



**The Additional Principal Chief Conservator of Forest,  
Regional Office (Eastern Central Zone)  
Ministry of Environment, Forests and Climate Change, Govt. of India  
Bungalow No. A-2, Shyamali Colony, Ranchi – 834002, Jharkhand.**

Ref No. - JMB/ENV/JMB/87/374/2023  
May 29, 2023

Ref.: Environmental Clearance letter no. - J-11015/91/2017-IA.II(M) dated- 11<sup>th</sup> July 2022.

**Sub: Half Yearly Compliance Status Report of Environment Clearance conditions issued by MoEFCC, New Delhi to Jamadoba Colliery, Tata Steel Limited, Dhanbad for the period October'22 to March'23**

Dear Sir,

We are enclosing herewith compliance report for the period **October'22 to March'23** for the EC granted vide letter no.- J-11015/91/2017-IA.II(M) dated- 11<sup>th</sup> July 2022 issued by Ministry of Environment, Forest and Climate Change, New Delhi.

We trust the information furnished is in line with your requirement.

Thanking you,

Yours faithfully,

**Head (Planning)  
Jharia Division, Tata Steel Ltd.**

Encl: As above.

Copy to: Member Secretary, CPCB, Eastern Zonal Office, Southend Conclave, 502, 5<sup>th</sup> Floor  
1582, Rajdanga Main Road, Kolkata -700107.

Copy to: Member Secretary, JSPCB, T.A. Division Building (Ground Floor), H.E.C, Dhurwa,  
Ranchi - 834004.

Copy to: Regional Officer, JSPCB, HIG-1 Sardar Patel Nagar, Housing Colony, Hirapur, Dhanbad

**HALF YEARLY COMPLIANCE REPORT**  
**(PERIOD: OCT'22 – MAR'23)**

**JAMADOBA UNDERGROUND COAL MINE**

**(CAPACITY: 0.34 MTPA)**  
**TEHSIL: JHARIA, DIST: DHANBAD, JHARKHAND**



**TATA STEEL LIMITED, JHARIA DIVISION**

**P.O.- JAMADOBA, DIST. - DHANBAD,**  
**STATE- JHARKHAND, PIN CODE – 828112**

**ENVIRONMENTAL CLEARANCE GRANTED VIDE LETTER NO. J-11015/91/2017-  
IA.II (M) dated July 11, 2022 ISSUED BY GOVT. OF INDIA, MINISTRY OF  
ENVIRONMENT, FOREST AND CLIMATE CHANGE, NEW DELHI.**

**Compliance status of Jamadoba Underground Coal Mine 0.34 MTPA in ML Area of 927.17 ha by M/s Tata Steel Ltd. At village Jorapokhar, Pattiya Dungri, Tehsil Jharia, District- Dhanbad, Jharkhand vide MoEFCC Letter no J-11015/91/2017-IA.II (M) dated July 11, 2022**

<b>Sl. No.</b>	<b>Consent Condition</b>	<b>Compliance Status</b>
i	PP to obtain the CTO for 0.34 MTPA capacities immediately after grant of EC.	Consent to Operate for the existing capacity has been obtained from the State PCB on 14.11.2022 and is valid till 31.12.2024.
ii	PP to conserve the Kari jhore, Dungri jhore, Damodar River following within the core area of the project and the measure taken for its conservation to be furnished in every six-monthly compliance to be reported to respective IRO and SPCB.	The conservation measures are ongoing, and the report shall be submitted to IRO, MoEFCC & SPCB as required.
iii	Since there is also Jamadoba Coal washery located within mine lease having separated EC vide Letter No.- J-11015/203/2011-II-IA(M) dated 3rd March 2014 so the adequate EMP measure to be adopted to minimize the cumulative impact, also the utilization of rejects generated from washery should be managed as per norms. PP shall obtain integrated EC for future coal/washery expansion.	There are existing environmental measures for the Jamadoba Coal preparation plant. The rejects like tailing, middling etc are utilized as per norms. The integrated EC shall be taken in case of washery expansion.
iv	PP shall obtain No objection certificate from Ground water Authority for extraction of ground water within six months and submit to IRO Ranchi.	The NOC from central Ground Water Authority for extraction of ground water has been granted vide NOC No. CGWA/NOC/MIN/ORIG/2021/1342 2; dated: 20/10/2021. The copy of NOC has been attached along with compliance report.
v	PP Shall reduce river sand used for stowing and explore usage of sand segregated from OB dump from any nearest mine (either its own or any mine) and submit detailed report to IRO Ranchi.	We are in the process of technological exploration of sand from OB dump.
vi	PP shall follow the recommendation of subsidence study and monitor the degree of subsidence regularly and shall be submitted to IRO- Ranchi.	The subsidence is monitored regularly, and the recommendations are implemented. The report shall be shared with IRO, Ranchi at the earliest. Report is attached as Annexure-VI.
vii	PP to accomplish the requirement of a full fledge qualified manpower with Environmental Engineer/Env. Science degree background in Environmental Management Cell etc. within six months and same shall be reported to IRO, MoEF&CC	We have a full-fledged Environment cell with Environment professionals and field monitoring staff.

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viii	PP to fulfil all the commitment made to address the public hearing issued in time bound manner as committed in EIA EMP report in Chapter & table 7.1 and a progressive report to be furnished to IRO with six monthly compliance report	The commitment are in various levels of compliance. The report shall be furnished to IRO, Ranchi as required. Annual Report for the FY 23, covering various activities carried out under CSR has been attached as Annexure-I.
ix	PP to maintain the transportation road properly to minimize the dust emission. PP to also develop puce roads by seeking consent from the panchayat with widening of roads especially roads inters linking the villages within the study area of 10 Km radius buffer zone.	The transportation roads in core and buffer zones are maintained properly to minimize the dust emission. The construction of roads in nearby villages are continuous process in consent with panchayat.
x	PP to complete the estimated allocated budgetary expenditure for EMP capital cost is Rs.273.0 lakhs & Recurring cost is Rs.1359.4 Lakhs per year as per its letter dated JMB/115/001339 dated 3rd September, 2021. Capital EMP budget shall be completed within strict timeline.	It is under progress. The completion within strict timeline shall be complied.
xi	PP to monitor the water quality of the ground water and surface water body located within the core zone and 5 Km radius from the periphery of the mine boundary as per procedure laid down by CPCB.	It has been complied.
xii	PP to install More continuous ambient air quality stations at suitable locations preferably village side with consultation of SPCB. The real time data so generated shall be uploaded on company website and linked it with website of CPCB & SPCB. In addition, data should also be displayed digitally at entry and exit gate of mine lease for public display.	A CAAQMS is being installed in Jamadoba group since 2014. A new CAAQMS has been installed recently in July 2022 and the data connectivity to SPCB, Jharkhand has been done.
xiii	PP shall develop rainwater harvesting in Jamadoba coal washery as proposed by PP in vide Letter dated JMB/115/001339 dated 3rd September, 2021 & water harvesting ponds near the villages of suitable area as suggested by EAC in consultation with Gram Panchayat within year and with cultivation of Lotus.	It shall be complied. Work has been initiated and under progress.
xiv	PP must seek the input of experts for phytoremediation of Slurry and accordingly work on it with proper scientific approach.	There is no generation of slurry during raw coal production.
xv	PP to plant additional 100,000 plants with three tier plantations along the transportation route, if not completed, and identified areas with consent to the gram panchayat within two year and plant	It is under progress.  Plantation and green belt development is a continuous process.

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	for remaining within 2 years for their proper growth.	Green belt report has been attached as Annexure-II.
xvi	PP to install solar lights along the road used for transportation of minerals to avoid the accidents at night and also seek its maintenance. PP is asked to also identify the rural areas for installation of solar light with in its maintenance within the study area of 10 km radius buffer zone within one year	It shall be complied
xvii	Proponent shall appoint an occupational Health Specialist for Regular and Periodical medical examination of the workers engaged in the project and maintain records accordingly also Occupational health check-up for workers having some ailments like BP, diabetes, habitual smoking etc. shall be undertaken once in six months and necessary redial/preventive measures taken accordingly. The recommendations of National Institute for ensuring good occupational environment for mine workers shall be implemented. The prevention measure for burns, malaria and provision of anti-snake venom including all other paramedical safeguards may be ensured before initiating the mining activities.	It has been complied. It's a continuous process. There is fully developed Tata Central Hospital in Jamadoba to take care of all these types of concerns of community.
xviii	Persons of nearby villages shall be given training on livelihood and skill development makes them employable with its proper records.	It is a continuous process and has been complied. Separate training cell (JNTVTI) has been developed for skill based training of local youth.
xix	The illumination and sound at night at project sites disturb the villages in respect of both human and animal population. Consequent sleeping disorders and stress may effects the health in the village located aloes tom mining operations. Habitations have a right for darkness and minimal noise levels at nights, PPs must ensure that the biological clock of the villages is not distributed by orienting the floodlights/masks away from the villagers and keeping the noise levels well within the prescribed limits for day lights/night hours	It has been noted and shall be complied strictly. No illumination and sound at night is being ensured.
xx	PP shall pay to farmers of agricultural land if there is any loss due to pollution found by concerned District Commissioner as per extent rules or norms.	It has been noted and shall be complied.
xxi	PP should establish in house (at project site) environment laboratory for measurement of environment parameter with respect to air quality and water (surface and ground A dedicated team	We have a full-fledged Environment cell with Environment professionals and field monitoring staff.

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	to oversee environment management shall be setup which should comprise of Environmental Engineer, Laboratory chemist and staff for monitoring of air , water quality parameters on routine basis. Any non-compliance or infringement should be reported to the concerned authority.	
4.1	The grant of Environment Compliance (EC) is further subject to compliance of the Standard EC Conditions as under:	
(a)	Statutory Compliance:	
i	The Environmental clearance shall be subject orders of Hon'ble Supreme Court of India. Hon'ble High Courts, NGT and any other Court of Law, from time to time, and as applicable to the project.	It has been noted.
ii	The project proponent shall obtain forest clearance under the provisions of Forest (Conservation) Act, 1986, in case of the diversion of forest land for non- forest purpose involved in the project.	It is not applicable.
iii	The Project proponent shall obtain clearance from the National Board for Wildlife, if applicable.	Not Applicable
iv	The project proponent shall prepare a site-specific conservation plan/wildlife management Plan and approved by the Chief Wildlife Warden. The recommendation of the approved Site-Specific Conservation Plan/Wildlife Management Plan shall be implemented in consultation with the State Forest Department. The implementation report shall be furnished along with the six-monthly compliance report (in case of the presence of schedule I species in the study area)	It has been notes and shall be complied.
v	The project proponent shall obtain Consent to Establish/Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1981 and Water (Prevention & Control of Pollution) Act, 1974 from the Concerned State Pollution Control Board/Committee.	The CTE has been obtained from JSPCB vide letter no. JSPCB/HO/RNC/CTE-14115974/2022/523 dated 12.11.2022 & CTO has been received from JSPCB with Ref No. JSPCB/HO/RNC/CTO-13955624/2022/1601 dated 14.11.2022.
vi	The project proponent shall obtain the necessary permission from the Central Ground Water Authority.	NOC has been obtained from CGWA vide NOC No. CGWA/NOC/MIN/ORIG/2021/1342 2; dated: 20/10/2021
vii	Solid Waste/Hazardous Waste generated in the	It has been noted and shall be

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	mines needs to addressed in accordance to the Solid Waste Management Rules,2016/ Hazardous & Other Waste Management Rules,2016	complied.
<b>I.(a)</b>	<b>Air Quality Monitoring and Preservation</b>	
i	Adequate ambient air quality monitoring stations shall be established in core zone as well as in the buffer zone for monitoring of pollutants, namely particulates ,SO <sub>2</sub> and NO <sub>x</sub> location of the Station shall be decided based on the metrological data, topographical features and environmentally and ecologically sensitive in consultation with the State Pollution Control Board. Monitoring of heavy metal such as Hg, As, Ni, Cd, Cr, etc. to be carried out at least once in six months. Online ambient air quality monitoring station may also be installed in addition to the regular air monitoring stations as per the requirement and /or in consultation with the SPCB.	It has been complied
ii	The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the coal Industry Standards notifies vide GSR 742 E dated 25.09.2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/Regional Office and to the CPCB/SPCB.	Ambient air quality of core as well as buffer zone are measures by inhouse environmental laboratory as well as third party NABL recognised lab. Report has been attached as Annexure-III.
iii	Transportation of coal, to the extent permitted by road shall be carried out by covered trucks/conveyors .Effective control measure such as regular water sprinkling /rain gun/mist sprinkling etc. shall be carried out in critical areas prone to air pollution with higher level of particulate matter all through the coal; transport roads., loading /Unloading and transfer points. Fugitive dust emissions from all sources shall be controlled regularly. It shall be ensured that the ambient air quality parameters conform to the norms prescribed by the Central/ State Pollution Control Board.	Transportation of coal from colliery to washery are done through covered conveyor belts. Road transportation is done through covered truck only.
iv	Major approach roads shall be black topped and properly maintained.	It has been complied
v	The transportation of coal shall be carried out as per the provision and route proposed in the approved mining plan. Transportation of coal through the exiting road passing through any	It has been complied

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	village shall be avoided. In case it is proposed to construct a bypass road it should be so constructed that the impact of sound, dust and accidents could be appropriately mitigated.	
vi	Vehicular emissions shall be kept under control and regularly monitored. All the vehicles engaged in mining and allied activities shall operate only after obtaining PUC' certificate from the authorized pollution testing centres.	It has been complied
vii	Coal Stock pile/crusher/feeder and breaker material transfer points shall invariably be provided with dust suppression system. Belt conveyors shall be fully covered to avoid air borne dust Side cladding all along the conveyor gantry should be made to avoid air borne dust. Drills shall be wet operated or fitted with dust extractors.	It has been complied
viii	Coal handling plant shall be operated with effective control measures w.r.t various environmental parameters. Environmental friendly sustainable technology should be implemented for mitigating such parameters.	CHP is being operated using dry fog system, water sprinklers, mist canons and other various effective dust control measures.
<b>(b)</b>	<b>Water Quality Monitoring and Preservation</b>	
i	The effluent discharge(mine waste water, workshop effluent) shall be monitored in terms of the parameters notified under the Water Act, 1974 Coal Industry Standard vide GSR 742 E, dated 25.09.2000 an as amended from time to time by the Central Pollution Control Board .	Water quality analysis discharge from mine sump, effluent treatment plants, sewage treatment plants are done regularly.
ii	The Monitoring data shall be uploaded on the company's website and displayed at the project site at a suitable location. The Circular NO. J-20012/1/2006-1A.11 (M) dated 27.05.2009 issued by Ministry of Environment, Forest and Climate Change shall also be referred in this regards for its compliance.	Monitoring data are being uploaded along with the half yearly compliance report on Tata Steel Limited website.
iii	Regular monitoring of ground water level and quality shall be carried out in and around the mine lease area by establishing a network of existing wells and construction new piezometers during the mining operations. The monitoring of ground water levels shall be carried out four times in a year i.e, pre monsoon monsoon, post monsoon and winter. The ground water quality shall be monitored once a year, and the data thus collected shall be sent regularly to MoEFCC/RO.	It is being complied.
vi	Monitoring of Water quality upstream and downstream of water bodies shall be carried out	Water quality upstream and downstream of the water bodies are



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	once in six months and records of monitoring data shall be maintained and submitted to the Ministry of environment, Forest and Climate Change/ Regional Office,	carried out.
v	Ground Water, excluding mine water, shall not be used for mining operation s rainwater harvesting shall be implemented for conservation and augmentation of ground water resources.	It has been noted and shall be complied
vi	The Project proponent shall not alter major water channels around the site. Appropriate embankment shall be provided along the side of the river/nallah flowing near or adjacent to the mine. The embankment constructed along river/nallah boundary shall be suitable dimensions and critical patches shall be strengthened by stone pitching on the river front side, Stabilized with plantation so as to withstand the peak water pressure preventing any chance of mine inundation.	It has been noted and agreed to comply.
vii	Garland drains (of suitable size, gradient and length) around the critical areas i.e. mine shaft and low lying areas, shall be designed keeping at least 50% safety margin the mine sites. The sump capacity shall also provide adequate retention period to allow proper settling of slit material of the surface runoff.	It is being complied
viii	The Water pumped out from the mine, after siltation, shall be utilized for industrial purpose viz. watering the mine area, roads green belt development etc. The drains shall be regularly distilled particularly after monsoon and maintained properly.	The pumped water from the mine are being utilized for stowing, coal washing, sprinkling, green belt development and water treatment plant for community.
ix	Industrial waste water from coal handling plant and mine water shall be properly collected and treated so as to conform to the standard prescribed under the Environment Protection Act, 1986 and the rules made thereunder, and as amended from time to time. Oil and grease trap shall be installed before discharge of workshop affluent. Sewage treatment plant of adequate capacity shall be installed for treatment of domestic waste water.	Industrial wastewater from coal handling plants are collected, treated and used in the coal washing and stowing activities.
x	Adequate ground water recharge measure shall be taken up for augmentation of ground water. The project authorities shall meet water requirement of nearby villages in case the village wells go dry to dewatering of mine.	Water recharge structures are being constructed and renewed regularly in the nearby villages.
xi	The surface drainage plan including surface	It has been noted and shall be

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	water conservation of area of influence affected by the said mining operations shall be prepared, considering the presence of any river/rivulet/pond/lake etc. with impact of mining activities on it. And implemented by the project proponent. The surface drainage plan and /or any diversion of natural water courses shall be as per the provisions of the approved Mining Plan /EIA/EMP submitted to this Ministry and the same should be as per the approved mining plan and as per the permission of DGMS.	complied
xii	The project proponent shall take all precautionary measure to ensure reverian/riparian ecosystem in and around the coal mine up to a distance of 5 km. a revarian/riparian ecosystem conservation and management plan should be prepared and implemented in consultation with the irrigation/water resources department in the state government.	It has been noted and shall be complied
(c)	<b>Noise and Vibration Monitoring and Prevention</b>	
i	Adequate measures shall be taken for control of noise levels below 85 db. (A) in the work environment. Workers engaged in underground mining operations of HEMM etc. shall be provided with personal protective equipment's (PPE) like ear plugs/muffs in conformity with the prescribed norms/guidelines in this regards. Progress in usage of such accessories to be monitored. Adequate awareness programme for users to be conducted.	It has been complied
ii	The noise level survey shall be carried out as per the prescribed gridlines to assess noise exposure of the workmen at vulnerable points in the mines premises, and report in this regard shall be submitted to the Ministry/RO on six monthly basis.	It has been complied. The report has been attached in <b>Annexure-III.</b>
(d)	<b>Mining Plan</b>	
i	Mining shall be carried out under strict adherence to provisions of Mines Act 1952 and subordinate legislations made there under as applicable.	It has been noted and shall be complied.
ii	No change in mining method i.e. UG to OC, calendar programme and scope of work shall be made without obtaining prior approval of the Ministry of Environment Forest, and Climate Change (MoEFCC)	It has been noted and shall be complied.

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iii	Mining shall be carried out as per the approved mining plan (including mines closure plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General of Mines Safety (DGMS)	It has been noted and shall be complied.
iv	Underground work place environment conditions shall be rendered ergonomic and air breathable with adequate illumination in conformance with DGMS Standards.	It has been complied
v	No mining activity shall be carried out in forest land without forestry clearance as per forest (Conservations) Act, 1980 and also adhering to the Scheduled tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act,2006 read with provisions of Indian Forest Act,1927	It has been noted. No forest land involved.
vi	Efforts should be made to reduce energy and fuel consumption by conservation, efficiency improvements and use of renewable energy.	It has been noted and shall be complied
<b>(e)</b>	<b>Land Reclamation</b>	
i	Digital Survey of entire lease hold area/core zone using Satellite Remote Sensing survey shall be carried out at least once in three years for monitoring land use pattern and report in 1:50,000 scale or as notified by Ministry of Environment, Forest and Climate Change (MoEFCC) from time to time shall be submitted to MoEFCC/ Regional Office (RO)	It has been complied. The LULC study was done in 2021 and the report was submitted to IRO, Ranchi
ii	Post mining I/Forestry purpose and shall be handled over to the respective State Government, as specified in the Guidelines for preparation of Mine closure Plan, issued by the Ministry of Coal dated 27th August,2009 and subsequent amendments	It has been noted and shall be complied
iii	Regular Monitoring of subsidence movement on the surface over and around the working areas and its impact on natural drainage pattern, water bodies, vegetation, structure, roads and surroundings shall be continued till movement ceases completely. In case of observation of any high rate of subsidence beyond the limit prescribed, appropriately effective mitigation measures shall be taken to avoid loss of life and materials. Cracks should be effectively plugged in with ballast and clay soil/suitable material.	It has been complied
iv	Fly ash shall be used for external dump of overburden, backfilling, or stowing of mines as per provision contained in clause (I )and (ii) of	It is being complied.

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	subparagraph (8) of fly ash notification issued vide SO 2804 E dated 3rd Nov. 2009 as amended from time to time. Efforts shall be made to utilize gypsum generated from flue Gas Desulfurization (FGD) if any along with fly ash for external dump of overburden, backfilling or stowing of mines. Compliance report shall be submitted to Regional office of MoEFCC, CPCB, and SPCB.	
v	A separate team for subsidence monitoring and surface mitigation measures shall be constituted and continuous monitoring & implementation of mitigation measures be carried out.	A separate team including surveyors has been made for continuous measurement and monitoring subsidence and implement mitigation measures.
vi	Through inspection of the mines lease area of any cracks developed at the surface due to mining activities below ground shall be carried out to prevent inrush of water in the mine.	It is being complied
vii	Native tree species shall be selected and planted over areas affected by subsidence.	Generally, no areas are as much affected by subsidence. However, native species are planted for the land reclamation.
viii	The Project proponent shall make necessary alternative arrangements, if grazing land is for livestock grazing, if any. In this context the project proponent shall implements the direction of Hon'ble Supreme Court with regards to acquiring grazing land.	Not applicable as it is an underground mine
<b>(f)</b>	<b>Green Belt</b>	
i	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered flora/fauna, if any spotted/ reported in the study area. Action plan, in this regards if any shall be prepared and implemented in consultation with the State Forest and Wildlife Department.	It has been noted and shall be complied
ii	Green belt, consisting of three -tier plantation, of which not less than 7.5 m shall be developed all along the mines lease area in a phased manner. The green belt comprising of a mix of natives species shall be developed all along the major roads/ coal transportation roads.	It has been complied partially and work is under progress.
<b>(g)</b>	<b>Public Hearing and Human Health Issues</b>	
i	Adequate illumination shall be ensured in all mine location (as per DGMS standards) and monitored.	Illumination monitoring is done on regular basis as per DGMS norms.
ii	The project proponent shall undertake occupational Health survey for initial and	IME and PME rase done on regular basis through our inhouse Tata

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	Periodical medical examination of the workers engaged in the project and maintain records accordingly as per the provision of the Mines Rule, 1995 and DGMS Circulars. Besides carrying out regular periodic health check-up of their workers, 20% of the workers engaged in active mining operations shall be subjected to health check-up for occupational disease and hearing impairment, if any.	Central Hospital.
iii	Personal (including outsourcing employees) working in dusty area shall wear protective respiratory devices and shall also be provide with adequate training and information on safety and health aspects.	Adequate on site and off-site job training are given before deployment of employees. PPEs are being ensured to wear from safety and environment point of view.
iv	Skill training as per safety norms specified by DGMS shall be provided to all workmen including the outsourcing employees to ensure high safety standards in mines.	Skill training along with basis safety training are done before deployment of employees to work.
v	Effective arrangements shall be made to provide and maintain at suitable point's conveniently situated, a sufficient supply of drinking water for all the persons employed.	Water treatment plants are operated for safe drinking water supply in nearby community.
vi	Implementation of Action Plan on the issues raised during the public hearing shall be ensured. The Project Proponent shall undertake all the tasks as peer the Action Plan Submitted with budgetary provisions during the Public Hearing. Land outies shall be compensated as per the norms laid out R&R Policy of the Company/or the National R&R Polity/R & R Policy of State Government as applicable.	It is under progress and shall be complied. The various action plans are in various stages of compliance.
vii	The project proponent shall follow the mitigation measures provided in the Ministry's OM No. Z-11013/5712014-IA.II (M) dated 29th October, 2014, titled 'Impact of mining activities on habitations issues related to the mining projects where habitation and villages are the part of mines lease areas or habitations and villages are surrounded by the mine lease area'.	It has been noted and shall be complied
<b>(h)</b>	<b>Corporate Environment Responsibility</b>	
i	The company shall have a well laid down environmental policy duly approve by the Board of Directors. The environmental policy should prescribe for standard operating procedures have proper checks and balances and to bring in focus any infringements/deviation/violation of the environment/forest /wildlife norms/conditions. The company shall have defined system of	The company has well laid down Environmental Policy. Attached as Annexure-IV.

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	reporting infringements /deviation/violation of their environment /forest/wildlife norms/conditions and /or shareholder/stockholders. The copy of the board resolution in this regards shall be submitted to MoEF&CC as a part of six monthly reports.	
ii	A separate Environmental Cell both at the project and company head quarter level, with qualified personal shall be set up under the control of senior Executive, who will directly to the head of the organization.	It has been complied
iii	Action Plan for implementation EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be providing for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the six Monthly Compliance Report.	It has been noted and shall be complied
iv	Self-Environmental audit shall be conducted annually. Every three year third party environmental audit shall be carried out.	Self-audit is conducted annually and IRQS audit for EMS 14001:2015 are conducted. Attached as Annexure-V.
	<b>Miscellaneous</b>	
i	The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspaper of District or State of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the projects proponents website permanently.	It has been complied
ii	The copies of the environmental clearance shall be submitted by the projects proponents to the head of local bodies, panchayats and Municipal Bodies in addition to relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.	It has been complied
iii	The project proponent shall upload the status of compliance of the Stipulated environment clearance conditions, including results of monitored data on their website and update the same on half yearly basis.	It has been noted and shall be complied
iv	The project proponent shall monitor the criteria pollutants level namely; MP10, So2, NOx	It has been complied

**Compliance status of Jamadoba Underground Coal Mine 0.34 MTPA in ML Area of 927.17 ha by M/s Tata Steel Ltd. At village Jorapokhar, Pattiya Dungri, Tehsil Jharia, District- Dhanbad, Jharkhand vide MoEFCC Letter no J-11015/91/2017-IA.II (M) dated July 11, 2022**

	(ambient level) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to public and put on the website of the company.	
v	The project proponent shall submit six monthly reports on the status of the compliance of stipulated environment conditions on the website of the Ministry of Environment, Forest and Climate Change at environmental clearance portal.	It has been noted and shall be complied
vi	The project proponent shall follow the mitigation measure provided in this Ministry's OM No. Z-11013/5712014-IA.II (M) dated 29th October, 2014, Titled "Impact of mining activities on habitation - issues related to the mining projects wherein habitations and villages are the apart of mine lease areas or habitations and villages are surrounded by the mines lease area.	It has been notes and shall be complied
vii	The project proponent shall submit the environmental statement for each financial year in FORM-V the concerned State pollution Control Board as prescribe under the Environment Rule, 1986 as amended subsequently and put on the Website of the company.	Environmental Statement has been submitted on time to the concerned authorities.
viii	The project authorities shall inform to the regional Office of MoEF&CC regarding commencement of mining operations.	The mining activities are ongoing since more than 100 years.
ix	The project authorities must strictly adhere to the stipulation made by the State Pollution Control Board and the State Government.	Shall be complied
x	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during public hearing and also that during their presentation to the Expert Appraisal Committee.	It has been noted and shall be complied
xi	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forest and Climate Change.	It has been Agreed
xii	Concealing factual data or submission of false /fabricated data may result in revocation of this environmental clearance and attract action under this provision of Environment (Protection) Act, 1986.	It has been noted
xiii	The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.	It has been agreed

**Compliance status of Jamadoba Underground Coal Mine 0.34 MTPA in ML Area of 927.17 ha by M/s Tata Steel Ltd. At village Jorapokhar, Pattiya Dungri, Tehsil Jharia, District- Dhanbad, Jharkhand vide MoEFCC Letter no J-11015/91/2017-IA.II (M) dated July 11, 2022**

xiv	The Ministry reserve the right to stipulate additional condition if found necessary .The company in a time bound manner shall implement these conditions.	Agreed
xv	The Regional office of this Ministry shall monitor compliance of the stipulated conditions The project authorities should extend full cooperation to the officers of the Regional Office by furnishing the requisite data /information/monitoring reports.	Agreed
xvi	The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1986, Hazardous and Other Waste (Managements and Trans- Boundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders by the Hon'ble Supreme Court of India/ High Court and any other Court of Law relating to the subject matter.	It has been agreed
5	The Proponent shall abide by all the commitments and recommendation made in the EIA/EMP report and also that during presentation to the EAC. All the commitments made on the issues raised during public hearing shall also be implemented in letter and spirit.	All the commitment and recommendations made as per Public hearing are under process of completion.
6	The proponent shall obtain all necessary Clarence /approvals that may be required before the start of the project. The Ministry or any other competent authority may stipulate any further condition for environmental protection. Ministry or any other competent authority may stipulate any further condition for Environment protection.	It has been agreed
7	Any appeal against this environmental clearance shall lie with the Green Tribunal if Preferred, with in a period of 30 day as prescribed under section 16 of the National Green Tribunal Act, 2010.	Not required
8	The coal company\project proponent shall be liable to pay compensation against the illegal mining, if any, and raised by the respective state Government at any point of time in terms of the orders dated 2nd August, 2017 of Hon'ble Supreme Court in WP (Civil) No.-114/2014 in the matter of Common Cause Vs Union of India & others.	Agreed



**Compliance status of Jamadoba Underground Coal Mine 0.34 MTPA in ML Area of 927.17 ha by M/s Tata Steel Ltd. At village Jorapokhar, Pattiya Dungri, Tehsil Jharia, District- Dhanbad, Jharkhand vide MoEFCC Letter no J-11015/91/2017-IA.II (M) dated July 11, 2022**

9	The concerned State Government shall ensure no mining operations to commence till the entire compensation for illegal mining if any is paid by the project proponents through their respective Department Of Mining & Geology, in strict compliance of judgement of Hon'ble Supreme Court.	It has been noted
10	This environmental clearance shall not be operational till time the project proponent complies with the above said judgement of Hon'ble Supreme Court, as applicable, and other statutory requirements.	Agreed

## Executive Summery

Tata Steel Foundation is focused upon co-creating solutions, with tribal and excluded communities, to address their development challenges. Working for the overall development of community through its interventions in Health, livelihood, Education and Skill development.

Followings are the key highlights of the work carried out by Tata Steel Foundation in FY'23:

- In Public Health camp, 24968 villagers from 35 villages got free health check-up and medicines.
- A total of 79 camps were organized for Non communicable diseases (hypertension, diabetes, breast, and oral cancers) in which 2,296 beneficiaries got screened and were provided health services.
- Under the Ni-kshya Mitra program, 673 food packets were provided in Baghmara block.
- Under Cataract, 85 Nukar natak were organised to create awareness among villagers on blindness and a total of Eight camps organized in which 1,021 surgeries were successfully done.
- In Nutritional Garden, TSF Jamadoba distributed seed, plants and Agri materials to 1500 Households and wall paintings around nutrition were done at 180 places in different villages.
- Tata Steel started SPARSH centre with technical collaboration with LEPRASociety in which 1570 patients got benefitted.
- Under RISHTA project, TSF Jamadoba is working with 1465 beneficiaries through Pre and post-test.
- Total number of students enrolled in Pre-Matriculation Couching in FY'23 is 2378 in 18 centres.
- TSF Jamadoba has recently organized the `placement-drives for the job-openings at Tata Electronics Private Limited (TEPL) in which 24 candidates joined Tata Electronics.
- The total enrolment of the candidates in Community Youth coaching program for Uniform services is 64.
- Tata Steel Foundation (TSF), in collaboration with NIIT Foundation (NF), has been offering IT and English Courses in which total enrolment is 755.
- To promote paddy cultivation a total of 92 farmers (36 from Jamadoba and 56 from Sijua) of the leasehold area were supported with paddy seeds having acreage of 92 acres.
- 20 acre of horticulture plantation has been done through providing plants of Banana, papaya, Mango, coconut, guava, and lemon.
- TSF Jamadoba is supporting 140 landless families with critical inputs around various types of micro enterprises.
- Gender and Leadership for Disha, in which 240 women leaders are being developed. Out of 240, 60 women have completed training till module 4.
- Tata feeder centre, training of budding sports talent in three sporting segments i.e., Football, Archery and Athletics. As of now the total intake of the players under these sporting segments is 188.

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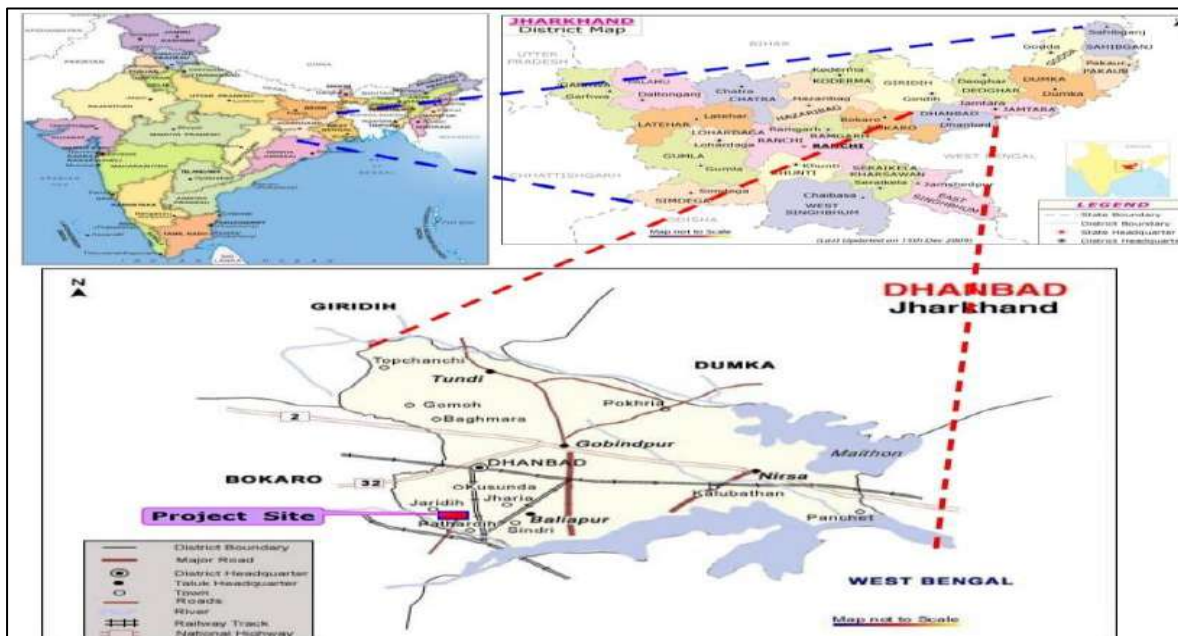
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# INTRODUCTION

Tata Steel Foundation (the Foundation), a wholly owned subsidiary of Tata Steel Limited, was incorporated on August 16, 2016, under Section 8 of the Companies Act 2013. The Foundation is focused upon co-creating solutions, with tribal and excluded communities, to address their development challenges. During this process of co-creation, the Foundation endeavours to develop and implement change models that are replicable at a national scale, enable significant and lasting betterment in the well-being of communities proximate to the Company’s operating locations and embed a societal perspective in key business decisions. The Foundation strives for excellence by ensuring that all programmes are aligned with community needs and focus on national priority areas enabling communities to access and control resources to improve the quality of their lives with dignity.



TSF, Jamadoba is working in 44 villages of three blocks (Jharia, Dhanbad and Baghmara). Working in different areas like Health, Livelihood, Education, and Infrastructural development for livelihood enhancement and make community self-sufficient.



## PUBLIC HEALTH

Tata Steel provides both curative and preventive healthcare services to improve levels of health amongst the community. Tata Steel Foundation is committed to provide best health care facility to people in Tata Steel leasehold area. TSF Jamadoba, acts as strengthening agency for awareness generation, promotion of good health and hygiene, and bridge gap between community and government health facilities.

### **Major Achievement:**

- In Public Health camp, 24968 villagers from 35 villages got free health check-up and medicines.
- Focussing the preventive aspects of public health, a total of 79 camps were organized for Non communicable diseases (hypertension, diabetes, breast, and oral cancers) in which 2296 beneficiaries got screened and were provided health services.
- Under the Ni-kshya Mitra program, 673 food packets were provided in Baghmara block.

### **Nutritional Garden:**

The kitchen/home gardens have been found to play an important role in improving food security for the poor rural household. Keeping in view the importance of vegetables in daily diets and its low availability, TSF Jamadoba has started Nutritional Garden program for villagers of Tata Steel lease hold area. TSF Jamadoba, provides seed, plants and Agri materials to villagers for Kitchen Garden and have the benefits of good quality of food without using external fertilizer or chemicals.

TSF Jamadoba, distributed seed, plants and Agri materials to 1500 Households and wall paintings around nutrition were done at 180 places in different villages.

### **Case Study of Mrs. Dhani Devi**

“Connecting with nature is connecting with God” is the story of Dhani Devi (Age -29) wife of Mr. Devan Kalindi, and resident of Harijan Tola of Patia Panchayat. TSF Jamadoba reached her during seed distribution campaign in her village. During the home visit TSF Jamadoba team came to know that they have to rely on daily wages for their livelihood as they are landless. After monitoring the troublesome and pathetic condition of the family during home visit. Mrs. Dhani Devi was suggested to do kitchen gardening and explained about the benefits of kitchen garden. Which will not only increase her family nutritional intake but also save money which they spend on buying vegetable or for medical purpose which arises due to malnourishment. Kitchen garden will also help her generate additional income if the produce is high through selling of vegetable.

She decided to own an uncultivated and useless land in her village with the consent of community and SHG members. The issue was discussed in front of village community, and she got a small piece of land. TSF Jamadoba has supported her with seed, plants and Agri materials and provided one day training session.



Now after three months, she has done one of the best kitchen gardens and promised to continue it in near future. Mrs. Dhani Devi thanked TSF Jamadoba team for their effort and handholding support.



## **CATARACT**

Tata steel has collaborated with Shankar Netralaya during the year 2017-18 to do cataract camps through Mobile Eye surgical unit (MESU) which carries out operations for the cataract infected patients. Under the program for preventable blindness a total of 85 Nukar natak were organised to create awareness among villagers on blindness because of cataract in Tata Steel lease hold area villages and a total of Eight camp organised (2 at Baghmara CHC, Rajganj, 2 at Bhelatand and 3 at Digwadih) in which 1441 patient were screened, and total surgery done is 1,021.

### **Case Study of Mr. Niranjn Mahato:**

It has been correctly said “I have a very poor eyesight, and I can’t imagine a world without my glasses or contacts”. Mr. Niranjn Mahato of Nunidih Basti, was working as a helper at Tata Steel canteen, he uses to put coal in the cooking stove. During his mid-forties he notice that his vision is getting blur. He started wearing spectacles for clear vision. His right eye vision deteriorated dramatically.

He gets to know about Tata Steel Foundation, Eye check-up camp from one of the beneficiaries residing near his house. So, he visited the camp and diagnosed with cataract. After all the screening done by doctors, operation date was given. But on the date of operation, he was diagnosed with Hypertension and was referred to TSF Medical department. He visited TSF, Jamadoba and the medical team provided all the necessary support and medicines. The next day he visited again as per the advice of TSF medical team, and he was found normal and sent for cataract surgery.

On 20.09.2022, Cataract surgery was done. And now he can see the world clearly and does all his work without any support from others. He expresses his happiness and gratitude to Tata Steel Foundation.



## RISHTA

Regional Initiative for Safe Sexual Health by Today's Adolescents, formally known as "Project RISHTA" is a consortium project on Adolescents' Reproductive and Sexual Health, which aims "to improve the sexual and reproductive health and wellbeing of adolescents in Jharia Division.

RISHTA project aims at empowering adolescents to know and exercise their adolescent rights and be sensitive to issues of adolescent health (preventive and curative). Furthermore, pregnancy during adolescence is associated with higher risk of health problems like anaemia, sexually transmitted infections, unsafe abortion, and mental disorders (like depression). Pregnant adolescents also bear negative social consequences and often have to leave school reducing their employability leading to long-term economic implications. Unmet needs for family planning especially for spacing are high among adolescents.

### Key objectives of RISHTA project

- Enable adolescents to take right decision with right information for their future.
- Inculcating the importance of adolescents' health, which otherwise remains ignored.
- Reduce Early Age of Marriage across the block
- Inducing the importance of life skills in adolescents as catalysts to cater to their life approach in a more progressive manner.
- Orienting the adolescents with adolescent rights which are powerful tools for them to exercise.



- Number of adolescents reached through ARSH sessions -1465.
- 4 number of National/International Day observed in which 567 number of participants participated.
- 4 Kishor Navdampatti samaroh was organized with 56 adolescent couple participation.



- Total 123 meeting with AWW, Asha and PRI member with 1470 participants.
- Total 3 Child marriage delayed.
- 135 Sathiya were trained around various aspects of sexual and reproductive health
- Total 13 no. of pregnancy delayed.

### **Case Study of Mohini Kumari Khetrpal**

Mohini Kumari Khetrpal is 20 years (DOB – 11/11/2002) old girl who believes that education and hard work never goes in vain. Her father Mr. Deepak Kumar Khetrpal is a daily wage labor, and her mother Mrs. Anjana Devi is a house manager. She has one younger sibling, who works as a daily wage laborer with his father. The monthly income of the family was Rs. 8000 /-. And the financial condition was not good.

She is associated with RISHTA team for last 4 years. She has completed her intermediate and wanted to help her family financially. One day Mohini came to attend RISHTA meeting in which one of the TSF staff was discussing on F&B training which is given by PACE Centre Jamshedpur. She found this training fruitful for her career growth and to make her family financial stable.



She contacted RISHTA team after few days of training to know the procedure of selection in F&B course and wanted RISHTA team to convince her parents. The team visited her house and counselled her parents and convinced them.

The team lined up with PACE training Centre for F&B training and Mohini got admission in 2 months training program. After successful completion of her training, she got placed at Ramada Hotel Jamshedpur. Now she is earning Rs. 14,500/- per month with free accommodation, which enabled her to take care of both her and her family financial need.

With regular guidance of TSF RISHTA team, she completed her graduation and now enrolled herself in Hotel Management course for departmental promotion. She and her family are very thankful to TSF Jamadoba and RISHTA team for all the support and guidance.

### **SPARSH**

In 2005, India was declared with leprosy eliminated. Vertical system comprising Non-Medical Assistants and Supervisors were abolished. Health personals dedicated for NLEP2 have been deployed in other health vertical. Rigorous screening and monitoring system became poor post 2005. Considering the fact of high endemicity in Dhanbad (adjacent to



Purulia), a joint venture namely “SPARSH centre- A healing Touch” had been started in 2009.

Above all, new cases have been found in special pockets of India through Leprosy Case Detection Campaign by NLEP, GoI (14th September to 4th October 2016). According to WHO report, India accounts for 60% of total new cases of Leprosy across the world. Many new cases have been found in Bihar, Jharkhand, and Chhattisgarh.

Tata Steel started SPARSH centre with technical collaboration with LEPRO Society, for the benefit of the Leprosy affected persons in the year 2009 (26th October) and the reconstructive surgery unit started during the year 2017. This reconstructive surgery unit which is one-of-its-kind in Eastern India will play a major role in the leprosy eradication programmes, benefitting the patients from the States of Jharkhand and Bihar.



### **Coverage Area**

The SPARSH centre caters to the patients from Jharkhand and Bihar. Till today patients from 13 blocks have been able to access health services.

### **Objective of SPARSH Centre**

- Provide healthcare facilities to leprosy affected people and helping them to cope up with the societal stigma attached to the disease.
- To correct the deformities of people suffering from Leprosy, so that they come in the mainstream society.
- Restoring livelihood opportunities for those who have undergone reconstructive surgery.

### **Services offered**

- OPD services for patients suffering from leprosy
- Providing specially designed footwear to the patients
- Raising awareness regarding leprosy through a Mobile IEC Van in 200 villages in Dhanbad district
- Capacity building of health officials in leprosy

### **Key achievements during this period**

- A total of 1570 persons suffering from leprosy and related illness were provided health facilities.

- 1,53,500 persons were covered under the IEC campaign which creates awareness around the early identification and treatment of leprosy in 200 villages of the Dhanbad district.
- 454 MCR footwear manufactured for person affected of Leprosy.
- Reconstructive surgery to correct deformity was organised in which total 23 RCS was done.

### **Case Study of Mr. Prahalad Mahato:**

Mr. Prahalad Mahato (Age – 26 years) son of Ramlochan Mahto, Resident of Nischitpur village, Baghmara. He lives in his sister's house in Baghara village due to leprosy. His wife and son left him and his father lives alone at Nischitpur village, where he works as a daily wage worker.

He was referred by PHC Baghmara for reconstructive surgery at SPARSH centre to correct left claw hand after one year treatment from MDT. During examination, SPARSH Doctors found that he is suffering with Type II(ENL) reaction with right Ulnar, bilateral lateral popliteal and posterior tibial neuritis.

Prahalad Mahato was suffering from Leprosy for last 4 year and started his treatment at Nirmal Leprosy Hospital, Gobindpur for one year. During his treatment he get Lepra reaction. Then he started his treatment at MDT, PHC Baghmara.



After examination and diagnose at SPARSH centre, the treatment started with Steroid therapy for a period of one month. The reaction was subsided, and muscle power improved. Again, he gets recurrent reaction. The centre started second line drug for Lepra reaction with clofazimine therapy with proper counselling for a period of 4 month. He was declared cured of ENL reaction.

The reason of reaction was psychological problem caused due to disease, family, and future. The centre counsels Prahalad and his family time to time for proper case holding and management. Finally, he copped and accepted mental health treatment and case management of SPARSH centre.



The reason of reaction was psychological problem caused due to disease, family, and future. The centre counsels Prahalad and his family time to time for proper case holding and management. Finally, he copped and accepted mental health treatment and case management of SPARSH centre.

Now he is doing good and works as a daily wage worker with his father at his hometown. He believes that his deformity will correct, and his family will live together after surgery. He is very thankful to TSF Jamadoba and SPARSH team.

## EDUCATION

### **Pre-Matriculation coaching:**

PMC (Pre-Matriculation Coaching) classes have been running since 2012 in government and private (J.A.C. Board) schools for class VI to X in the leasehold areas of Jamadoba and Sijua. PMC was started in 2011-12 with 1,025 students at 11 centres, especially for the poor students, who cannot afford private tuition classes for bringing improvement in their studies. Pre- Matriculation coaching classes have been operated in two parts from Class VIII - X and Preparatory classes for classes VI to VII.

Total number of students enrolled last year (FY22) was 1548 in 09 centres. The Pre-Matriculation Coaching class is a boon for the students as it has been observed that the students have gained a lot from this program. Due to this program, they have been able to score good marks in their academic exams. According to the survey done before starting of PMC class, the passing % of the class 10th was 70%. In FY 22, TSF Jamadoba has achieved 100% result in the matriculation exam.

The purpose of running this Pre-Matriculation Coaching class is to provide quality tuitions to the poor students in English, Math, and Science. The total number of teachers in one centre is 5 - two teachers for Classes VI-VII and three teachers for classes VIII-X. The teachers are being paid through the school committees or the SHGs (Self Help Group).

In FY 23, TSF Jamadoba have conducted PMC classes at 18 centres covering 2378 students.



### **Jyoti Fellowship Programme:**

As part of affirmative action policy and effort towards inclusive growth and development of Scheduled Caste and Scheduled Tribe community. Tata Steel Foundation awarded Jyoti Fellowship to 346 meritorious students of Jamadoba region. Total scholarship amount is Rs. 17,98,750/-.

The objective of Tata Steel Jyoti Fellowship is to ensure that meritorious student from economically- challenged SC/ ST families have an opportunity to continue and pursue their

educational goals and fulfil career aspirations. Tata Steel's Tribal Cultural Society (TCS) identifies deserving candidates from operational areas of the company on the merit-based test.

### **Language Classes:**

Language classes on `Ol-chiki` script was started for the Santali communities residing in and around Tata Steel leasehold areas that is Bhowra-parsiabad village (Jamadoba) and Bhelatand Majhi tola (Sijua location). The classes are held during the weekend. The total enrolment is 71 (JMB- 33 students and Sijua- 38 students).



## **Employability Programme**

### **Placement Drives**

With an objective to provide employment opportunity for youths. TSF Jamadoba has recently organized the `placement-drives (for the job-openings at Tata Electronics Private Limited (TEPL) in collaboration with the Model Career Centre, Jamshedpur.

The placement –drive was specially meant for the local female candidates who are aged between 18-20 years (21 for the SC/ST category) and have passed out their intermediate exam during the year 2021 and 2022.

This placement drive was attended by total 128 candidates out of which 64 were shortlisted and finally 24 female candidates from Tata Steel leasehold areas have joined Tata Electronics.



### **Community Youth coaching program for Uniform services:**

With an objective to support the youth prepare for entry into uniformed services, TSF Jamadoba is running ``Community Youth Coaching Program`` for the local youths. The coaching is provided to prepare for written as well as physical tests for clearing various competitive exam(s) of the Uniformed Services like State Police, CMPF like BSF, CRPF, ITBP, Coast Guards, Army, Navy, and Air Force etc.

As of now, the total enrolment of the candidates is 64 (31 at Jamadoba and 33 at Sijua). While this coaching program, the enrolled candidates have started appearing at the competitive exam related to the Uniformed Services.

Total 29 candidates (11 from Jamadoba, 18 from Sijua) have appeared at the SSC GD EXAM-2022 which was held in January`23. The SSC has declared the results of SSC GD Exam on 08th April,2023. Total 9 candidates (6 from Sijua and 3 from Jamadoba) have cleared the



written exam of SSC GD. The physical exam is likely to be held soon for the candidates who have cleared the written exam of SSC GD-2022.



### **Skill development centre:**

Tata Steel Foundation (TSF), in collaboration with NIIT Foundation (NF), has been offering IT and English Courses in small towns and interior villages of the Company's operational areas since FY15. This program was initiated in response to the high demand for these skills among youth. The goal is to empower communities within Tata Steel operational areas by developing IT (Information Technology) and English capabilities among them. This would include youths, women (SHG, ANM, Asha, etc), adolescents and migrant laborers.

### **Progress made during the period**

- A total of 755 enrolment has been done for FY'23.
- Out of 755 – 375 enrolled in Jamadoba and 380 in Sijua centre.
- A total of 677 students completed their course – 330 at Jamadoba and 347 at Sijua.



## **LIVELIHOOD ENHANCEMENT**

### **Support to farmers during kharif season:**

To promote paddy cultivation a total of 92 farmers (36 from Jamadoba and 56 from Sijua) of the leasehold area were supported with paddy seeds having acreage of 92 acres. The improved varieties of seeds promoted were KV21 and Purnima Gold. The farmers contributed 50% of the cost of seeds and each farmer was supported with a maximum of 1 acre. A total of 200 kg of seeds were promoted (164 kg of Purnima Gold seeds and 36 kg of KV2 seeds).

## Horticulture Development:

Horticulture development is a very useful method of income augmentation for the farmers. During the year 20 acre of horticulture plantation has been done through providing plants of Banana, papaya, Mango, coconut, guava, and lemon. Out of which the district horticulture department has also supported in this initiative by providing plants for 10 acres. In which total of 142 farmers got benefited.



## Leveraging Government Resources:

Community mobilization has been done by raising awareness levels of the farmers so that they can access the agriculture related schemes. During the year following progress has been made:

- 13 farmers have received 5350 banana and papaya plant from District Horticulture Department Dhanbad having an acreage of 6 acre of land.
- 4 animal health camps have been organized with support of district animal husbandry department in which a total of 1414 animal received medical check-up.
- TSF Jamadoba in collaboration with MSME Dhanbad has organised 30 days stitching training program in Petia Panchyat Bhawan, Petiya.
- FLD project of District Horticulture Department is being implemented in Tundi.
- 15 Diesel pump sets and 2 tractors was lesioned with govt. on 90% subsidiary under which 15 farmers got benefitted.
- 331 farmers got free elephant yam seed from District Horticulture Department.
- 160 women attended 3 days training on mushroom farming and received free Mushroom spawn.



### **Distribution of Micro-Enterprise Toolkit:**

Micro-Enterprise businesses not only help in promoting quality of life for business runners but also add value to the local economy. They produce numerous jobs at small-scale, improve income, and boost purchasing power.

TSF Jamadoba is supporting 140 landless families with critical inputs around various types of micro enterprises which will help them in self-employment and entrepreneurship.



### **Promoting Fish Farming:**

“Promoting fish farming” is one of the key initiatives towards improving the livelihood of the people living in Tata Steel leasehold area. During the FY’23, total 52 ponds were supported with fingerlings having 208 beneficiaries. Total 312 kg of fingerlings were distributed. The fingerlings were provided at 50% contribution from the pond-beneficiaries.

Besides providing fingerlings to the pond beneficiaries and build their capacities, much emphasis is given on improving the feeding practice. In this respect, TSF Jamadoba is facilitating farmers in getting proper-feed packets from the District Fishery Department at 50% subsidy.

### **Case Study of Mr. Abhimanyu Mahato:**

A young farmer Mr. Abhimanyu Mahato (Age 35), his father’s name Mr. Shankar Mahato resident of Patia Panchayat of Dhanbad district. Just a matric pass is growing rapidly with increase interest in the field of fish production. It is correctly said “The capacity to learn is a gift; the ability to learn is a skill; the willingness to learn is a choice.” With his willingness and support from TSF Jamadoba, made him earn his livelihood with dignity.

He used to support his family by doing agriculture which was not sufficient for overall development and give a dignified life to his family. Then he comes to know about Tata Steel Foundation and about its programmes from his friend. With keen interest in fish farming, he reached TSF Jamadoba office. And after knowing that TSF Jamadoba is supporting with fingerlings and capacity building on fish farming.

On the next day he meets TSF field staff and gives the application for fish farming. After that he received 5 days training on fish farming from Government Fishery Department at Ranchi.



When he returned from training, decided to start his own business of fish production. Mr. Abhimanyu Mahato improved his pond by expanding the area of pond to 1.5 acer and cleaned grass under water that can harm fishes. Then the TSF provided 100 kg fingerlings at 50% subsidy. Currently his annual income is one Lakh from Fish farming.

Mr. Abhimanyu Mahato is very happy with the support provided by TSF and said that now he can send his children for higher education and live his life with dignity. The help from TSF Jamadoba made him economically as well as socially strong.

## LIVELIHOOD EMPOWERMENT

### Disha Training:

The primary objective of Disha project is to enable women leaders through social-political empowerment by making systematic investments in community-based organizations to enhance their participation and productivity, and to create and sustain model of rural women. The project has an objective to increase knowledge, awareness, and income of women through capacity building.

Training of active SHG members on Gender and Leadership for Disha, in which 240 women leaders are being developed. Out of 240, 60 women have completed training till module 4.



## SPORTS

Organising sporting events/activities etc. has been a key strategy for ensuring the community engagement and to nurture the local young talents across Tata Steel leasehold areas. The children from the leasehold-villages will be given opportunities to take part in various sporting events/ activities towards shaping their future career in the Sports field.





During this year in the feeder centre training of budding sports talent is being done in three sporting segments i.e., Football, Archery and Athletics. As of now the total intake of the players under these sporting segments is 188.

Major achievement in Sports:

#### Achievement in Archery

S. No.	Name	Village	Medal	Event
1	Ms. Nazia Parween	Digwadih No.10	Selected	Centre for excellence (Govt. of Jharkhand), U-16
2	Ms. Madhu Kumari	Patherdih	Selected	Centre for excellence (Govt. of Jharkhand), U-16
3	Ms. Riya Kumari	Digwadih No.10	Selected	Centre for excellence (Govt. of Jharkhand), U-16
4	Ms. Pinky Kumari	Jealgora	Selected	Centre for excellence (Govt. of Jharkhand), U-16
5	Ms. Simran Kumari	Jealgora	Selected	Centre for excellence (Govt. of Jharkhand), U-16
6	Ms. Versha Chakroborty	Noonidih	Selected	Centre for excellence (Govt. of Jharkhand), U-16
7	Khusi Kumari	Digwadih	Gold	NTPC Mini National Archery Competition
8	Md. Adil	Digwadih	Selected	Tata Archery Academy

#### Achievement in Football

S. No.	Name	Village	Selection	Event
9	Mr. Pankaj Basti	Bhowra -36 No. PO Bhowra	Selected	National Camp at Bhubneshwar
10	Mr. Mrinal	Jealgora Basti	Selected	National Camp at Bhubneshwar
11	Mr. Prashant Diger	Nagina Bazar, Mohalbani	Selected	Residential sports training centre, Kumaitha Stadium Deoghar
12	Ms. Anju Sharma	Domgarh	Selected	Jharkhand state team camp u-17 at Chaibasa
13	Master Narayan Mahato	Digwadih No.10	Selected	SAIL Football Academy, Bokaro
14	Raj Kr. Mahato	Upper Dungri	Selected	CISF Delhi
15	Md. Irfan	Bhaga	Selected	Kuljeet Football Academy, Punjab
16	Mr. Vishnu Hajari	Noonidih Basti	Selected	Kuljeet Football Academy, Punjab
17	Mr. Vikky Kr. Mahato	Dumariatand	Selected	Kuljeet Football Academy, Punjab

## INFRASTRUCTURE

- 7600 people got benefitted through construction of 6,193 mts. long roads in 10 villages (Sijua 12 no., Dukhitdih, Rampur 2, Chetudih, Kanchanpur Bauritola, Upper dungri, Petiya, Banskapuria, Suyakanali, Malkera) and drain of length 1,552 mts were constructed in (Belubakhar, Lahargora, Purnadih, Sundarpur, Petiya, Kalimela, Lower Dungri, Upper Dungri, Digwadih Mahato basti, Kasiatand, Fatehpur, Rampur, Barughutu, Malkera illages) of Tata Steel intervention area.



- 1000 people got benefitted through repair of 4 deep bore well in 4 villages ((Lower Dungri, Rampur Md tola, Kapuria, Kanchanpur)



- In 11 villages (Debogram harijan tola, Debogram bangali tola, Banskapuria, Azadnagar, Belubakhar, Suyakanali, Upper dungri, Dungri no.3, Dungri no.7, Digwadih Majhi basti, Sunderpur) of Tata Steel leasehold area, 11,435 people got benefitted through installation of 8,878 mts. long piped drinking water supply.



- Renovation and construction of 282 mts long irrigation drain which is benefitting 34 farmers in 5 villages (Chattand, Petiya, Chaitudih, Kasiatand, Lower Dungri).



- In 4 villages of Sijua (Banskapuria, Rampur, Debogram, Sawaldih) deepening of 4 ponds is done to solve water crises at village level.



- 9080 people got benefitted through construction of 39 Rural infrastructure like pond steps (17), sitting platform (15), community center (3), culvert (1), community shed (2), Biswanath club.





## Annexure- Greenbelt Development Report

Glimpses of already existing green belt and plantation activities done in this monsoon season in and around Digwadih colliery premises to enhance the green cover have been depicted in the pictures below:



Picture: Plantation done in this monsoon season in and around Digwadih Colliery premises





Picture: Developed Green belt in and around Digwadih Colliery premises



Picture: Developed Green belt in and around Digwadih Colliery premises

**AIR QUALITY REPORT**

Core zone & Buffer zone

Period- October'22 to December'22

No. of sampling points: 4

Core zone (as per Air quality standards for coal mines in EPA Notification, 1988)							
Location	Latitude/ Longitude	Date	Weather Condition	SPM 24 Hourly Limit- 700 µg/m <sup>3</sup>	RSPM 24 Hourly Limit- 300 µg/m <sup>3</sup>	SO <sub>2</sub> 24 Hourly Limit- 120 µg/m <sup>3</sup>	NO <sub>x</sub> 24 Hourly Limit-120 µg/m <sup>3</sup>
Jamadoba Group Office	23°42'15.3" N/ 86°24'11" E	20.10.22	Clear	208.9	76.3	14.8	16.2
		10.11.22	Clear	236.7	88.2	15.8	17.3
		12.12.22	Clear	242.3	94.5	14.8	16.9
Buffer zone (as per NAAQS 2009 for ambient air quality standards)							
Location	Latitude/ Longitude	Date	Weather Condition	PM10 24 Hourly Limit- 100µg/m <sup>3</sup>	PM2.5 24 Hourly Limit- 60µg/m <sup>3</sup>	SO <sub>2</sub> 24 Hourly Limit- 80µg/m <sup>3</sup>	NO <sub>2</sub> 24 Hourly Limit- 80µg/m <sup>3</sup>
Digwadih 12 No. Colony	23°41'42" N/ 86°24'45.3" E	18.10.22	Clear	74.6	38.2	12.4	14.7
		08.11.22	Clear	80.2	46.5	13.7	14.1
		07.12.22	Clear	86.3	44.2	12.7	14.8
New Village Colony, Jamadoba	23°41'51" N/ 86°23'19" E	17.10.22	Clear	77.3	42.6	13.1	15.8
		03.11.22	Clear	89.4	49.2	14.8	16.2
		05.12.22	Clear	82.7	42.6	13.2	15.7
6&7 Pits Kalimandir colony	23°43'15" N/ 86°24'12" E	19.10.22	Clear	86.2	45.7	14.5	16.8
		07.11.22	Clear	78.6	42.6	12.4	14.9
		06.12.22	Clear	89.2	46.5	15.1	17.2



**Sr. Manager (Environment)**



Ambient Air Quality and Groundwater Quality Report (Period- October'22 to March'23)

**AIR QUALITY REPORT**

Core zone & Buffer zone

Period- January'23 to March'23

No. of sampling points: 4

Core zone (as per Air quality standards for coal mines in EPA Notification, 1988)							
Location	Latitude/ Longitude	Date	Weather Condition	SPM 24 Hourly Limit- 700 µg/m <sup>3</sup>	RSPM 24 Hourly Limit- 300 µg/m <sup>3</sup>	SO <sub>2</sub> 24 Hourly Limit- 120 µg/m <sup>3</sup>	NO <sub>x</sub> 24 Hourly Limit-120 µg/m <sup>3</sup>
Jamadoba Group Office	23°42'15.3" N/ 86°24'11" E	09.01.23	Clear	238.7	92.6	15.6	17.8
		17.02.23	Clear	234.6	90.3	13.7	15.4
		20.03.23	Cloudy	187.6	70.8	12.5	14.8
Buffer zone (as per NAAQS 2009 for ambient air quality standards)							
Location	Latitude/ Longitude	Date	Weather Condition	PM10 24 Hourly Limit- 100µg/m <sup>3</sup>	PM2.5 24 Hourly Limit- 60µg/m <sup>3</sup>	SO <sub>2</sub> 24 Hourly Limit- 80µg/m <sup>3</sup>	NO <sub>2</sub> 24 Hourly Limit- 80µg/m <sup>3</sup>
Digwadih 12 No. Colony	23°41'42" N/ 86°24'45.3" E	06.01.23	Clear	84.1	42.6	13.9	15.2
		15.02.23	Clear	96.3	52.7	15.8	17.1
		17.03.23	Clear	75.4	36.1	13.2	15.7
New Village Colony, Jamadoba	23°41'51" N/ 86°23'19" E	12.01.23	Clear	90.7	46.0	15.8	16.3
		16.02.23	Clear	94.8	50.3	14.2	16.8
		15.03.23	Clear	92.2	49.7	15.4	18.4
6&7 Pits Kalimandir colony	23°43'15" N/ 86°24'12" E	10.01.23	Clear	87.4	40.5	14.9	15.8
		14.02.23	Clear	85.1	38.2	13.4	16.2
		16.03.23	Clear	87.1	43.5	14.8	15.9



**Sr. Manager (Environment)**



**Ground Water Quality Analysis (Hand Pump & Dung Well)**  
**(Post- Monsoon Season- November'2022)**

S.No	Date	Location	Time	Depth in meter	pH	Electrical Conductivity, $\mu\text{S/m}$
1	06.11.22	Purnadih (Jorapokhar)	11:55 AM	2.98	7.2	834
2	06.11.22	Bhowra 13 No	12:25 PM	2.09	7.0	946
3	06.11.22	Mohalbani Basti	12:50 PM	3.94	7.3	834
4	06.11.22	Digwadih 10 No F & J	01:15 PM	2.97	7.2	1087
5	06.11.22	Kalimela Shivmandir	11:20 AM	1.38	7.1	938
6	06.11.22	Kalimela Kalimandir	11:35 AM	3.28	7.2	1024
7	06.11.22	Lower Dungari	11:00 AM	3.49	7.2	736
8	06.11.22	Upper Dungari	10:35 AM	3.12	7.3	824
9	06.11.22	Pattia Basti	10:05 AM	2.52	7.2	798
10	06.11.22	Kenduadih Basti	09:40 AM	2.14	7.1	766
11	06.11.22	Jorapokhar Kushtand	02:25 PM	1.47	7.2	844
12	06.11.22	Jamadoba 3 No	02:05 PM	2.52	7.1	795
13	06.11.22	6&7 Pits (Ayodhya Nagri)	01:45 PM	2.08	7.1	938
14	06.11.22	Jorapokhar Basti Chhattand	02:50 PM	1.74	7.2	732



**Sr. Manager (Environment)**

Ambient Air Quality and Groundwater Quality Report (Period- October'22 to March'23)

**Ground Water Quality Analysis (Hand Pump & Dung Well)  
(Winter Season- January'2023)**

S.No	Date	Location	Time	Depth in meter	pH	Electrical Conductivity $\mu$ S/m
1	30.01.2023	Purnadih (Jorapokhar)	12:15 PM	3.21	7.1	936
2	30.01.2023	Bhowra 13 No	12:55 PM	2.45	7.2	998
3	30.01.2023	Mohalbani Basti	01:20 PM	4.21	7.1	842
4	30.01.2023	Digwadih 10 No F & J	01:40 PM	3.48	7.2	1139
5	30.01.2023	Kalimela Shivmandir	11:25 AM	1.85	7.2	924
6	30.01.2023	Kalimela Kalimandir	11:45 AM	3.78	7.3	1086
7	30.01.2023	Lower Dungari	11:05 AM	3.73	7.2	748
8	30.01.2023	Upper Dungari	10:40 AM	3.68	7.1	839
9	30.01.2023	Pattia Basti	10:15 AM	2.87	7.2	834
10	30.01.2023	Kenduadih Basti	09:45 AM	2.26	7.3	773
11	30.01.2023	Jorapokhar Kushtand	11:50 AM	2.64	7.2	831
12	30.01.2023	6&7 Pits (Ayodhya Nagri)	02:05 PM	2.35	7.2	956
13	30.01.2023	Jorapokhar Basti Chhattand	02:25 PM	1.82	7.2	747
14	30.01.2023	Jorapokhar Babu Basa	12:35 PM	2.77	7.2	1038



**Sr. Manager (Environment)**



# 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: aditirnds.com  
Phone: 0326-2952377 (O)  
Mobile: 09471358492, 09431512808

Ref. No.: - ARDS/22-23/2051

Date: 12.11.2022

## TEST REPORT OF AMBIENT AIR QUALITY

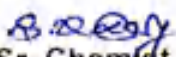
- Name of the industry : M/S TATA STEEL, JAMADOBA, TATA STEEL LIMITED, JAMADOBA GROUP PLANT, DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Date of Sample Collection : 07.11.2022 to 08.11.2022
- Date of Testing : 09.11.2022 to 11.11.2022
- Test Procedure : As per IS-5182

### TEST RESULTS

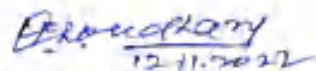
LOCATION – OFFICERS COLONY, 12 NO. DIGWADIH

SI No.	Particulars	Value	NAAQ - CPCB STANDARD
	Avg. Ambient Temperature	29°C	Avg. Humidity 49%
1.	Particulate Matter (PM <sub>10</sub> ), µg/m <sup>3</sup>	74.81	100 µg/m <sup>3</sup>
2.	Particulate Matter (PM <sub>2.5</sub> ), µg/m <sup>3</sup>	37.84	60 µg/m <sup>3</sup>
3.	SO <sub>2</sub> , µg/m <sup>3</sup>	14.60	80 µg/m <sup>3</sup>
4.	NO <sub>2</sub> , µg/m <sup>3</sup>	26.61	80 µg/m <sup>3</sup>
5.	Ozone, µg/m <sup>3</sup>	20.12	180 µg/m <sup>3</sup>
6.	NH <sub>3</sub> , µg/m <sup>3</sup>	16.53	400 µg/m <sup>3</sup>
7.	CO, mg/m <sup>3</sup>	0.96	4 mg/m <sup>3</sup>
8.	Pb, µg/m <sup>3</sup>	BDL	1 µg/m <sup>3</sup>
9.	As, ng/m <sup>3</sup>	BDL	6 ng/m <sup>3</sup>
10.	Ni, ng/m <sup>3</sup>	BDL	20 ng/m <sup>3</sup>
11.	Benzene, µg/m <sup>3</sup>	BDL	5 µg/m <sup>3</sup>
12.	Benzoapyrene ng/m <sup>3</sup>	BDL	1 ng/m <sup>3</sup>

NOTE: BDL - Below Detection Limit

  
Sr. Chemist  
Aditi R&D Services



  
Quality Manager  
Aditi R&D Services, Sindri

### Statements:

- The test report refers only to the particular item(s) submitted for testing.
- The test results reported in this report are valid at the time of and under the stated condition of measurement.
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Plot No - I-B-17 (P)  
Sindri, Industrial Area,  
P.O.- Domgarh, Dist.- Dhanbad  
Jharkhand - 828107  
Email ID: sindriaditi@gmail.com  
Website: aditirdservices.com  
Phone: 0326-2952377 (O)  
Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2052

Date: 12.11.2022

## TEST REPORT OF AMBIENT AIR QUALITY


- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO. : 4700092573/932 Dt. 20.07.2021
- Date of Sample Collection : 07.11.2022 to 08.11.2022
- Date of Testing : 09.11.2022 to 11.11.2022
- Test Procedure : As per IS-5182

### TEST RESULTS

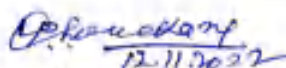
LOCATION - CENTRAL WORKSHOP AREA, JAMADOBA

SI No.	Particulars	Value	NAAQ - CPCB STANDARD
	Avg. Ambient Temperature	29°C	Avg. Humidity 49%
1.	Particulate Matter (PM <sub>10</sub> ), µg/m <sup>3</sup>	86.9	100 µg/m <sup>3</sup>
2.	Particulate Matter (PM <sub>2.5</sub> ), µg/m <sup>3</sup>	46.8	60 µg/m <sup>3</sup>
3.	SO <sub>2</sub> , µg/m <sup>3</sup>	17.52	80 µg/m <sup>3</sup>
4.	NO <sub>2</sub> , µg/m <sup>3</sup>	26.61	80 µg/m <sup>3</sup>
5.	Ozone, µg/m <sup>3</sup>	17.84	180 µg/m <sup>3</sup>
6.	NH <sub>3</sub> , µg/m <sup>3</sup>	17.26	400 µg/m <sup>3</sup>
7.	CO, mg/m <sup>3</sup>	0.99	4 mg/m <sup>3</sup>
8.	Pb, µg/m <sup>3</sup>	BDL	1 µg/m <sup>3</sup>
9.	As, ng/m <sup>3</sup>	BDL	6 ng/m <sup>3</sup>
10.	Ni, ng/m <sup>3</sup>	BDL	20 ng/m <sup>3</sup>
11.	Benzene, µg/m <sup>3</sup>	BDL	5 µg/m <sup>3</sup>
12.	Benzoapyrene ng/m <sup>3</sup>	BDL	1 ng/m <sup>3</sup>

NOTE: BDL - Below Detection Limit

  
Sr. Chemist  
Aditi R&D Services



  
12.11.2022  
Quality Manager  
Aditi R&D Services, Sindri

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# ADITI R&D SERVICES

## Testing Laboratory

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Plot No. - I-B-17 (P)  
Sindri, Industrial Area.  
P.O - Domgarh, Dist - Dhanbad  
Jharkhand - 825107  
Email ID: sindriaditi@gmail.com  
Website: aditirdservices.com  
Phone: 0326-2952377 (O)  
Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2055

Date: 12.11.2022

### TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Date of Sample Collection : 07.11.2022 to 08.11.2022
- Date of Testing : 09.11.2022 to 11.11.2022
- Test Procedure : As per IS-5182

### TEST RESULTS

#### LOCATION - TATA CENTRAL HOSPITAL

Sl No.	Particulars	Value	NAAQ - CPCB STANDARD
	Avg. Ambient Temperature	29°C	Avg. Humidity 49%
1.	Particulate Matter (PM <sub>10</sub> ), µg/m <sup>3</sup>	73.24	100 µg/m <sup>3</sup>
2.	Particulate Matter (PM <sub>2.5</sub> ), µg/m <sup>3</sup>	36.49	60 µg/m <sup>3</sup>
3.	SO <sub>2</sub> , µg/m <sup>3</sup>	14.52	80 µg/m <sup>3</sup>
4.	NO <sub>2</sub> , µg/m <sup>3</sup>	23.19	80 µg/m <sup>3</sup>
5.	Ozone, µg/m <sup>3</sup>	16.57	180 µg/m <sup>3</sup>
6.	NH <sub>3</sub> , µg/m <sup>3</sup>	14.62	400 µg/m <sup>3</sup>
7.	CO, mg/m <sup>3</sup>	0.83	4 mg/m <sup>3</sup>
8.	Pb, µg/m <sup>3</sup>	BDL	1 µg/m <sup>3</sup>
9.	As, ng/m <sup>3</sup>	BDL	6 ng/m <sup>3</sup>
10.	Ni, ng/m <sup>3</sup>	BDL	20 ng/m <sup>3</sup>
11.	Benzene, µg/m <sup>3</sup>	BDL	5 µg/m <sup>3</sup>
12.	Benzo(a)pyrene, ng/m <sup>3</sup>	BDL	1 ng/m <sup>3</sup>

NOTE: BDL - Below Detection Limit

*B. D. Ray*  
Sr. Chemist  
Aditi R&D Services



*Pradeep Kumar*  
12.11.2022  
Quality Manager  
Aditi R&D Services, Sindri

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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: aditirdservices.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/22-23/2028 Date: 09.11.2022		M/S TATA STEEL, JAMADOBA,			
Date of Monitoring		TATA STEEL LIMITED, JAMADOBA GROUP PLANT,			
		DIST. - DHANBAD (JHARKHAND)			
07.11.2022 TO 08.11.2022		Avg. Ambient Temperature (°C)	Average Humidity (%)	Weather Condition	Status of the plant
Work Order 4700092573/932 Dt. 20.07.2021		28	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	
		MAX	MIN	AVG. dB(A) Leq	MAX	MIN	AVERAGE dB(A) Leq	Day Time	Night Time
	LOCATION							Industrial Area	Industrial Area
	JAMADOBA GROUP								
1.	Central Workshop	67.3	59.8	65.0	53.7	44.6	51.19		
2.	6 & 7 Pits Colliery Office	64.9	59.6	63.01	51.4	42.5	48.92	75	70
								Residential Area	Residential Area
3.	Officer Colony 12 No. Digwadih	50.7	47.8	49.49	43.5	39.8	42.03	65	55
								Silence Zone	Silence Zone
4.	Tata Central Hospital	46.9	42.4	45.21	40.1	37.9	39.14	50	40

*S. S. Roy*  
Sr. Chemist  
Aditi R&D Services



*Ch. Prasad*  
29.11.2022  
Quality Manager  
Aditi R&D Services, Sindri

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Plot No - I-B-17 (P)  
Sindri, Industrial Area,  
P.O. - Domgarh, Dist.- Dhanbad  
Jharkhand - 828107  
Email ID: sindriar@aditirds.com  
Website: aditirdservices.com  
Phone: 0326-2952377 (O)  
Mobile: 09471356492, 09431512608

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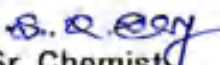
Date: 11.11.2022

## TEST REPORT OF MINERALOGICAL COMPOSITION OF PARTICULATE MATTER

- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO. : 4700092573/932 Dt. 20.07.2021
- Date of Sample Collection : 08.11.2022
- Date of Testing : 09.11.2022 – 10.11.2022

### TEST RESULTS

Sl No.	Particulars	Mineralogical Composition (%)			
		SiO <sub>2</sub>	FeO	Al <sub>2</sub> O <sub>3</sub>	CaO
1.	Central Workshop Area Jamadoba	1.13	0.04	0.97	2.6
2.	Officer's Colony, 12 No. Digwadih	1.42	0.09	0.92	2.1

  
Sr. Chemist  
Aditi R&D Services



  
11.11.2022  
Quality Manager  
Aditi R&D Services, Sindri

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

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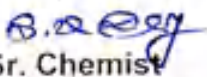
Date: 17.11.2022

## TEST REPORT OF SURFACE WATER

- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Sample Code : 1. Damodar River Up Stream  
2. Damodar River Down Stream
- Date of Sample Collection: 07.11.2022 To 08.11.2022
- Date of Testing : 09.11.2022 To 16.11.2022
- Test : pH, TDS, Turbidity, DO, BOD, Cl, F, SO<sub>4</sub>

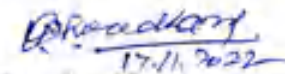
### TEST RESULT

Sl. No.	PARAMETERS OF TEST	VALUE		Limit as per IS 2296 Class - C	Test Method
		Damodar River Up Stream	Damodar River Dn Stream		
1.	pH	7.5	7.6	6.5 -8.5	IS-3025 (P-11): 1983
2.	Total Dissolved Solids, mg/l	595	625	1500	IS-3025 (P-16): 1984
3.	Turbidity, NTU	9.5	11.2	-	IS-3025 (P-10):1984
4.	Dissolved Oxygen, mg/l	6.8	6.4	4.0	IS-3025 (P-38):1989
5.	Bio chemical Oxygen Demand, mg/l	2.0	2.2	3.0	IS-3025 (P-44):1994
6.	Chloride as Cl, mg/l	44	52	-	IS-3025 (P-32):1988
7.	Fluoride as F, mg/l	0.52	0.54	1.5	IS-3025 (P-60):2008
8.	Sulphate as SO <sub>4</sub> , mg/l	36	48	400	IS-3025 (P-24):1986

  
Sr. Chemist

Aditi R&D Services



  
17.11.2022

Quality Manager  
Aditi R&D Services, Sindri

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Plot No. - I-B-17 (P)  
Sindri, Industrial Area,  
P.O - Domgarh, Dist. - Dhanbad  
Jharkhand - 826107  
Email ID: sindriaditi@gmail.com  
Website: aditirnds.com  
Phone: 0326-2952377 (O)  
Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2102

Date: 17.11.2022

### TEST REPORT OF MINE WATER DISCHARGE

- Name of the industry : M/S TATA STEEL, JAMADOBA, TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Sample Code : 1. 2 Pit Jamadoba Colliery  
2. 3 Pit Jamadoba Colliery  
3. 2 Incline Jamadoba Colliery  
4. 6 & 7 Pits Colliery  
5. Digwadih Colliery
- Date of Sample Collection: 07.11.2022 To 08.11.2022
- Date of Testing : 09.11.2022 to 16.11.2022
- Test : pH, TDS, TSS, BOD, COD, OIL & GREASE.

### TEST RESULT

Sl. No.	PARAMETERS OF TEST	VALUE					Limit as per IS-2296 Class B (For Bathing)	Test Method
		2 Pit Jamadoba Colliery	3 Pit Jamadoba Colliery	2 Incline Jamadoba Colliery	6 & 7 Pits Colliery	Digwadih Colliery		
1.	pH,	7.9	7.3	7.3	7.6	7.8	6.5-8.5	IS-3025 (P-11): 1983
2.	Total Dissolved Solids, mg/l	896	680	610	660	742	-	IS-3025 (P-16): 1984
3.	Total Suspended Solids, mg/l	38	26	32	18	28	-	IS-3025(P-17): 1984
4.	Bio chemical Oxygen Demand, mg/l	2.4	2.7	2.2	1.6	2.4	3	IS-3025 (P-44):1994
5.	Chemical Oxygen Demand, mg/l	48	54	44	32	48	-	IS-3025 (P-58):2006
6.	Oil & Grease, mg/l	BDL	BDL	BDL	BDL	BDL	-	IS-3025 (P-39):2021

*S. S. Ray*  
Sr. Chemist  
Aditi R&D Services



*Pradeep Kumar*  
17.11.2022  
Quality Manager  
Aditi R&D Services, Sindri

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Sindri, Industrial Area,  
P.O. - Domgarh, Dist.- Dhanbad  
Jharkhand - 828107  
Email ID: sindriaditi@gmail.com  
Website: aditirdservices.com  
Phone: 0326-2952377 (O) -  
Mobile: 09471356492, 09431512606

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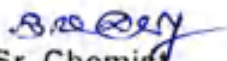
Date: 17.11.2022

### TEST REPORT OF SEWAGE

- Name of the industry : M/S TATA STEEL, JAMADOBA, TATA STEEL LIMITED, JAMADOBA GROUP PLANT, DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Sample Code : 1. S.T.P. Outlet Jamadoba Canteen  
2. S.T.P. Outlet J.C.P.P. Canteen  
3. S.T.P. Outlet Railway Colony
- Date of Sample Collection: 07.11.2022 to 08.11.2022
- Date of Testing : 09.11.2022 to 16.11.2022
- Test : pH, TDS, TSS, BOD, COD, OIL & GREASE.

### TEST RESULT

Sl. No.	PARAMETERS OF TEST	VALUE			MoEF&C Notification 1 <sup>st</sup> Jan.2016 Permissible Max. Desirable Limit	Test Method
		S.T.P. Outlet Jamadoba Canteen	S.T.P. Outlet J.C.P.P. Canteen	S.T.P. Outlet Railway Colony		
1.	pH,	7.3	7.6	7.3	6.0-9.0	IS-3025 (P-11):1983
2.	Total Dissolved Solids, mg/l	648	725	760	2100	IS-3025 (P-16):1984
3.	Total Suspended Solids, mg/l	28	22	32	100	IS-3025(P-17):1984
4.	Bio chemical Oxygen Demand, mg/l	11.5	10.0	12.0	30	IS-3025 (P-44):1994
5.	Chemical Oxygen Demand, mg/l	58	52	60	250	IS-3025 (P-58):2006
6.	Oil & Grease, mg/l	0.4	B.D.L	1.2	10	IS-3025 (P-39):2021

  
Sr. Chemist  
Aditi R&D Services



  
Quality Manager  
Aditi R&D Services, Sindri

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

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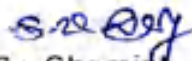
Date: 18.11.2022

## TEST REPORT OF EFFLUENT

- Name of the industry : M/S TATA STEEL, JAMADOBA, TATA STEEL LIMITED JAMADOBA GROUP PLANT, DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Sample Code : 1. E.T.P. Outlet T.C.H.  
2. E.T.P. Outlet Garage
- Date of Sample Collection: 07.11.2022 to 08.11.2022
- Date of Testing : 09.11.2022 to 16.11.2022
- Test : pH, TDS, TSS, BOD, COD, OIL & GREASE.

### TEST RESULT

Sl. No.	PARAMETERS OF TEST	VALUE		MoEF&C Notification 1 <sup>st</sup> Jan.2016 Permissible Max. Desirable Limit	Test Method
		E.T.P. Outlet T.C.H	E.T.P. Outlet Garage		
1.	pH,	7.5	7.6	6.0-9.0	IS-3025 (P-11): 1983
2.	Total Dissolved Solids, mg/l	635	660	2100	IS-3025 (P-16): 1984
3.	Total Suspended Solids, mg/l	23	25	100	IS-3025(P-17) : 1984
4.	Bio chemical Oxygen Demand, mg/l	08	10	30	IS-3025 (P-44):1994
5.	Chemical Oxygen Demand, mg/l	48	53	250	IS-3025 (P-58):2006
6.	Oil & Grease, mg/l	B.D.L	B.D.L	10	IS-3025 (P-39):2021

  
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Aditi R&D Services



  
18.11.2022  
Quality Manager  
Aditi R&D Services, Sindri

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P.O. - Domgarh, Dist. - Dhanbad  
Jharkhand - 828107  
Email ID: sindriaditi@gmail.com  
Website: aditirdservices.com  
Phone: 0326-2952377 (O)  
Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2111

Date: 18.11.2022

## TEST REPORT OF DRINKING WATER

- Name of the industry : M/S TATA STEEL, JAMADOBA, TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Sample Code :
  1. Canteen Jamadoba Colliery
  2. Canteen Jamadoba Washery
  3. Canteen Digwadih Colliery
  4. Canteen 6&7 Pit Colliery
- Date of Sample Collection: 07.11.2022 to 08.11.2022
- Date of Testing : 09.11.2022 to 16.11.2022
- Test :  
Colour, Odour, Taste, Turbidity, pH, Total Hardness, Iron, Chloride, Res. Free chlorine, Total Dissolved Solids, Calcium, Copper, Manganese, Sulphate, Nitrate, Fluoride, Phenolic Compound, Mercury, Cadmium, Arsenic, Cyanide, Lead, Zinc, Total Coliform, Hexavalent Chromium, Mineral Oil, Alkalinity, Aluminium & Boron.

### TEST RESULT

Sl. No	PARAMETERS OF TEST	VALUE				IS as per IS 10500:2012		Test Method
		Canteen Jamadoba Colliery	Canteen Jamadoba Washery	Canteen Digwadih Colliery	Canteen 6&7 Pit Colliery	Desirable	Permissible	
1.	Colour, (Hazen Unit)	1	1	1	1	5.00	15.0	IS 3025 (P-4):2021
2.	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	IS 3025 (P-5):2018
3.	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	IS 3025 (P-7):2017
4.	Turbidity, NTU	1	1	NIL	NIL	1.0	5.0	IS 3025 (P-10):1984
5.	pH	7.6	7.3	7.5	7.6	6.5-8.5	No. Relax.	IS-3025 (P-11):1983
6.	Total Hardness as CaCO <sub>3</sub> , mg/l	320	368	340	310	200	600	IS 3025 (P-21):2009
7.	Chloride as Cl <sub>1</sub> , mg/l	58	54	56	44	250	1000	IS 3025 (P-32):1988
8.	Res. Free chlorine as Cl <sub>2</sub> , mg/l	NIL	NIL	NIL	NIL	0.20	1.0	IS 3025 (P-26):2021
9.	Total Dissolved Solids, mg/l	795	760	735	715	500	2000	IS 3025 (P-16):1984
10.	Calcium as CaCO <sub>3</sub> , mg/l	41.5	46	38	32	75	200	IS 3025 (P-40):1991
11.	Copper as Cu, mg/l	BDL	BDL	BDL	BDL	0.05	1.5	IS 3025 (P-42):1992

Continued on Page 2

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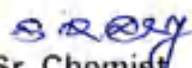
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Plot No. - I-B-17 (P)  
Sindri, Industrial Area,  
P.O. - Domgarh, Dist.- Dhanbad  
Jharkhand - 828107  
Email ID: sindriaditi@gmail.com  
Website: aditirdservices.com  
Phone: 0326-2952377 (O)  
Mobile: 09471358492, 09431512608

Sl. No.	PARAMETERS OF TEST	VALUE				IS as per IS 10500:1991		Test Method
		Jamadoba Canteen Colliery	Jamadoba Canteen Washery	Canteen Digwadih Colliery	Canteen 6&7 Pit Colliery	Desirable	Permissible	
12.	Manganese as Mn, mg/l	BDL	BDL	BDL	BDL	0.10	0.30	IS 3025 (P-59):2006
13.	Sulphate as SO <sub>4</sub> , mg/l	48	52	62	46	200	400	IS 3025 (P-24):1986
14.	Nitrate as NO <sub>3</sub> , mg/l	2.6	2.8	2.9	3.2	45	No. Relax	IS 3025 (P-34):1988
15.	Fluoride as F, mg/l	0.32	0.28	0.34	0.33	1.0	1.5	IS 3025 (P-60):2008
16.	Phenolic Compound as (C <sub>6</sub> H <sub>5</sub> OH) mg/l	BDL	BDL	BDL	BDL	0.001	0.002	IS 3025 (P-43):1992
17.	Mercury as Hg, mg/l	BDL	BDL	BDL	BDL	0.001	No. Relax	IS 3025 (P-48):1994
18.	Cadmium as Cd, mg/l	BDL	BDL	BDL	BDL	0.003	No. Relax	IS 3025 (P-41):1992
19.	Arsenic as As, mg/l	BDL	BDL	BDL	BDL	0.01	No. Relax	IS 3025 (P-37):1988
20.	Cyanide as CN, mg/l	BDL	BDL	BDL	BDL	0.05	No. Relax	IS 3025 (P-27):1986
21.	Lead as Pb, mg/l	BDL	BDL	BDL	BDL	0.01	No. Relax	IS 3025 (P-47):1994
22.	Zinc as Zn, mg/l,	0.16	0.18	0.12	0.12	5	15	IS 3025 (P-42):1992
23.	Total Coliform, No./100ml	Absent	Absent	Absent	Absent	Absent	Absent	IS 3025 (P-49):1994
24.	Hexavalent Chromium as Cr, mg/l	BDL	BDL	BDL	BDL	0.05	No. Relax	IS 3025 (P-52):2003
25.	Mineral Oil, mg/l	BDL	BDL	BDL	BDL	0.5	No. Relax	IS 3025 (P-39):1989
26.	Alkalinity as CaCO <sub>3</sub> , mg/l,	370	330	365	345	200	600	IS 3025 (P-23):1983
27.	Aluminium as Al, mg/l	BDL	BDL	BDL	BDL	0.03	0.2	IS 3025 (P-55):2003
28.	Boran as B, mg/l	BDL	BDL	BDL	BDL	0.5	1.0	IS 3025 (P-57):2005

NOTE: BDL - Below Detection Limit

  
Sr. Chemist  
Aditi R&D Services



  
18.11.2022  
Quality Manager  
Aditi R&D Services, Sindri

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

Ref. No.: - ARDS/22-23/ 2112

Date: 18.11.2022

## TEST REPORT OF GROUND WATER

- Name of the industry : M/S TATA STEEL, JAMADOBA, TATA STEEL LIMITED, JAMADOBA GROUP PLANT, DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO. : 4700092573/932 Dt. 20.07.2021
- Sample Code :
  1. Purnadi Joraphokhar
  2. Digwadih 10 No. F&J
  3. Kalinala Kali Mandir
  4. Upper Dungri
  5. Kenduadih Basti
  6. 6 & 7 Pit Ayodha Nagari
- Date of Sample Collection : 07.11.2022 to 08.11.2022
- Date of Testing : 09.11.2022 to 16.11.2022
- Test : Colour, Odour, Taste, Turbidity, pH, Total Hardness, Iron, Chloride, Res. Free chlorine, Total Dissolved Solids, Calcium, Copper, Manganese, Sulphate, Nitrate, Fluoride, Phenolic Compound, Mercury, Cadmium, Arsenic, Cyanide, Lead, Zinc, Total Coliform, Hexavalent Chromium, Mineral Oil, Alkalinity, Aluminium & Boron.

### TEST RESULT

PARAMETERS OF TEST	VALUE						IS as per IS 10500:1991		Test Method
	Purandi Joraphokhar	Digwadih 1 No. F&J	Kalinala Kali Mandir	Upper Dungri	Kenduadih Basti	6 & 7 Ayodha Nagari	Desirable	Permissible	
Colour, (Hazen Unit)	1	2	1	2	1	2	5	15	IS 3025 (P-4):2021
Temperature °C	22	24	23	24	22	23	-	-	-
Electrical Conductivity, µmhos/cm	1020	1045	1065	1080	940	1070	-	-	-
Total Dissolved Solids, mg/l	653	680	693	702	611	696	-	-	IS 3025(P-16):1984
pH	7.7	7.6	7.3	7.5	7.6	7.8	6.5-8.5	No Relax	IS-3025(P-11):1983
Total Hardness as CaCO <sub>3</sub> , mg/l	328	280	365	258	385	260	200	600	IS 3025(P-21):2009
Calcium as Ca, mg/l	67.2	59.2	73.6	51.6	77.2	52	75	200	IS 3025(P-40):1991
Magnesium as Mg, mg/l	37.2	95	42.1	30	44	30.2	30	100	IS 3025(P-46):1994
Chloride as Cl, mg/l	38	32	48	28	52	28	250	1000	IS 3025(P-32):1988
Fluoride as F <sub>2</sub> , mg/l	0.28	0.26	0.44	0.46	0.36	0.32	1.0	1.5	IS 3025(P-60):2008

Continued on Page 2

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

- 2 -

Sl. No	PARAMETERS OF TEST	VALUE						IS as per IS 10500:1991		Test Method
		Purandi Joraphokhar	Digwadih 1 No. F&J	Kalinala Kali Mandir	Upper Dungri	Kendui adih Basti	6 & 7 Ayodha Nagar	Desirable	Permissible	
10	Sulphate as SO <sub>4</sub> , mg/l	42	66	70	62	58	54	200	400	IS 3025(P-24):1986
12	Nitrate as NO <sub>3</sub> , mg/l	11.8	12.4	8.2	10.4	9.8	9.4	45	No. Relax	IS 3025(P-34):1988
13	Alkalinity as CaCO <sub>3</sub> , mg/l	285	260	310	325	345	340	200	600	IS 3025(P-23):1983
14	Lead as Pb, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.01	No. Relax	IS 3025(P-47):1994
15	Zinc as Zn, mg/l	0.18	0.14	0.18	0.16	0.14	0.16	5	15	IS 3025(P-42):1992
16	Iron as Fe, mg/l	0.2	0.1	0.1	0.2	0.2	0.2	0.3	No. Relax	IS 3025(P-53):2003
17	Copper as Cu, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.05	1.5	IS 3025 (P-42):1992
18	Mercury as Hg, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.001	No. Relax	IS 3025(P-48):1994
19	Cadmium as Cd, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.003	No. Relax	IS 3025(P-41):1992
20	Nickel as Ni, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.02	No. Relax	IS 3025(P-37):1992
21	Arsenic as As, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.01	No. Relax	IS 3025(P-37):1988
22	Cyanide as CN, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.05	No. Relax	IS 3025(P-27):1986
23	Total Chromium as Cr, mg/l	BDL	BDL	BDL	BDL	BDL	BDL	0.05	No. Relax	IS 3025(P-52):2003

NOTE: BDL - Below Detection Limit

  
Sr. Chemist  
Aditi R&D Services



  
Quality Manager  
Aditi R&D Services, Sindri

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

Ref. No.: - ARDS/22-23/2050

Date: 12.11.2022

## TEST REPORT OF AMBIENT AIR QUALITY

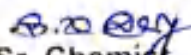
- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Date of Sample Collection : 07.11.2022 to 08.11.2022
- Date of Testing : 09.11.2022 to 11.11.2022
- Test Procedure : As per IS-5182

### TEST RESULTS

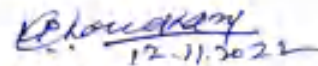
LOCATION - 6 & 7 PITS COLLOIERY OFFICE

SI No.	Particulars	Value	NAAQ - CPCB STANDARD
	Avg. Ambient Temperature	29°C	Avg. Humidity 49%
1.	Particulate Matter (PM <sub>10</sub> ), µg/m <sup>3</sup>	93.80	100 µg/m <sup>3</sup>
2.	Particulate Matter (PM <sub>2.5</sub> ), µg/m <sup>3</sup>	47.92	60 µg/m <sup>3</sup>
3.	SO <sub>2</sub> , µg/m <sup>3</sup>	20.75	80 µg/m <sup>3</sup>
4.	NO <sub>2</sub> , µg/m <sup>3</sup>	28.60	80 µg/m <sup>3</sup>
5.	Ozone, µg/m <sup>3</sup>	24.19	180 µg/m <sup>3</sup>
6.	NH <sub>3</sub> , µg/m <sup>3</sup>	18.82	400 µg/m <sup>3</sup>
7.	CO, mg/m <sup>3</sup>	1.98	4 mg/m <sup>3</sup>
8.	Pb, µg/m <sup>3</sup>	BDL	1 µg/m <sup>3</sup>
9.	As, ng/m <sup>3</sup>	BDL	6 ng/m <sup>3</sup>
10.	Ni, ng/m <sup>3</sup>	BDL	20 ng/m <sup>3</sup>
11.	Benzene, µg/m <sup>3</sup>	BDL	5 µg/m <sup>3</sup>
12.	Benzoapyrene ng/m <sup>3</sup>	BDL	1 ng/m <sup>3</sup>

NOTE: BDL - Below Detection Limit

  
Sr. Chemist  
Aditi R&D Services



  
12.11.2022  
Quality Manager  
Aditi R&D Services, Sindri

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P.O - Domgarh, Dist - Dhanbad  
Jharkhand - 828107  
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Website: aditirnds.com  
Phone: 0326-2952377 (O),  
Fax: 0326-2952377  
Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2908

Date: 18.02.2023

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Date of Sample Collection : 10.02.2023 to 11.02.2023
- Date of Testing : 15.02.2023 to 17.02.2023
- Test Procedure : As per IS-5182

### TEST RESULTS

#### LOCATION – 6 & 7 PITS COLLIERY OFFICE

Sl No.	Particulars	Value	NAAQ - CPCB STANDARD
1.	Particulate Matter (PM <sub>10</sub> ), µg/m <sup>3</sup>	81.37	100 µg/m <sup>3</sup>
2.	Particulate Matter (PM <sub>2.5</sub> ), µg/m <sup>3</sup>	48.62	60 µg/m <sup>3</sup>
3.	SO <sub>2</sub> , µg/m <sup>3</sup>	20.19	80 µg/m <sup>3</sup>
4.	NO <sub>2</sub> , µg/m <sup>3</sup>	25.58	80 µg/m <sup>3</sup>
5.	Ozone, µg/m <sup>3</sup>	17.29	180 µg/m <sup>3</sup>
6.	NH <sub>3</sub> , µg/m <sup>3</sup>	14.49	400 µg/m <sup>3</sup>
7.	CO, mg/m <sup>3</sup>	0.83	4 mg/m <sup>3</sup>
8.	Pb, µg/m <sup>3</sup>	BDL	1 µg/m <sup>3</sup>
9.	As, ng/m <sup>3</sup>	BDL	6 ng/m <sup>3</sup>
10.	Ni, ng/m <sup>3</sup>	BDL	20 ng/m <sup>3</sup>
11.	Benzene, µg/m <sup>3</sup>	BDL	5 µg/m <sup>3</sup>
12.	Benzoapyrene ng/m <sup>3</sup>	BDL	1 ng/m <sup>3</sup>

NOTE: BDL - Below Detection Limit

A. Das,  
Sr. Chemist  
Aditi R&D Services



Technical Manager  
Aditi R&D Services, Sindri

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Fax: 0326-2952377  
Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2909

Date: 18.02.2023

### TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Date of Sample Collection : 10.02.2023 to 11.02.2023
- Date of Testing : 15.02.2023 to 17.02.2023
- Test Procedure : As per IS-5182

### TEST RESULTS

LOCATION – OFFICERS COLONY, 12 NO. DIGWADIH

LOCATION – OFFICERS COLONY, 12 NO. DIGWADIH			
	Avg. Ambient Temperature	24 <sup>o</sup> C	Avg. Humidity
Sl No.	Particulars	Value	NAAQ - CPCB STANDARD
1.	Particulate Matter (PM <sub>10</sub> ), µg/m <sup>3</sup>	87.76	100 µg/m <sup>3</sup>
2.	Particulate Matter (PM <sub>2.5</sub> ), µg/m <sup>3</sup>	52.66	60 µg/m <sup>3</sup>
3.	SO <sub>2</sub> , µg/m <sup>3</sup>	19.41	80 µg/m <sup>3</sup>
4.	NO <sub>2</sub> , µg/m <sup>3</sup>	26.35	80 µg/m <sup>3</sup>
5.	Ozone, µg/m <sup>3</sup>	17.63	180 µg/m <sup>3</sup>
6.	NH <sub>3</sub> , µg/m <sup>3</sup>	14.82	400 µg/m <sup>3</sup>
7.	CO, mg/m <sup>3</sup>	0.79	4 mg/m <sup>3</sup>
8.	Pb, µg/m <sup>3</sup>	BDL	1 µg/m <sup>3</sup>
9.	As, ng/m <sup>3</sup>	BDL	6 ng/m <sup>3</sup>
10.	Ni, ng/m <sup>3</sup>	BDL	20 ng/m <sup>3</sup>
11.	Benzene, µg/m <sup>3</sup>	BDL	5 µg/m <sup>3</sup>
12.	Benzoapyrene ng/m <sup>3</sup>	BDL	1 ng/m <sup>3</sup>

NOTE: BDL - Below Detection Limit

A. Das,

Sr. Chemist

Aditi R&D Services



Technical Manager

Aditi R&D Services, Sindri

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P.O. - Domgarh, Dist. - Dhanbad  
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Phone: 0326-2952377 (O),  
Fax: 0326-2952377  
Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2910

Date: 18.02.2023

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO. : 4700092573/932 Dt. 20.07.2021
- Date of Sample Collection : 10.02.2023 to 11.02.2023
- Date of Testing : 15.02.2023 to 17.02.2023
- Test Procedure : As per IS-5182

### TEST RESULTS

#### LOCATION – CENTRAL WORKSHOP AREA, JAMADOBA

SI No.	Particulars	Value	NAAQ - CPCB STANDARD
	Avg. Ambient Temperature	26°C	Avg. Humidity 39%
1.	Particulate Matter (PM <sub>10</sub> ), µg/m <sup>3</sup>	86.77	100 µg/m <sup>3</sup>
2.	Particulate Matter (PM <sub>2.5</sub> ), µg/m <sup>3</sup>	52.12	60 µg/m <sup>3</sup>
3.	SO <sub>2</sub> , µg/m <sup>3</sup>	19.64	80 µg/m <sup>3</sup>
4.	NO <sub>2</sub> , µg/m <sup>3</sup>	28.23	80 µg/m <sup>3</sup>
5.	Ozone, µg/m <sup>3</sup>	16.60	180 µg/m <sup>3</sup>
6.	NH <sub>3</sub> , µg/m <sup>3</sup>	17.65	400 µg/m <sup>3</sup>
7.	CO, mg/m <sup>3</sup>	1.06	4 mg/m <sup>3</sup>
8.	Pb, µg/m <sup>3</sup>	BDL	1 µg/m <sup>3</sup>
9.	As, ng/m <sup>3</sup>	BDL	6 ng/m <sup>3</sup>
10.	Ni, ng/m <sup>3</sup>	BDL	20 ng/m <sup>3</sup>
11.	Benzene, µg/m <sup>3</sup>	BDL	5 µg/m <sup>3</sup>
12.	Benzoapyrene ng/m <sup>3</sup>	BDL	1 ng/m <sup>3</sup>

NOTE: BDL - Below Detection Limit

A. Das,

Sr. Chemist

Aditi R&D Services



Technical Manager

Aditi R&D Services, Sindr

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Jharkhand - 828107  
Email ID: sindriaditi@gmail.com  
Website: aditirnds.com  
Phone: 0326-2952377 (O).  
Fax: 0326-2952377  
Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2911

Date: 18.02.2023

## TEST REPORT OF AMBIENT AIR QUALITY

- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Date of Sample Collection : 10.02.2023 to 11.02.2023
- Date of Testing : 15.02.2023 to 17.02.2023
- Test Procedure : As per IS-5182

### TEST RESULTS

#### LOCATION – TATA CENTRAL HOSPITAL

LOCATION – TATA CENTRAL HOSPITAL				
	Avg. Ambient Temperature	24 <sup>0</sup> C	Avg. Humidity	40%
Sl No.	Particulars	Value	NAAQ - CPCB STANDARD	
1.	Particulate Matter (PM <sub>10</sub> ), µg/m <sup>3</sup>	78.07	100 µg/m <sup>3</sup>	
2.	Particulate Matter (PM <sub>2.5</sub> ), µg/m <sup>3</sup>	45.84	60 µg/m <sup>3</sup>	
3.	SO <sub>2</sub> , µg/m <sup>3</sup>	17.68	80 µg/m <sup>3</sup>	
4.	NO <sub>2</sub> , µg/m <sup>3</sup>	26.61	80 µg/m <sup>3</sup>	
5.	Ozone, µg/m <sup>3</sup>	16.44	180 µg/m <sup>3</sup>	
6.	NH <sub>3</sub> , µg/m <sup>3</sup>	17.38	400 µg/m <sup>3</sup>	
7.	CO, mg/m <sup>3</sup>	0.89	4 mg/m <sup>3</sup>	
8.	Pb, µg/m <sup>3</sup>	BDL	1 µg/m <sup>3</sup>	
9.	As, ng/m <sup>3</sup>	BDL	6 ng/m <sup>3</sup>	
10.	Ni, ng/m <sup>3</sup>	BDL	20 ng/m <sup>3</sup>	
11.	Benzene, µg/m <sup>3</sup>	BDL	5 µg/m <sup>3</sup>	
12.	Benzoapyrene ng/m <sup>3</sup>	BDL	1 ng/m <sup>3</sup>	

NOTE: BDL - Below Detection Limit

A. Das

Sr. Chemist

Aditi R&D Services



Technical Manager

Aditi R&D Services, Sindri

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Jharkhand - 828107  
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Website: aditirdservices.com  
Phone: 0326-2952377 (O).  
Fax: 0326-2952377  
Mobile: 09471358492, 09431512608

## TEST REPORT OF NOISE (AMBIENT) LEVEL MONITORING

Ref. No. & Date		NAME AND ADDRESS OF THE CLIENT			
ARDS/22-23/2862 Date: 13.02.2023		M/S TATA STEEL, JAMADOBA,			
Date of Monitoring		TATA STEEL LIMITED, JAMADOBA GROUP PLANT,			
10.02.2023 TO 11.02.2023		DIST. - DHANBAD (JHARKHAND)			
Work Order 4700092573/932 Dt. 20.07.2021		Avg. Ambient Temperature (°C)	Average Humidity (%)	Weather Condition	Status of the plant
		24	40	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) Leg	
		MAX	MIN	AVG. dB(A) Leq	MAX	MIN	AVERAGE dB(A) Leq	Day Time	Night Time
LOCATION								Industrial Area	Industrial Area
JAMADOBA GROUP									
1.	Central Workshop	67.4	53.2	64.55	54.4	47.5	52.2	75	70
2.	6 & 7 Pits Colliery Office	69.2	61.8	66.92	56.8	50.3	54.67		
								Residential Area	Residential Area
3.	Officer Colony 12 No. Digwadih	52.4	48.6	50.9	47.8	42.8	45.98	65	55
								Silence Zone	Silence Zone
4.	Tata Central Hospital	48.2	44.6	46.76	46.2	38.2	43.83	50	40

A. Das.

Sr. Chemist

Aditi R&D Services



Technical Manager

Aditi R&D Services, Sindri

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Fax: 0326-2952377  
Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2912

Date: 18.02.2023

## TEST REPORT OF MINERALOGICAL COMPOSITION OF PARTICULATE MATTER

- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO. : 4700092573/932 Dt. 20.07.2021
- Date of Sample Collection : 11.02.2023
- Date of Testing : 15.02.2023 - 17.02.2023

### TEST RESULTS

Sl No.	Particulars	Mineralogical Composition (%)			
		SiO <sub>2</sub>	FeO	Al <sub>2</sub> O <sub>3</sub>	CaO
1.	6 & 7 Pits Colliery Office	1.70	0.06	1.18	2.3
2.	Tata Central Hospital	2.08	0.12	1.26	2.78

A. Das.

Sr. Chemist  
Aditi R&D Services



*[Signature]*

Technical Manager  
Aditi R&D Services, Sindri

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Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2931

Date: 20.02.2023

## TEST REPORT OF SURFACE WATER

- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Sample Code : 1. Damodar River Up Stream  
2. Damodar River Down Stream
- Date of Sample Collection: 11.02.2023
- Date of Testing : 13.02.2023 To 18.02.2023
- Test : pH, TDS, Turbidity, DO, BOD, Cl, F, SO<sub>4</sub>

### TEST RESULT

Sl. No.	PARAMETERS OF TEST	VALUE		Limit as per IS 2296 Class - C	Test Method
		Damodar River Up Stream	Damodar River Dn Stream		
1.	pH	8.2	8.2	6.5 -8.5	IS-3025 (P-11): 1983
2.	Total Dissolved Solids, mg/l	328	328	1500	IS-3025 (P-16): 1984
3.	Turbidity, NTU	01	01	-	IS-3025 (P-10):1984
4.	Dissolved Oxygen, mg/l	5.6	5.8	4.0	IS-3025 (P-38):1989
5.	Bio chemical Oxygen Demand, mg/l	2.2	2.4	3.0	IS-3025 (P-44):1994
6.	Chloride as Cl, mg/l	32	34	-	IS-3025 (P-32):1988
7.	Fluoride as F, mg/l	0.49	0.52	1.5	IS-3025 (P-60):2008
8.	Sulphate as SO <sub>4</sub> , mg/l	53	54	400	IS-3025 (P-24):1986

A. Das.

Sr. Chemist  
Aditi R&D Services



Technical Manager  
Aditi R&D Services, Sindri

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# 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: sindnaditi@gmail.com  
Website: aditirnds.com  
Phone: 0326-2952377 (O),  
Fax: 0326-2952377  
Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2916

Date: 18.02.2023

## TEST REPORT OF MINE WATER DISCHARGE

- Name of the industry : M/S TATA STEEL, JAMADOBA, TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Sample Code : 1. 2 Pit Jamadoba Colliery  
2. 3 Pit Jamadoba Colliery  
3. 2 Incline Jamadoba Colliery  
4. 6 & 7 Pits Colliery  
5. Digwadih Colliery
- Date of Sample Collection: 10.02.2023 to 11.02.2023
- Date of Testing : 13.02.2023 To 18.02.2023
- Test : pH, TDS, TSS, BOD, COD, OIL & GREASE.

### TEST RESULT

Sl. No.	PARAMETERS OF TEST	VALUE					Limit as per IS-2296 Class B (For Bathing)	Test Method
		2 Pit Jamadoba Colliery	3 Pit Jamadoba Colliery	2 Incline Jamadoba Colliery	6 & 7 Pits Colliery	Digwadih Colliery		
1.	pH,	7.3	8.0	7.8	6.5	7.9	6.5-8.5	IS-3025 (P-11): 1983
2.	Total Dissolved Solids, mg/l	658	699	788	683	892	-	IS-3025 (P-16): 1984
3.	Total Suspended Solids, mg/l	36	32	36	23	34	-	IS-3025(P-17): 1984
4.	Bio chemical Oxygen Demand, mg/l	2.4	1.8	2.4	1.2	2.4	3	IS-3025 (P-44):1994
5.	Chemical Oxygen Demand, mg/l	40.2	48	59.5	52	54	-	IS-3025 (P-58):2006
6.	Oil & Grease, mg/l	0.4	0.4	BDL	BDL	BDL	-	IS-3025 (P-39):2021

A. Das,

Sr. Chemist

Aditi R&D Services



Technical Manager

Aditi R&D Services, Sindri

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Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2917

Date: 18.02.2023

## TEST REPORT OF SEWAGE

- Name of the industry : M/S TATA STEEL, JAMADOBA,  
TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Sample Code : 1. S.T.P. Outlet J.C.P.P. Canteen  
2. S.T.P. Outlet Jamadoba Canteen  
3. S.T.P. Outlet Railway Colony
- Date of Sample Collection: 10.02.2023 to 11.02.2023
- Date of Testing : 13.02.2023 to 18.02.2023
- Test : pH, TDS, TSS, BOD, COD, OIL & GREASE.

### TEST RESULT

Sl. No.	PARAMETERS OF TEST	VALUE			General Standards For Discharge Of Environmental Pollutants, Inland Surface Water By The MOEF&C	Test Method
		S.T.P. Outlet J.C.P.P. Canteen	S.T.P. Outlet Jamadoba Canteen	S.T.P. Outlet Railway Colony		
1.	pH,	7.7	7.9	7.5	5.5-9.0	IS-3025 (P-11):1983
2.	Total Dissolved Solids, mg/l	638	678	693	2100	IS-3025 (P-16):1984
3.	Total Suspended Solids, mg/l	28	30	38	100	IS-3025(P-17):1984
4.	Bio chemical Oxygen Demand, mg/l	13.6	12.4	14.8	30	IS-3025 (P-44):1994
5.	Chemical Oxygen Demand, mg/l	80	73	86.8	250	IS-3025 (P-58):2006
6.	Oil & Grease, mg/l	BDL	BDL	1.6	10	IS-3025 (P-39):2021

A. Das.

Sr. Chemist

Aditi R&D Services



*[Signature]*

Technical Manager

Aditi R&D Services, Sindri

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Ref. No.: - ARDS/22-23/2918

Date: 18.02.2023

## TEST REPORT OF EFFLUENT

- Name of the industry : M/S TATA STEEL, JAMADOBA, TATA STEEL LIMITED JAMADOBA GROUP PLANT, DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Sample Code : 1. E.T.P. Outlet T.C.H.  
2. E.T.P. Outlet Garage
- Date of Sample Collection: 10.02.2023
- Date of Testing : 13.02.2023 to 18.02.2023
- Test : pH, TDS, TSS, BOD, COD, OIL & GREASE.

### TEST RESULT

Sl. No.	PARAMETERS OF TEST	VALUE		General Standards For Discharge Of Environmental Pollutants, Inland Surface Water By The MOEF&C	Test Method
		E.T.P. Outlet T.C.H	E.T.P. Outlet Garage		
1.	pH,	7.3	7.2	5.5-9.0	IS-3025 (P-11): 1983
2.	Total Dissolved Solids, mg/l	890	752	2100	IS-3025 (P-16): 1984
3.	Total Suspended Solids, mg/l	28	27	100	IS-3025(P-17) : 1984
4.	Bio chemical Oxygen Demand, mg/l	8.6	9.5	30	IS-3025 (P-44):1994
5.	Chemical Oxygen Demand, mg/l	54	59	250	IS-3025 (P-58):2006
6.	Oil & Grease, mg/l	0.8	BDL	10	IS-3025 (P-39):2021

A. Das.  
Sr. Chemist  
Aditi R&D Services



  
Technical Manager  
Aditi R&D Services, Sindri

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

Ref. No.: - ARDS/22-23/2932

Date: 20.02.2023

### TEST REPORT OF DRINKING WATER

- Name of the industry : M/S TATA STEEL, JAMADOBA, TATA STEEL LIMITED  
JAMADOBA GROUP PLANT,  
DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO.: : 4700092573/932 Dt. 20.07.2021
- Sample Code : 1. Canteen - Jamadoba Colliery  
2. Canteen - Digwadih Colliery  
3. Canteen - 6 & 7 Pit Colliery  
4. Canteen - Jamadoba Washery
- Date of Sample Collection: 10.02.2023
- Date of Testing : 13.02.2023 to 18.02.2023
- Test :

Colour, Odour, Taste, Turbidity, pH, Total Hardness, Iron, Chloride, Res. Free chlorine, Total Dissolved Solids, Calcium, Copper, Manganese, Sulphate, Nitrate, Fluoride, Phenolic Compound, Mercury, Cadmium, Arsenic, Cyanide, Lead, Zinc, Total Coliform, Hexavalent Chromium, Mineral Oil, Alkalinity, Aluminium & Boron.

### TEST RESULT

Sl. No	PARAMETERS OF TEST	VALUE				IS as per IS 10500:2012		Test Method
		Canteen Jamadoba Colliery	Canteen Digwadih Colliery	Canteen 6 & 7 Pit Colliery	Canteen Jamadoba Washery	Desirable	Permissible	
1.	Colour, (Hazen Unit)	1	1	1	1	5.00	15.0	IS 3025 (P-4):2021
2.	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	IS 3025 (P-5):2018
3.	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	IS 3025 (P-7):2017
4.	Turbidity, NTU	NIL	NIL	NIL	NIL	1.0	5.0	IS 3025 (P-10):1984
5.	pH	7.5	8.2	7.8	8.0	6.5-8.5	No. Relax.	IS-3025 (P-11):1983
6.	Total Hardness as CaCO <sub>3</sub> , mg/l	376	380	224	416	200	600	IS 3025 (P-21):2009
7.	Chloride as Cl <sub>1</sub> , mg/l	58	60	36	60	250	1000	IS 3025 (P-32):1988
8.	Res. Free chlorine as Cl <sub>2</sub> mg/l	NIL	NIL	NIL	NIL	0.20	1.0	IS 3025 (P-26):2021
9.	Total Dissolved Solids, mg/l	828	750	406	738	500	2000	IS 3025 (P-16):1984
10.	Calcium as CaCO <sub>3</sub> , mg/l	43.2	43.2	36.8	52.8	75	200	IS 3025 (P-40):1991
11.	Copper as Cu, mg/l	BDL	BDL	BDL	BDL	0.05	1.5	IS 3025 (P-42):1992

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- 2 -

Sl. No.	PARAMETERS OF TEST	VALUE				IS as per IS 10500:1991		Test Method
		Canteen Jamadoba Colliery	Canteen Digwadih Colliery	6 & 7 Pit Colliery	Jamadoba Washery Canteen	Desirable	Permissible	
12.	Manganese as Mn, mg/l	BDL	BDL	BDL	BDL	0.10	0.30	IS 3025 (P-59):2006
13.	Sulphate as SO <sub>4</sub> , mg/l	72.7	36.6	31.3	62	200	400	IS 3025 (P-24):1986
14.	Nitrate as NO <sub>3</sub> , mg/l	3.3	3.1	2.8	2.9	45	No. Relax	IS 3025 (P-34):1988
15.	Fluoride as F, mg/l	0.38	0.32	0.34	0.28	1.0	1.5	IS 3025 (P-60):2008
16.	Phenolic Compound as (C <sub>6</sub> H <sub>5</sub> OH) mg/l	BDL	BDL	BDL	BDL	0.001	0.002	IS 3025 (P-43):1992
17.	Mercury as Hg, mg/l	BDL	BDL	BDL	BDL	0.001	No. Relax	IS 3025 (P-48):1994
18.	Cadmium as Cd, mg/l	BDL	BDL	BDL	BDL	0.003	No. Relax	IS 3025 (P-41):1992
19.	Arsenic as As, mg/l	BDL	BDL	BDL	BDL	0.01	No. Relax	IS 3025 (P-37):1988
20.	Cyanide as CN, mg/l	BDL	BDL	BDL	BDL	0.05	No. Relax*	IS 3025 (P-27):1986
21.	Lead as Pb, mg/l	BDL	BDL	BDL	BDL	0.01	No. Relax	IS 3025 (P-47):1994
22.	Zinc as Zn, mg/l,	0.14	0.12	0.12	0.18	5	15	IS 3025 (P-42):1992
23.	Total Coliform, No./100ml	Absent	Absent	Absent	Absent	Absent	Absent	IS 3025 (P-49):1994
24.	Hexavalent Chromium as Cr, mg/l	BDL	BDL	BDL	BDL	0.05	No. Relax	IS 3025 (P-52):2003
25.	Mineral Oil, mg/l	BDL	BDL	BDL	BDL	0.5	No. Relax	IS 3025 (P-39):1989
26.	Alkalinity as CaCO <sub>3</sub> , mg/l,	492	500	220	492	200	600	IS 3025 (P-23):1983
27.	Aluminium as Al, mg/l	BDL	BDL	BDL	BDL	0.03	0.2	IS 3025 (P-55):2003
28.	Boran as B, mg/l	BDL	BDL	BDL	BDL	0.5	1.0	IS 3025 (P-57):2005

NOTE: BDL - Below Detection Limit

A. Das,

Sr. Chemist  
Aditi R&D Services



*[Signature]*

Technical Manager  
Aditi R&D Services, Sindri

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Mobile: 09471358492, 09431512608

Ref. No.: - ARDS/22-23/2937

Date: 21.02.2023

## TEST REPORT OF GROUND WATER

- Name of the industry : M/S TATA STEEL, JAMADOBA, TATA STEEL LIMITED, JAMADOBA GROUP PLANT, DIST. - DHANBAD (JHARKHAND)
- Work Order Ref. NO. : 4700092573/932 Dt. 20.07.2021
- Sample Code :
  1. Moholbani Basti
  2. Jorapukhar Kushtand
  3. Bhowra 13 No
  4. Jamadoba 3 No
  5. Lower Dungri
- Date of Sample Collection : 10.02.2023
- Date of Testing : 13.02.2023 to 18.02.2023
- Test : Colour, Odour, Taste, Turbidity, pH, Total Hardness, Iron, Chloride, Res. Free chlorine, Total Dissolved Solids, Calcium, Copper, Manganese, Sulphate, Nitrate, Fluoride, Phenolic Compound, Mercury, Cadmium, Arsenic, Cyanide, Lead, Zinc, Total Coliform, Hexavalent Chromium, Mineral Oil, Alkalinity, Aluminium & Boron.

## TEST RESULT

Sl. No	PARAMETERS OF TEST	VALUE					IS as per IS 10500:1991		Test Method
		Moholbani Basti	Jorapukhar Kushtand	Bhowra 13 No	Jamadoba 3 No	Lower Dungri	Desirable	Permissible	
1.	Colour, (Hazen Unit)	1	1	1	1	1	5	15	IS 3025 (P-4):2021
2.	Temperature °C	22	23	23	22	23	-	-	-
3.	Electrical Conductivity, µmhos/cm	930	1280	750	350	630	-	-	-
4.	Total Dissolved Solids, mg/l	609	835	489	232	414	-	-	IS 3025(P-16):1984
5.	pH	7.0	8.1	7.5	7.9	7.7	6.5-8.5	No Relax	IS-3025(P-11):1983
6.	Total Hardness as CaCO <sub>3</sub> , mg/l	436	544	356	140	264	200	600	IS 3025(P-21):2009
7.	Calcium as Ca, mg/l	144	81.6	72	33.6	70.4	75	200	IS 3025(P-40):1991
8.	Magnesium as Mg, mg/l	18.2	81.6	42.2	13.4	21.1	30	100	IS 3025(P-46):1994
9.	Chloride as Cl, mg/l	99.9	70	52	22	62	250	1000	IS 3025(P-32):1988
10.	Fluoride as F, mg/l	0.36	0.26	0.28	0.32	0.36	1.0	1.5	IS 3025(P-60):2008

Continued on Page -2

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*[Handwritten Signature]*





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2

Sl. No	PARAMETERS OF TEST	VALUE					IS as per IS 10500:1991		Test Method
		Moholbani Basti	Jorapukhar Kushtand	Bhowra 13 No	Jamadoba 3 No	Lower Dungri	Desirable	Permissible	
11	Sulphate as SO <sub>4</sub> , mg/l	75	44	58.4	45.3	21.8	200	400	IS 3025(P-24):1986
12	Nitrate as NO <sub>3</sub> , mg/l	9.8	12.4	11.3	9.4	9.8	45	No. Relax	IS 3025(P-34):1988
13	Alkalinity as CaCO <sub>3</sub> , mg/l,	328	504	312	104	184	200	600	IS 3025(P-23):1983
14	Lead as Pb, mg/l	BDL	BDL	BDL	BDL	BDL	0.01	No. Relax	IS 3025(P-47):1994
15	Zinc as Zn, mg/l,	0.14	0.16	0.12	0.10	0.16	5	15	IS 3025(P-42):1992
16	Iron a Fe, mg/l	0.1	0.1	0.08	0.08	0.1	0.3	No. Relax	IS 3025(P-53):2003
17	Copper as Cu, mg/l	BDL	BDL	BDL	BDL	BDL	0.05	1.5	IS3025 (P-42):1992
18	Mercury as Hg, mg/l	BDL	BDL	BDL	BDL	BDL	0.001	No. Relax	IS 3025(P-48):1994
19	Cadmium as Cd, mg/l	BDL	BDL	BDL	BDL	BDL	0.003	No. Relax	IS 3025(P-41):1992
20	Nickel as Ni, mg/l	BDL	BDL	BDL	BDL	BDL	0.02	No. Relax	IS 3025(P-37):1992
21	Arsenic as As, mg/l	BDL	BDL	BDL	BDL	BDL	0.01	No. Relax	IS 3025(P-37):1988
22	Cyanide as CN, mg/l	BDL	BDL	BDL	BDL	BDL	0.05	No. Relax	IS 3025(P-27):1986
23	Total Chromium as Cr, mg/l	BDL	BDL	BDL	BDL	BDL	0.05	No. Relax	IS 3025(P-52):2003

NOTE: BDL - Below Detection Limit

A. Das.

Sr. Chemist  
Aditi R&D Services



*[Signature]*  
Technical Manager  
Aditi R&D Services, Sindri

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## ENVIRONMENTAL POLICY

Tata Steel's environmental responsibilities are driven by our commitment to preserve the environment and are integral to the way we do business.

1. We are committed to deal proactively with Climate Change issue by efficient use of natural resources & energy; reducing and preventing pollution; promoting waste avoidance and recycling measures; and product stewardship.
  - We shall identify, assess and manage our environment impact.
  - We shall regularly monitor, review and report publicly our environmental performance.
  - We shall develop & rehabilitate abandoned sites through afforestation and landscaping and shall protect and preserve the biodiversity in the areas of our operations.
  - We shall enhance awareness, skill and competence of our employees and contractors so as to enable them to demonstrate their involvement, responsibility and accountability for sound environmental performance.
2. We are committed to continual improvement in our environmental performance.
  - We shall set objective-targets, develop, implement and maintain management standards and systems, and go beyond compliance of the relevant industry standards, legal and other requirements.
3. We will truly succeed when we sustain our environmental achievement and are valued by the communities in which we work.

**Date :** November 1, 2017



**T V Narendran**  
CEO & Managing Director







## CERTIFICATE OF APPROVAL

Issued by Indian Register Quality Systems  
(A Division of IRCLASS Systems and Solutions Private Limited)

This is to certify that the Environmental Management Systems of

**Organisation:** Tata Steel Limited- Jharia Division

**Address:** GM Office, Jamadoba,  
Dhanbad, Jharkhand - 828 112

has been assessed and found conforming to the following requirement

**Standard:** ISO 14001:2015

**Scope:** Underground Mining, Processing &  
Dispatch of Coal

**Certificate No.:** IRQS/210100673

**Original Certification date:** 11/04/2003

**Current Date of Granting:** 09/04/2021

**Expiry Date:** 08/04/2024



A handwritten signature in black ink, appearing to read 'Shashi Nath Mishra', written over a horizontal line.

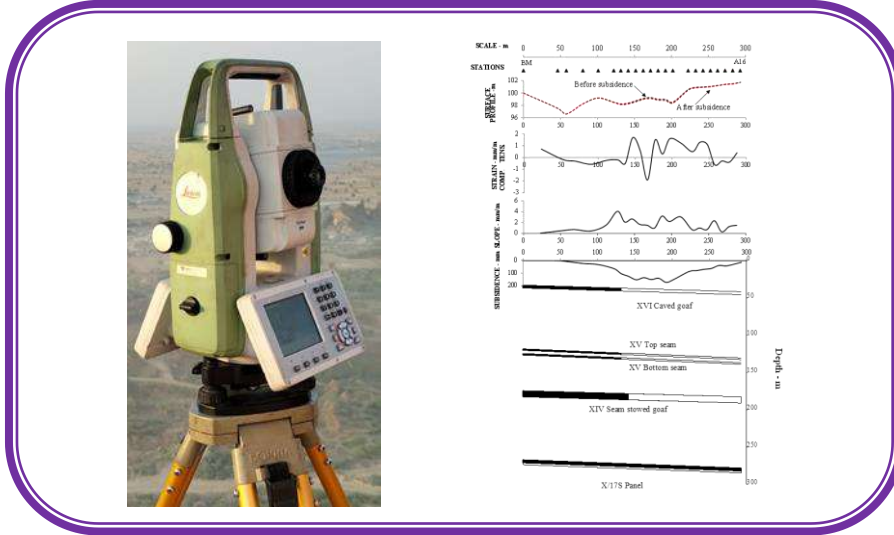
**Shashi Nath Mishra**  
Head IRQS

This approval is subject to continued satisfactory maintenance of the Environmental Management Systems of the organization to the above standard which will be monitored by IRQS. The use of the Accreditation Mark indicates accreditation with respect to activities covered by the certificate with accreditation no. C071. Condition Overleaf

COA/IRQS/RvA/EMS/Rev 00

Head Office: 52A, Adi Shankaracharya Marg, Opp. Powai Lake, Powai, Mumbai - 400 072, India.

झरिया कोलफील्ड की टाटा स्टील कोलियरियों में डिपिलरिंग पैनलों पर सबसिडेंस मूवमेंट्स के कारण सतह आकृतियाँ और ढांचाओं का सुरक्षा मूल्यांकन  
**SAFETY EVALUATION OF SURFACE FEATURES AND STRUCTURES  
DUE TO SUBSIDENCE MOVEMENTS OVER DEPILLARING PANELS  
AT TATA STEEL COLLIERIES OF JHARIA COALFIELD**



March, 2023

खान धंसान एवं सर्वेक्षण  
सीएसआईआर-केंद्रीय खनन एवं ईंधन अनुसंधान संस्थान  
(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)  
बरवा रोड, धनबाद - 826 015, झारखंड

**MINE SUBSIDENCE AND SURVEYING  
CSIR-CENTRAL INSTITUTE OF MINING & FUEL RESEARCH  
(Council of Scientific & Industrial Research)  
Barwa Road, Dhanbad - 826 015, Jharkhand**

झरिया कोलफील्ड की टाटा स्टील कोलियरियों में डिपिलरिंग पैनलों पर सबसिडेंस मूवमेंट्स के कारण सतह आकृतियाँ और ढांचाओं का सुरक्षा मूल्यांकन  
**SAFETY EVALUATION OF SURFACE FEATURES AND STRUCTURES DUE TO SUBSIDENCE MOVEMENTS OVER DEPILLARING PANELS AT TATA STEEL COLLIERIES OF JHARIA COALFIELD**  
(Period: March, 2021 to December, 2021)

**Project No. SSP/690/2022-23**

**PROJECT PERSONNEL**

डा॰ अमर प्रकाश, वरिष्ठ प्रधान वैज्ञानिक/ Dr. Amar Prakash, Sr. Pr. Scientist  
डा॰ सुजीत कुमार मण्डल, मुख्य वैज्ञानिक/ Dr. Sujit Kumar Mandal, Chief Scientist  
श्री संजीवन कुमार, तकनीकी सहायक/ Sri Sanjivan Kumar, Tech. Assistant  
श्री जगदीपा उरांव, तकनीकी सहायक/ Sri Jagdeepa Oraon, Tech. Assistant  
श्री सीमान्ता सिन्हा, तकनीशियन/ Sri Simanta Sinha, Technician  
श्री मनोज कुमार सिंह, वरिष्ठ तकनीशियन (1) / Sri Manoj Kumar Singh, Sr. Technician (1)

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**परियोजना प्रस्तावकों के हस्ताक्षर/ Signature of Project Proponents**

(अमर प्रकाश/ Amar Prakash)  
वरिष्ठ प्रधान वैज्ञानिक/ Sr. Pr. Scientist  
परियोजना नायक एवं विभागाध्यक्ष /Project Leader & Head of Section

(एस.के. मण्डल / S. K. Mandal)  
मुख्य वैज्ञानिक/ Chief Scientist  
परियोजना समन्वयक एवं अनुसंधान समूह के प्रमुख  
Project Coordinator & HORG

**सीएसआईआरहस्ताक्षरकर्ता प्राधिकृत सीआईएमएफआर- / CSIR-CIMFR Authorised Signatories**

(नीरज कुमार/ Niraj Kumar)  
प्रधान वैज्ञानिक एवं प्रमुख  
Pr. Scientist & HoS  
परियोजना प्रबंधन एवं अनुवीक्षण  
Project Planning and Monitoring

(जे॰ के॰ पांडे/ J. K. Pandey)  
मुख्य वैज्ञानिक एवं समन्वयक  
Chief Scientist & Coordinator  
परियोजना प्रबंधन एवं उद्योग संपर्क  
Project Planning & Industry Interface



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## EXECUTIVE SUMMARY

Subsidence investigations were conducted over 5 stowed panels during March, 2021 and December, 2021 at Jamadoba 2&3 Pit, Sijua and Bhelatand collieries of Tata Steel in Jharia Coalfield for the safety evaluation of different surface features and structures. All the panels were extracted by Bord & Pillar method of mining with 70-80 percent of coal extraction in conjunction with hydraulic sand stowing. Depillaring operations were carried out at depths ranging from 137 m to 273.8 m. The width-depth ratio of the panels varied between 0.41 and 0.73, i.e., all the panels were under sub-critical width condition. All these panels were extracted under multi-seam mining condition with overlying old stowed and caved goaves. X/17S panel of Sijua colliery and XIV/4S panel of Bhelatand colliery were completed during the study period. The important surface features over most of the panels include plantations, barren land, cultivated land, road and village. The study conducted during the above period led to the following conclusion and recommendation:

1. Maximum subsidence movement was 2.56% of extraction thicknesses over the 17S panel of X seam at Sijua colliery amounting to 172 mm and the depillaring operation was completed.
2. Maximum slope, compressive and tensile strains observed over measured panels was 4.30 mm/m, 1.91 mm/m and 1.68 mm/m respectively.
3. Subsidence, slope and strains profiles were influenced by the overlying old goaves, position of goaf edges, inclination of the seam, topography of the surface profiles as well as left out stooks/ribs in the overlying seams worked by bord & pillar method of mining. Hence, the profiles were not symmetric.
4. Subsidence movements did not cause any adverse impact on surface features and structures.
5. It is recommended to erect subsidence monitoring stations at least one month before the commencement of depillaring over new panels. Layout of subsidence monitoring stations should be made as proposed.
6. It is also recommended to extend subsidence monitoring stations outside the panel boundary equal to panel depth for proper evaluation of extent of subsidence.
7. It is recommended to continue subsidence investigations for the safety evaluation of different surface features and structures lying over different on-going and future depillaring panels.

## **1.0 INTRODUCTION**

Subsidence investigation is being carried out continuously since 1982, on yearly sponsorship at different collieries of Tata Steel (erstwhile TISCO) in Jharia Coalfield. The mine management of Tata Steel Jharia division requested Director, CSIR-Central Institute of Mining and Fuel Research (CIMFR), Dhanbad to conduct subsidence investigation over depillaring panels in the collieries of Jharia Coalfield for the period between March, 2021 and December, 2021. Subsidence investigations were conducted in three collieries, namely, Jamadoba 2&3 Pit, Sijua and Bhelatand of Tata Steel. Mining leasehold areas of these collieries have important surface features and structures like railway lines, quarters, hospital, roads, forest land, high tension line, nallah, agricultural land, water tank, buildings, etc. The main objectives of this study are to evaluate the stability and safety of different surface features and structures lying above the depillaring panels. It was proposed to conduct surface ground movement studies over 5 stowed panels from March, 2021 to December, 2021, located in the above-mentioned three collieries. The report covers outcome of subsidence investigations conducted over 5 panels at Tata Steel collieries in Jharia Coalfield during March, 2021 to December, 2021.

## **2.0 GEO-MINING DETAILS OF EXTRACTION**

Jamadoba 2&3 Pit colliery is located in the eastern limb whereas Sijua and Bhelatand collieries are located in the western limb of Jharia Coalfield as depicted in Fig. 1. Geomining details of different panels are shown in Table 1. The width-depth ratio of the panels varied between 0.41 - 0.73, i.e., all the panels were under sub-critical width condition. The low value of width-depth ratios of the panels were maintained to minimize the magnitude of subsidence movements for the protection of important surface features and structures. All the stowed panels were under multi-seam working condition. Layouts of monitoring stations with overlying workings and surface features are shown in figures 2 through 6. Hindrances in the field restricted systematic erection of subsidence monitoring stations over and around the panels. Hence, at places monitoring stations were laid as per the site situation. Borehole sections of three collieries with lithology and strata thickness are shown in figures 7 to 9.



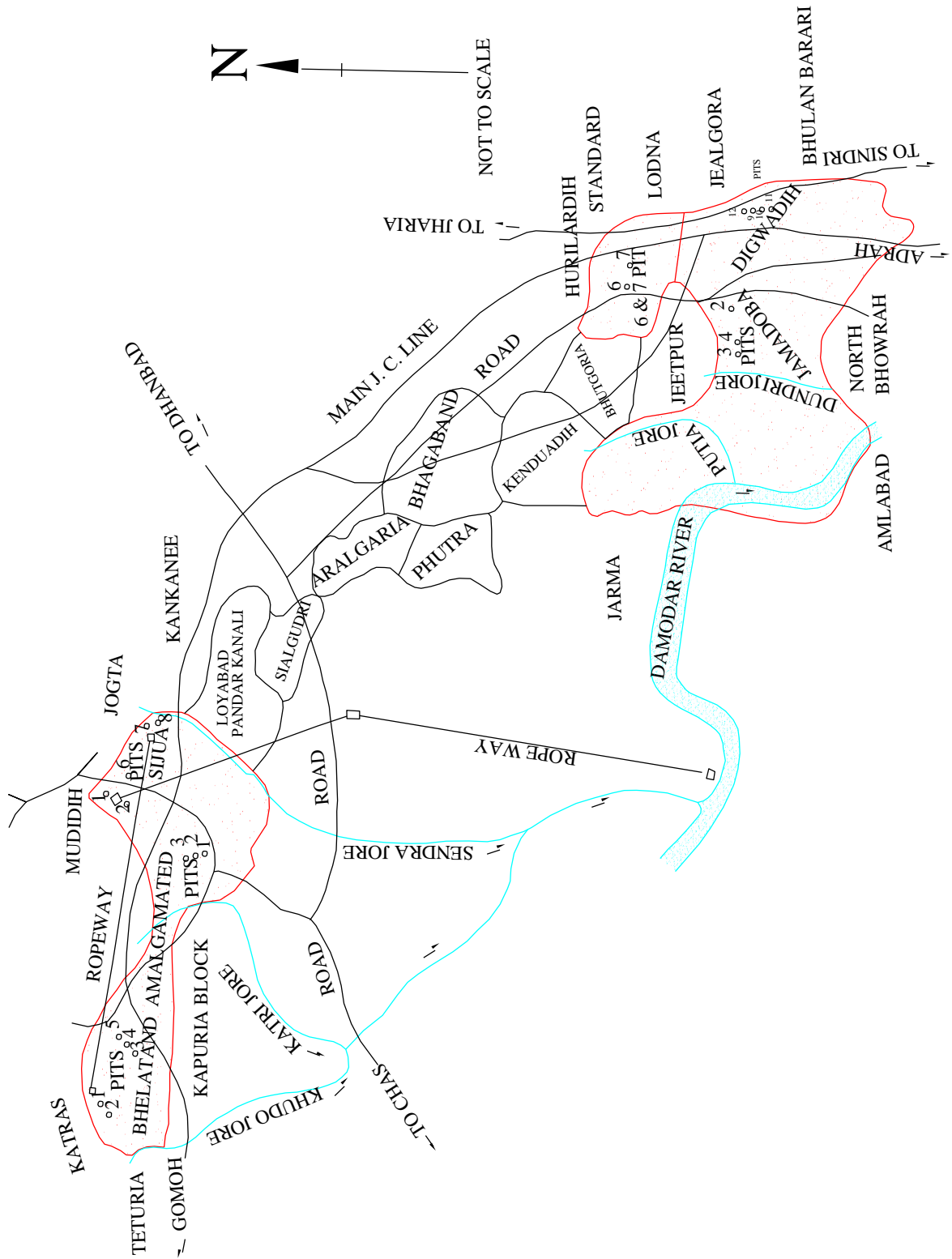


Fig. 1: Location of Tata Steel collieries in Jharia Coalfield

Table 1: Geo-mining details of extraction in different collieries of Tata Steel in Jharia Coalfield

Sl. No.	Colliery	Seam/dip of seam/panel	Extraction thickness (m)	Average depth of extraction (m)	Panel size (m x m)	Mining method / extraction percentage (%) / Overburden sandstone (%)	Extraction period	Overlying goaf	Surface properties
1	Jamadoba 2&3 Pit	XV/1 in 5/4S	3.00	137.00	245x100	B&P/70/60	02/2020 to cont.	Caved goaf in 16,15A, 15 Partly virgin and mostly standing on pillars	Barren land
2	Sijua	X/1 in 4.6/ 17S	6.71	290.11	150X280	B&P /75/65	03/2019 to 30/09/2021	16 seam, 15 (top and bottom) seams caved goaf and 14 seam stowed goaf	Plantation
3	Sijua	IX/1 in 5.07/1S (Ext.)	3.05	295.945	120X120	B&P/75/65	09/2020 to cont.	12 seam, 13 seam ,14 seam and 16 seam caved goaf	Barren land and plantation
4	Sijua	X/1 in 4.67/15S	6.71	310.850	150X300	B&P/80/65	20/02/2021 to cont.	14 seam, 15 seam (bottom), 15 seam (top) and 16 seam caved goaf	Barren land and cultivated land
5	Bhelatand	XIV(E)/1 in 5.40/4S	3.00	373.80	188X240	B&P/75/63	05/2019 to 01/08/2021	17 seam caved goaf, 16 seam standing on pillar, 15 seam partly caved and partly virgin	village and road

B&P = Bord & Pillar, S = Stowing

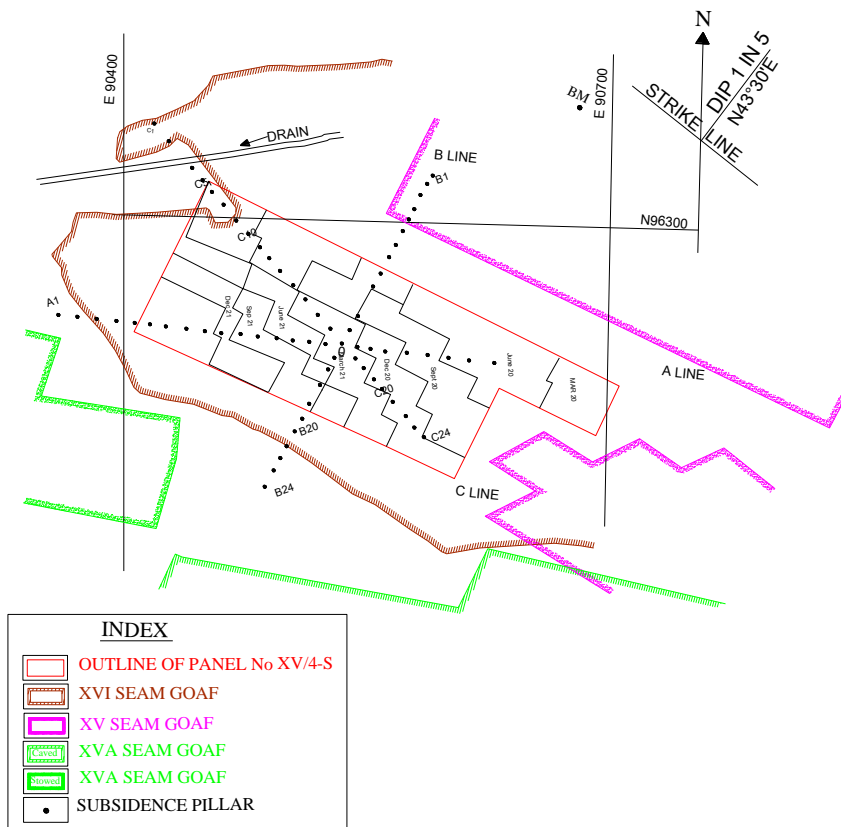


Fig. 2: Layout of monitoring stations over 4S panel of XV seam with overlying goaves at Jamadoba 2&3 Pit

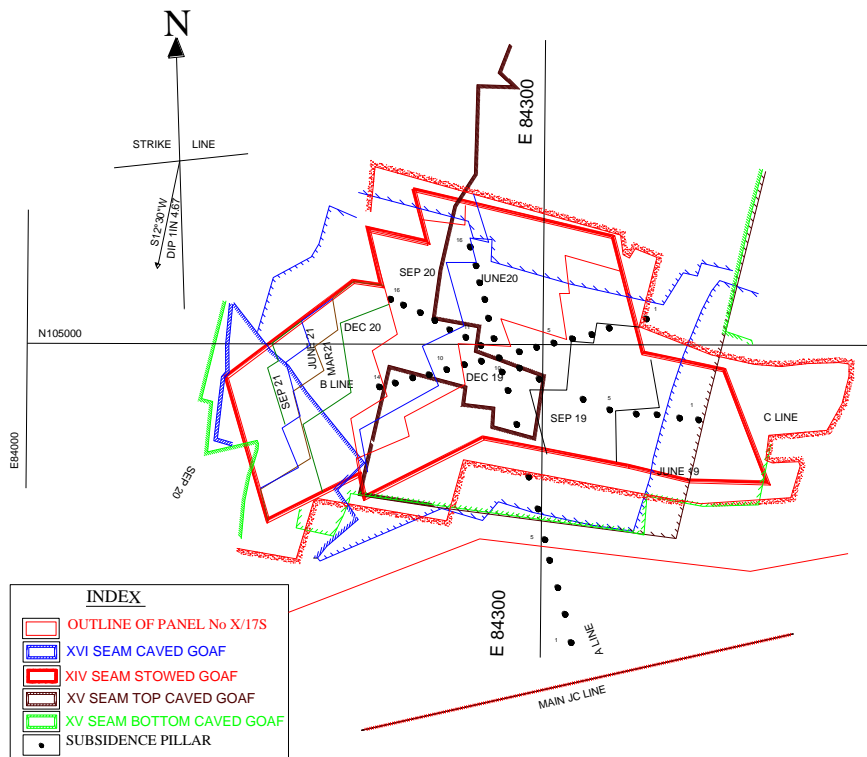


Fig. 3: Layout of monitoring stations over 17S panel of X seam with overlying goaves at Sijua colliery



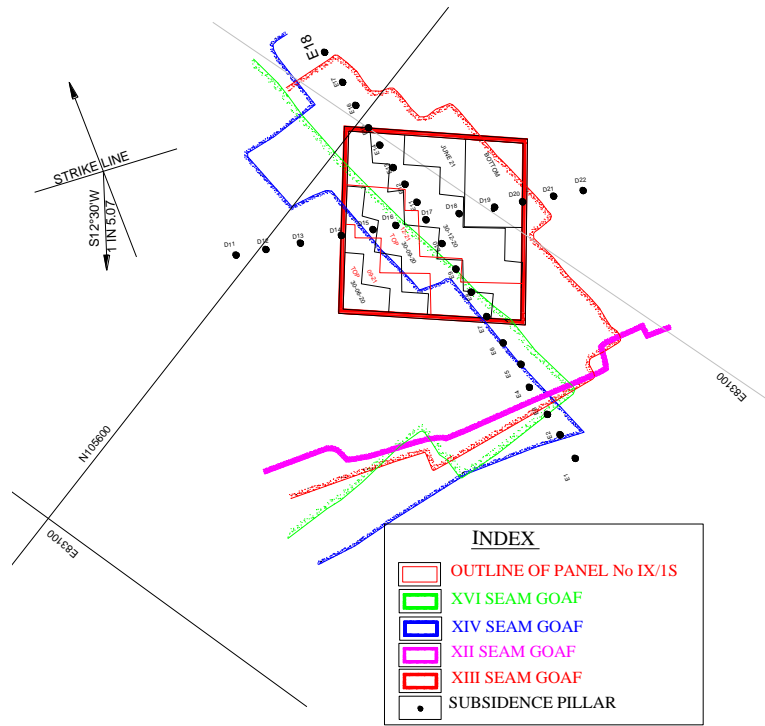


Fig. 4: Layout of monitoring stations over 1S panel of IX seam with overlying goaves at Sijua colliery

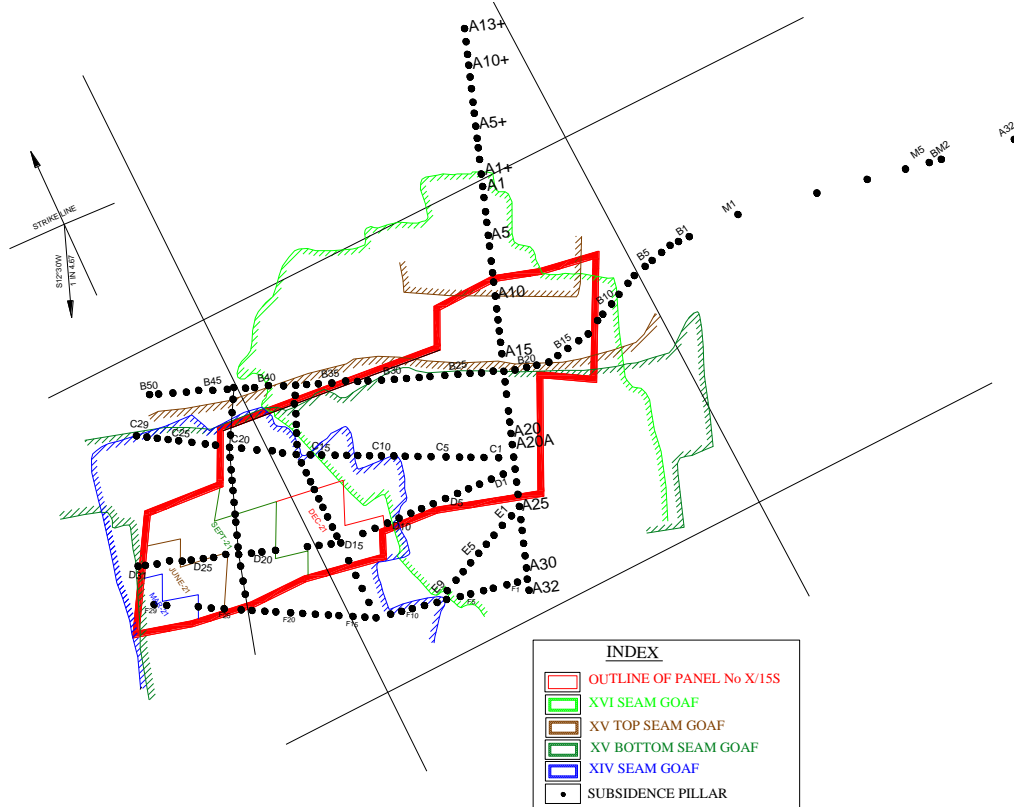


Fig. 5: Layout of monitoring stations over 15S panel of X seam with overlying goaves at Sijua colliery

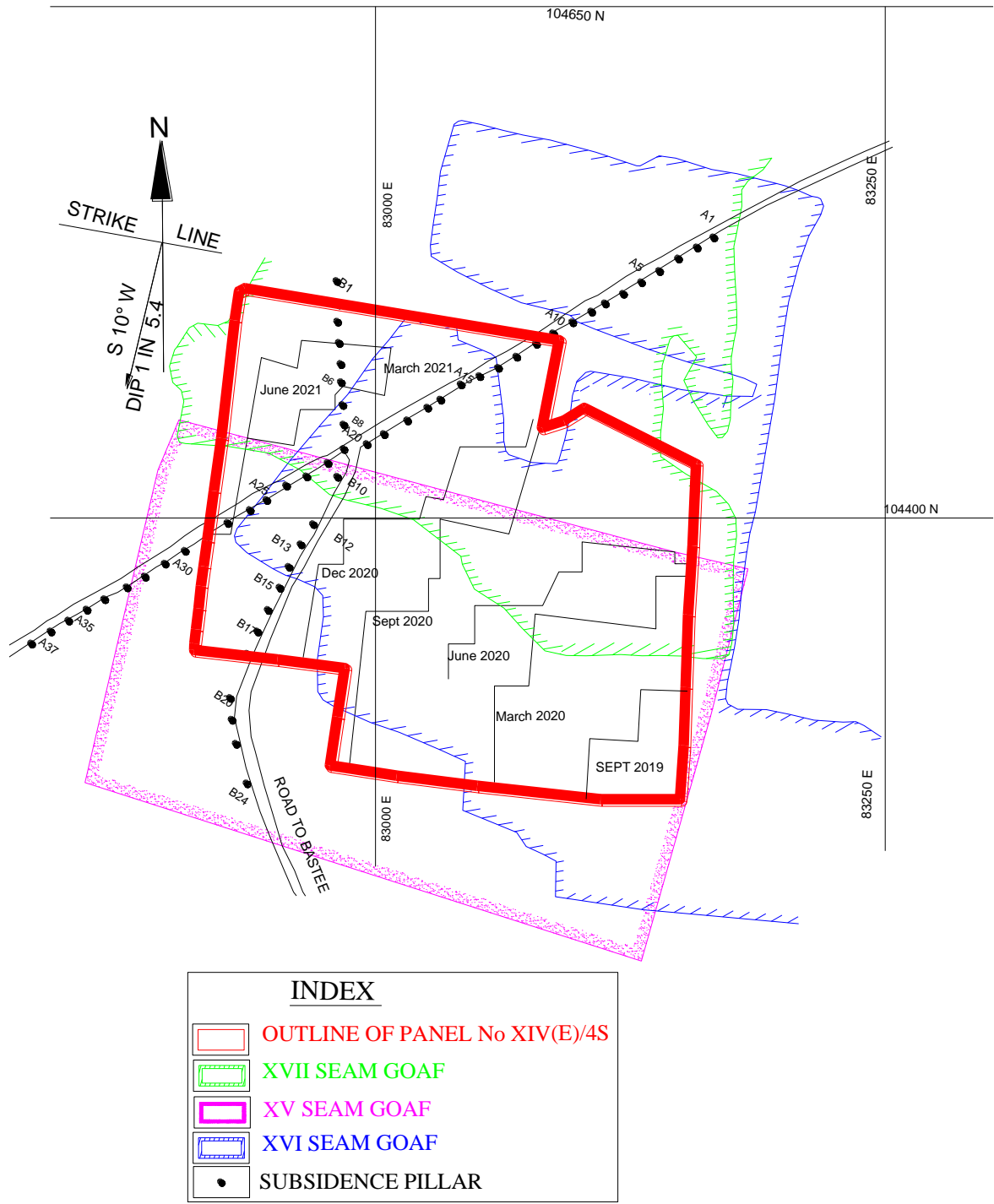


Fig. 6: Layout of monitoring stations over 4S panel of XIV seam with overlying goaves at Bhelatand colliery

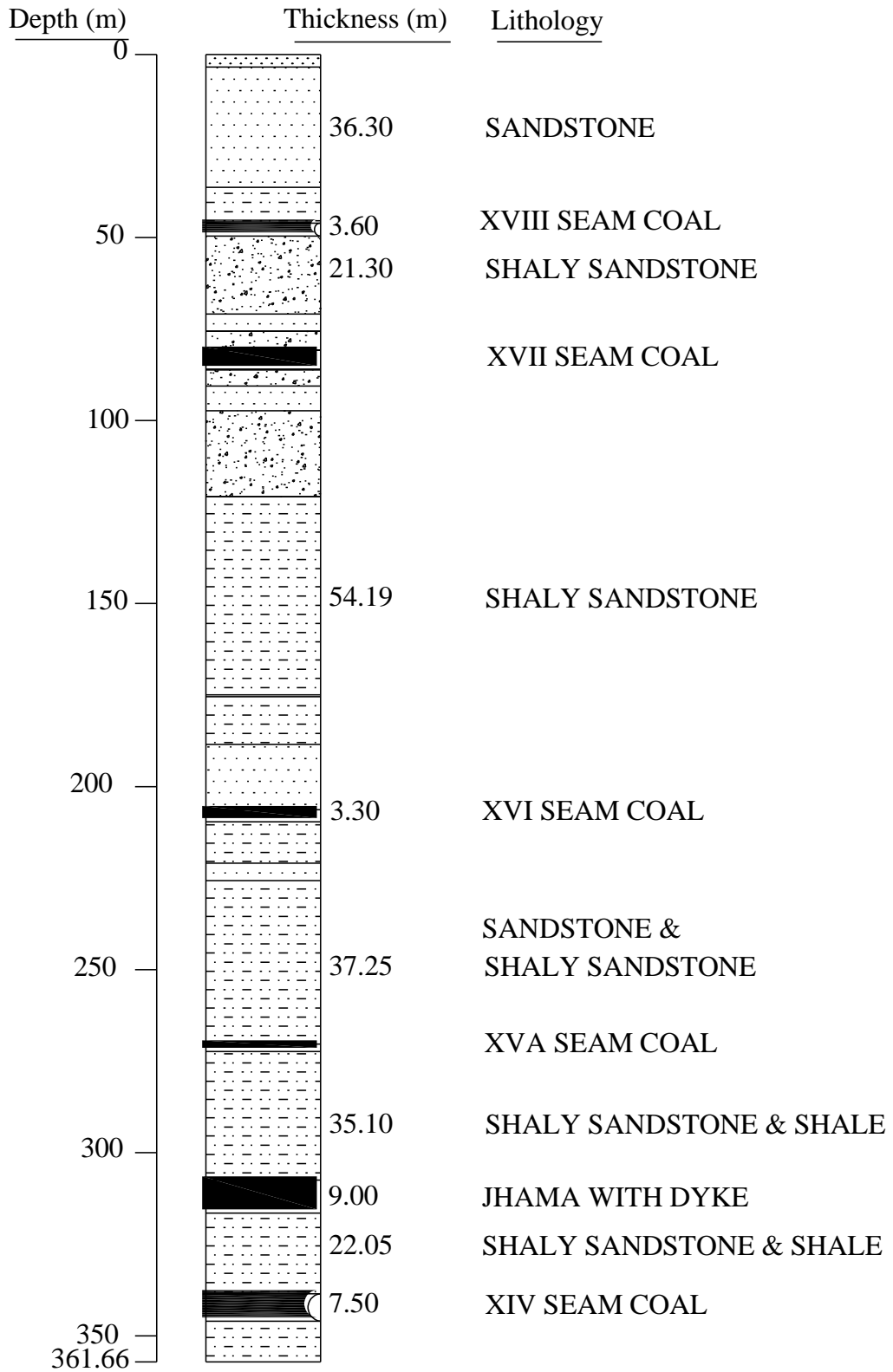


Fig. 7: Section of borehole no. J3 of Jamadoba 2&3 Pit



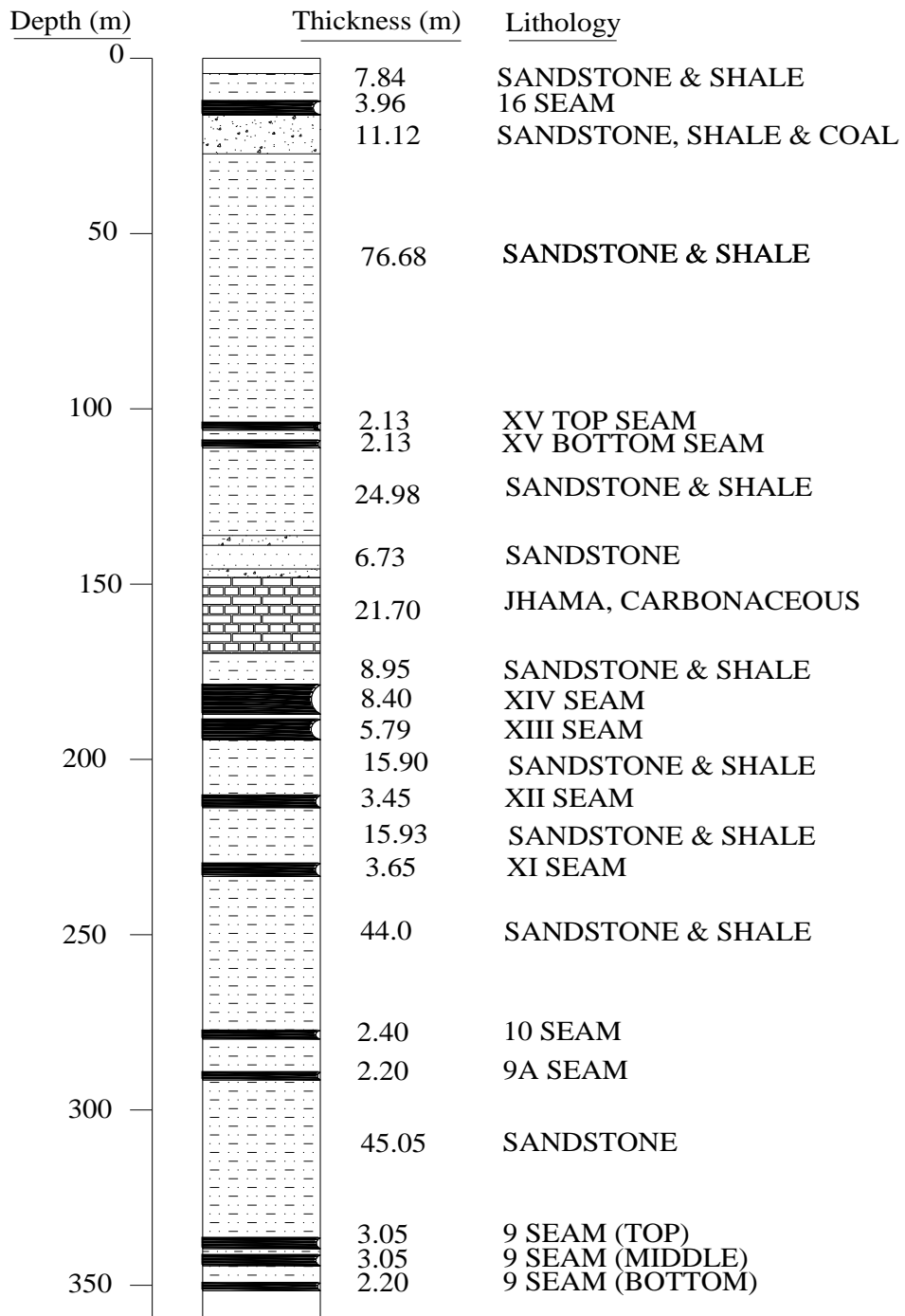


Fig. 8: Section of 2 Pit of Sijua colliery

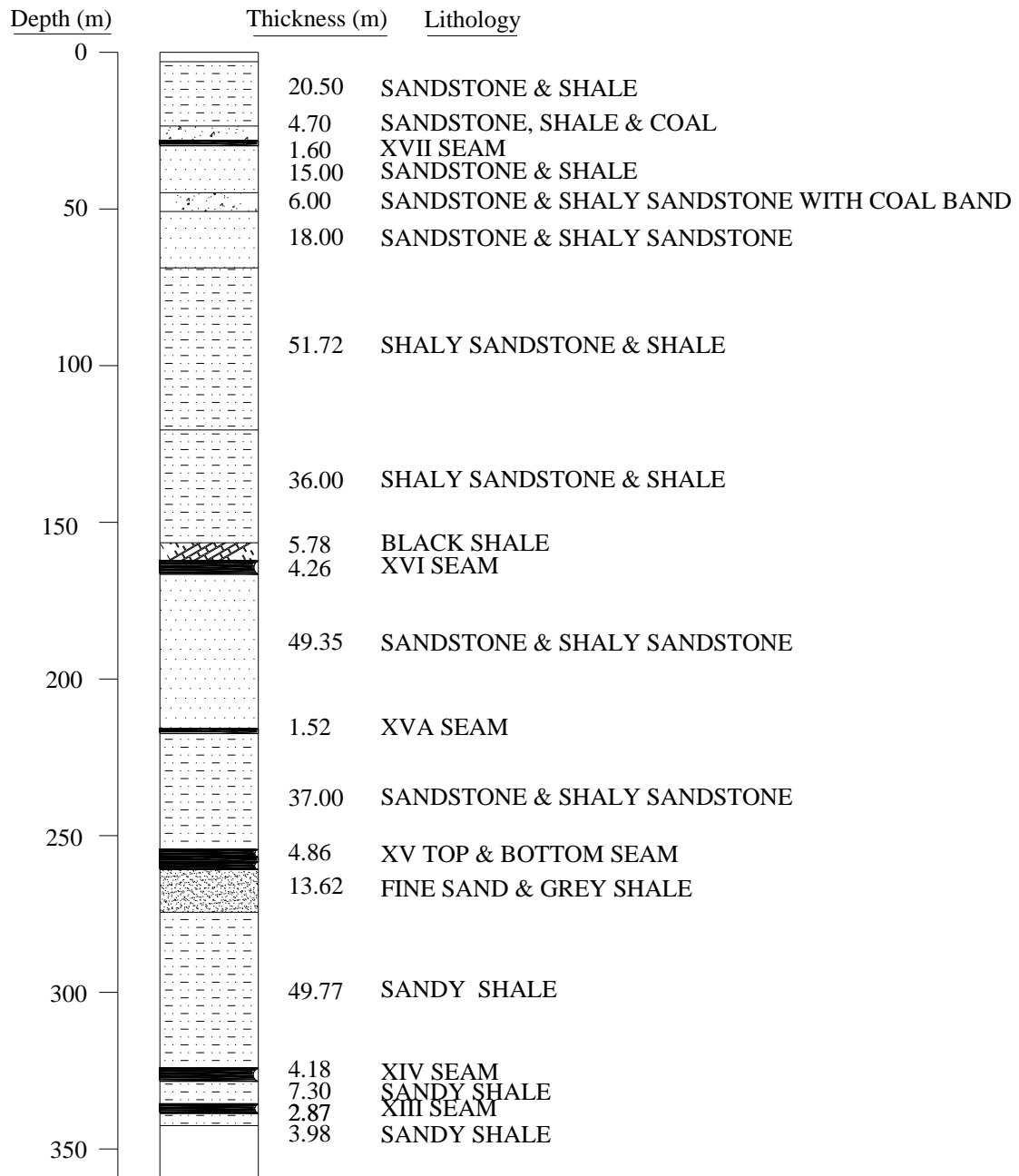


Fig. 9: Section of borehole no. B in Bhelatand colliery

The general lithologies of the overburden in all the three collieries comprise sandstone, shale, shaly sandstone, sandy shale, carbonaceous shale and coal seams. Sandstone and shale are the dominant rock types in the overburden. Percentage of sandstone lying over the working panels varied from 60 to 65%. The gradient of seam varied from 1 in 4.67 to 1 in 5.4. All the coal seams lie in Barakar formation of Lower Gondwana. Depillaring was

completed in XV/4S panel of Jamadoba 2&3 Pit and X/17S panel of Sijua colliery. Depillaring was in progress in the remaining three panels. Most of the panels lie below the barren land and plantation area (Table 1).

### 3.0 METHODOLOGY

Monitoring stations are fixed on the ground as per the designed layout at regular interval covering the entire area of interest. Subsidence measurement is carried out from a reference station/Bench Mark (B.M.) fixed beyond the influence of ground movement. Total Station is used to conduct subsidence investigations in all the panels.

Total Station, an outgrowth of theodolite, is used for measuring Reduced Level of subsidence monitoring stations and horizontal distance between the adjacent monitoring stations in the field (Fig. 10). This aids in computing subsidence (vertical displacement), strain (horizontal displacement) and slope of the subsidence. The key specification of Total Station is given in Table 2. Therefore, Missing Line Measurement (MLM) mode is adopted for subsidence investigation, as it calculates the horizontal distance, slope distance and difference in elevation between two target prisms as illustrated in Fig. 11.



Fig. 10: Total Station



Table 2: Specification of Total Station

Parameter	Specification
Make	Leica
Model	TS07
Measurement Range (1 prism)	3500 m
Linear accuracy	$\pm (1\text{mm} + 1.5 \text{ ppm} \times D)$
Linear Least count	1 mm
Angular accuracy	1"
Angular Least count	0.1"

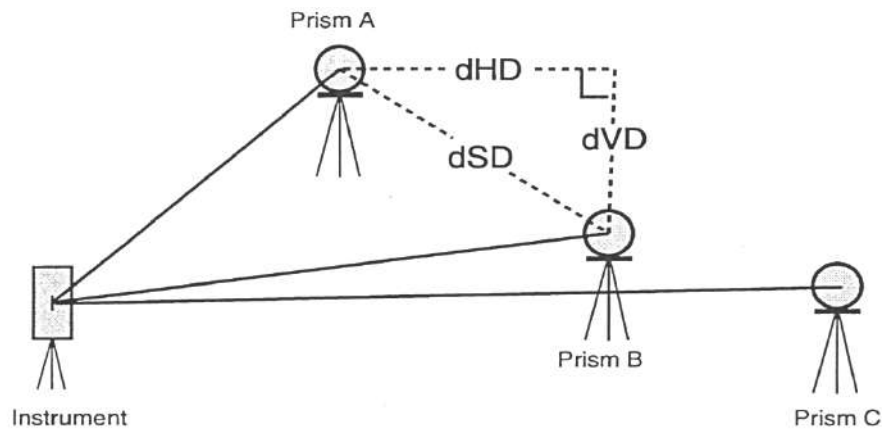


Fig. 11: Concept of Missing Line Measurement

#### 4.0 RESULT OF SUBSIDENCE INVESTIGATIONS

Surface subsidence investigations were conducted over 5 stowed panels (1 panel at Jamadoba 2&3 Pit, 3 panels at Sijua colliery and 1 panel at Bhelatand colliery) of Tata Steel collieries in Jharia Coalfield. Depillaring in X/17S panel of Jamadoba 2&3 Pit and XIV/4S panel of Bhelatand colliery were completed in September, 2021 and August, 2021 respectively. Two readings were taken over the X/15S panel of Sijua colliery and the magnitude of subsidence was negligible till last measurement. Initial reading was taken over a new IX/3S panel of Sijua colliery. Hence, no subsidence profile was prepared for these two panels.

Total Station is proved to be useful in congested and highly undulating topographical areas for subsidence monitoring. Fixing of subsidence monitoring stations over few panels were not possible as per the desired layout owing to surface constraints like paddy field, built-up

areas, building etc. Table 3 shows the outcome of subsidence investigations conducted over 5 panels whereas figures 12 to 20 depict respective surface, strain, slope and subsidence profiles along different lines of monitoring stations erected over the studied panels. A brief description of the outcome of this study is illustrated below.

#### **4.1 Non-Effective Width**

One new panel was started during the study period at Sijua. Computation of non-effective width (NEW) of extraction, expressed in terms of average depth of extraction, was not possible due to improper layout of subsidence monitoring stations due to surface constraints.

#### **4.2 Maximum Subsidence**

Maximum subsidence movements over different stowed panels varied between 8 and 172 mm. The maximum subsidence over completed stowed panel was 2.56% of extraction height. The factors influencing the magnitude of subsidence movements include thickness of extraction, status of working over and around the panel, inclination of seam, type of goaf support, percentage of extraction, panel dimension etc.

#### **4.3 Maximum Slope and Strains**

Maximum slope, compressive and tensile strains measured over stowed panels were 4.30 mm/m, 1.91 mm/m and 1.68 mm/m respectively as depicted in Table 3.

#### **4.4 Subsidence Characteristics**

The characteristics of subsidence profiles observed along different lines of monitoring stations are as follows:

1. The shapes of the subsidence profiles were asymmetric in nature. This characteristic was primarily attributed due to the combined influence of irregular overlapping of overlying caved and stowed goaves, left out coal rib pillars in the seams of overlying panels, goaf edge effects and inclination of seams as well as varied panel geometry (Figs. 12 through 20). Maximum subsidence of 172 mm was observed over X/17S panel of Sijua colliery with a subsidence factor of 2.56. The width of the panel was 150 m with a width to depth ratio of 0.51 i.e. panel width was under sub-critical condition. However, some cumulative impact of overlying three caved panels in XVI, XV Top and XV Bottom seams and one stowed panel of XIV seam could have caused additional influence to subsidence.

2. Slope and strain profiles were also not regular. These were influenced by irregular overlying goaves, seam inclination, topography of ground surface and left out stooks/ribs in Bord & Pillar mining (Figs. 12 to 20).
3. No remarkable change was observed in ground slope and surface profiles due to underground mining with stowing as the magnitude of subsidence was low due to small width-depth ratios of the panels. All the panels were kept under sub-critical condition i.e. width-to-depth ratio of panels were from 0.41 to 0.73 resulting in generation of low strain and slope values.
4. Goaf treatment by method of stowing was adopted for all the panels with an objective to minimize ground deformation at the surface.



Table 3: Result of subsidence investigations at different collieries of Tata Steel in Jharia Coalfield

Sl. No.	Colliery/Panel	Width/depth ratio	Maximum subsidence (S)		Maximum slope (mm/m)	Maximum compressive strain (mm/m)	Maximum tensile strain (mm/m)	Remarks
			(mm)	(%)				
1	Jamadoba 2&3 XV/4S	0.73	90	3	2.26	1.48	1.34	Extraction in progress
2	Sijua X/17S	0.51	172	2.56	4.30	1.91	1.68	Extraction completed
3	Sijua IX/1S (Ext.)	0.41	36	1.18	1.02	0.78	0.96	Extraction in progress
4	Sijua X/15S	0.48	8	0.12	0.546	0.76	0.72	Extraction in progress
5	Bhelatand XIV(E)/4S	0.50	70	2.33	2.59	1.51	1.36	Extraction completed

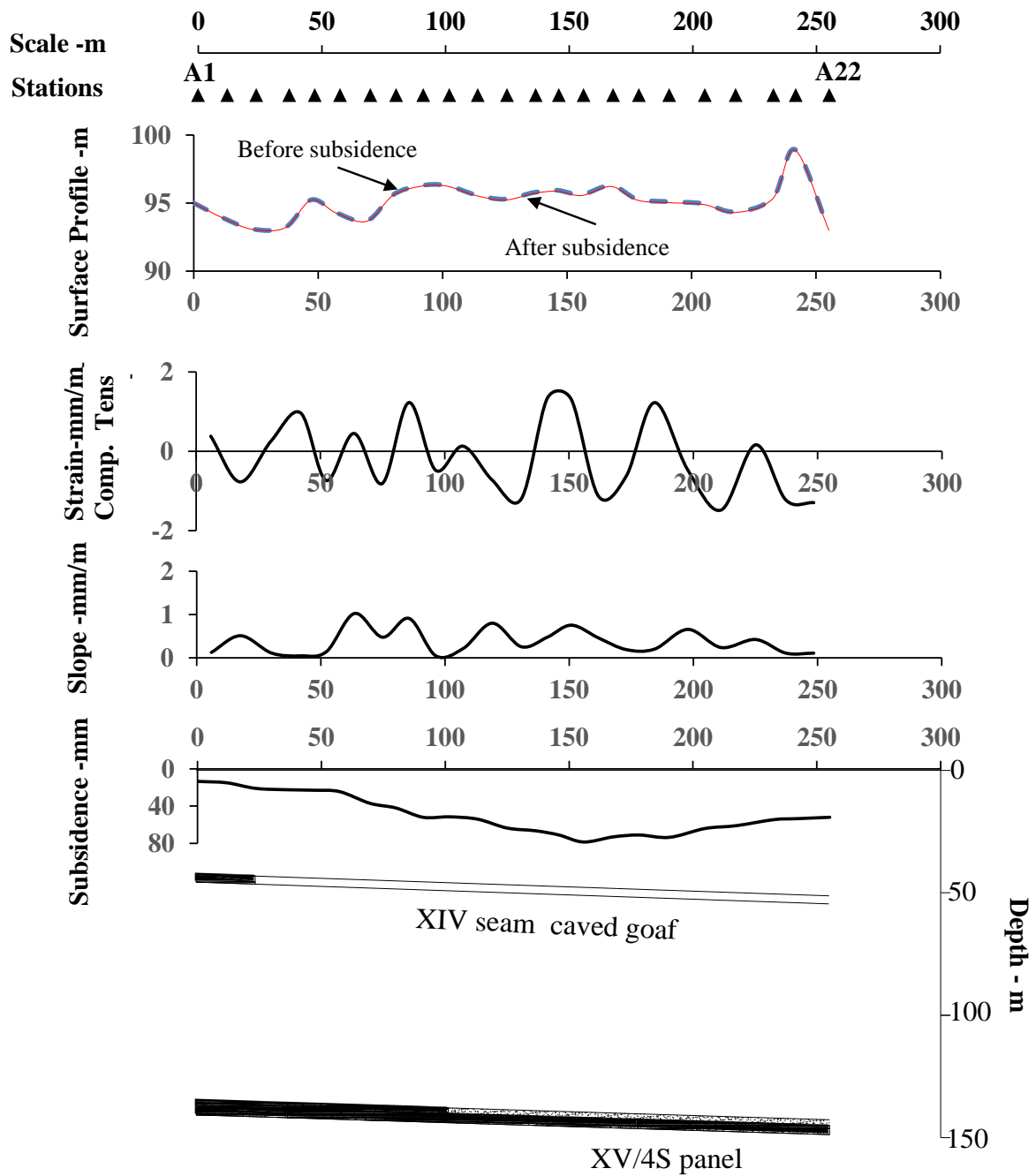


Fig. 12: Surface, strain, slope and subsidence profiles along A-line of monitoring stations over 4S panel in XV seam at Jamadoba 2&3 Pit colliery

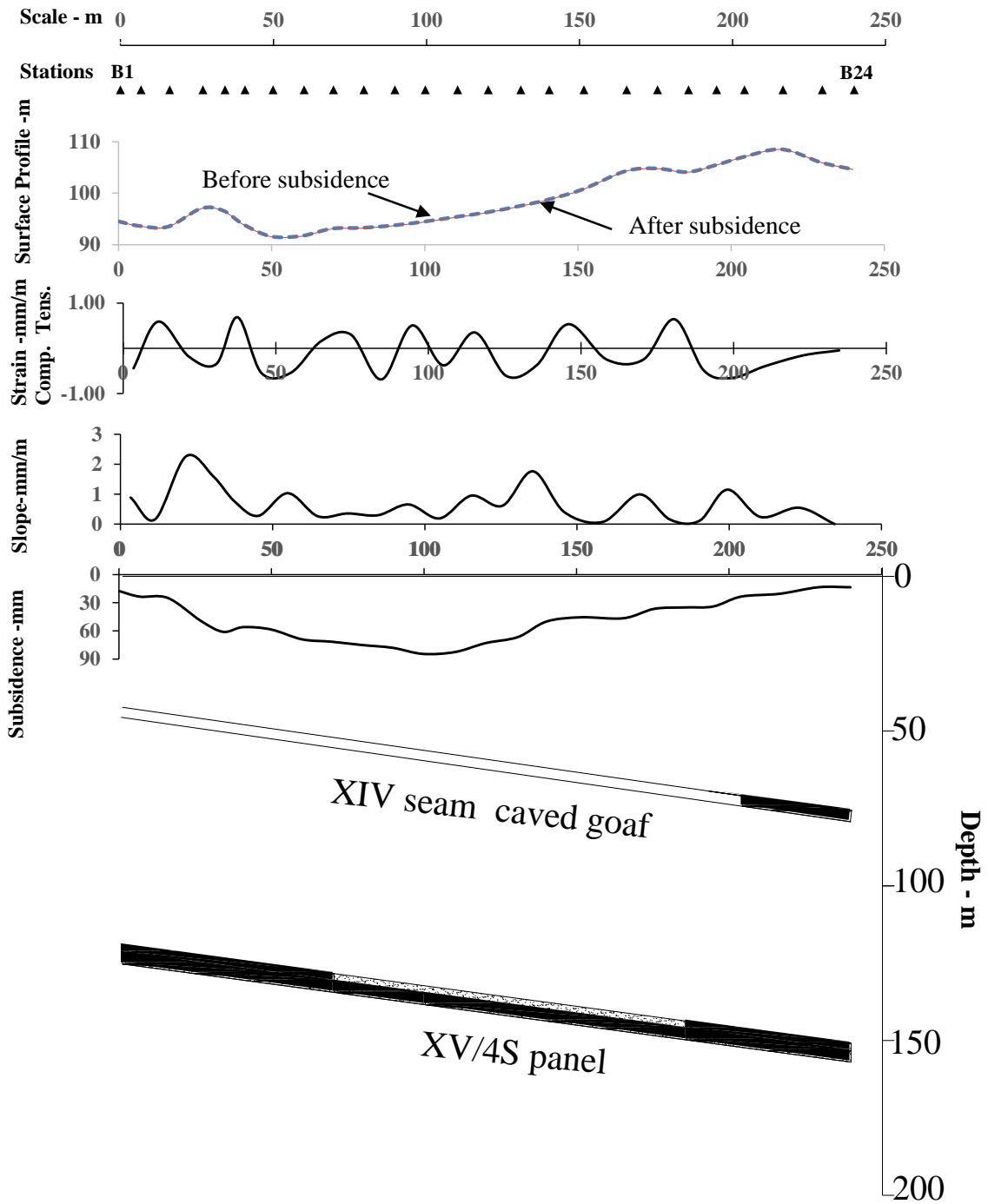


Fig. 13: Surface, strain, slope and subsidence profiles along B-line of monitoring stations over 4S panel in XV seam at Jamadoba 2&3 Pit colliery



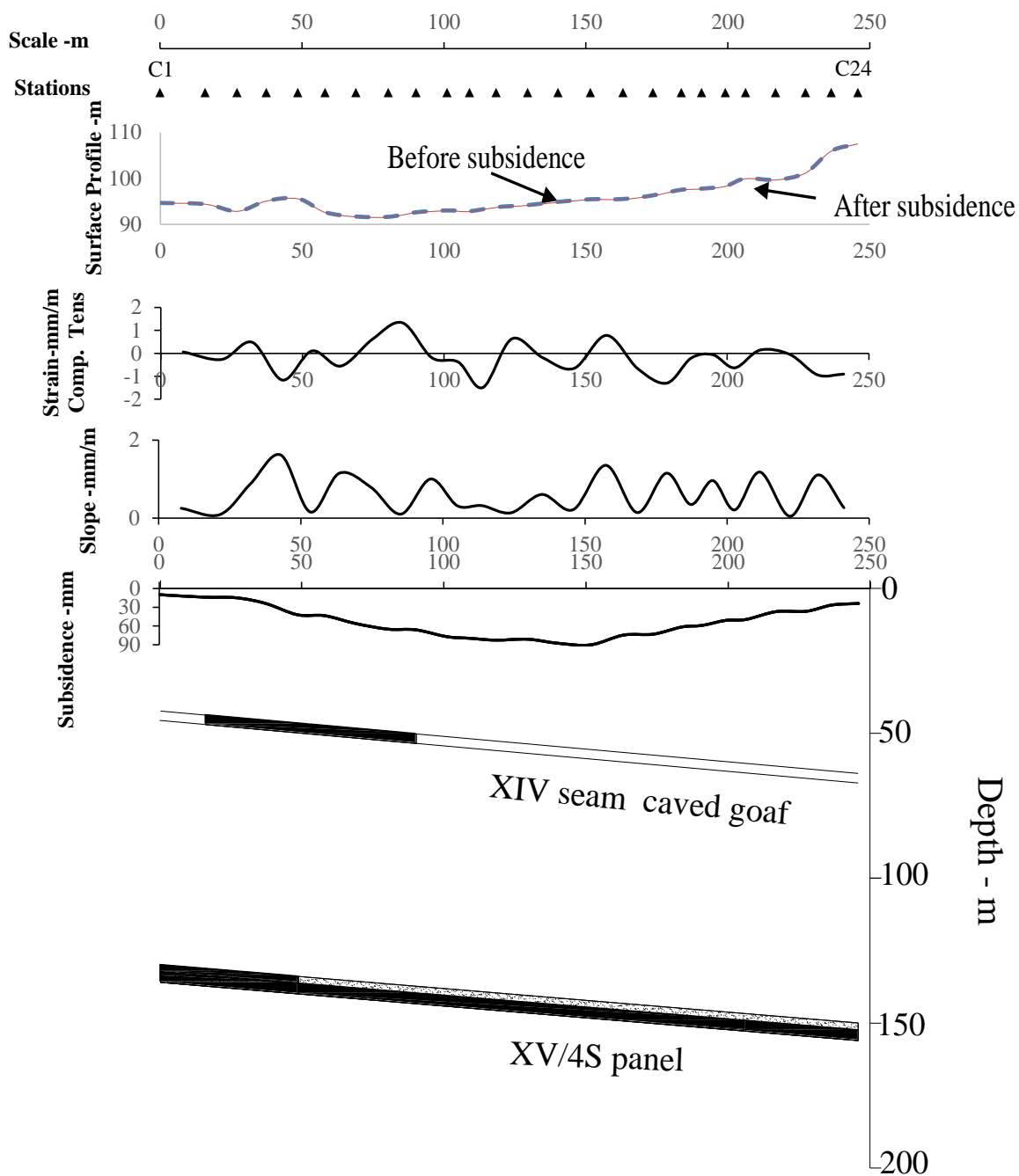


Fig. 14: Surface, strain, slope and subsidence profiles along C-line of monitoring stations over 4S panel in XV seam at Jamadoba 2&3 Pit colliery

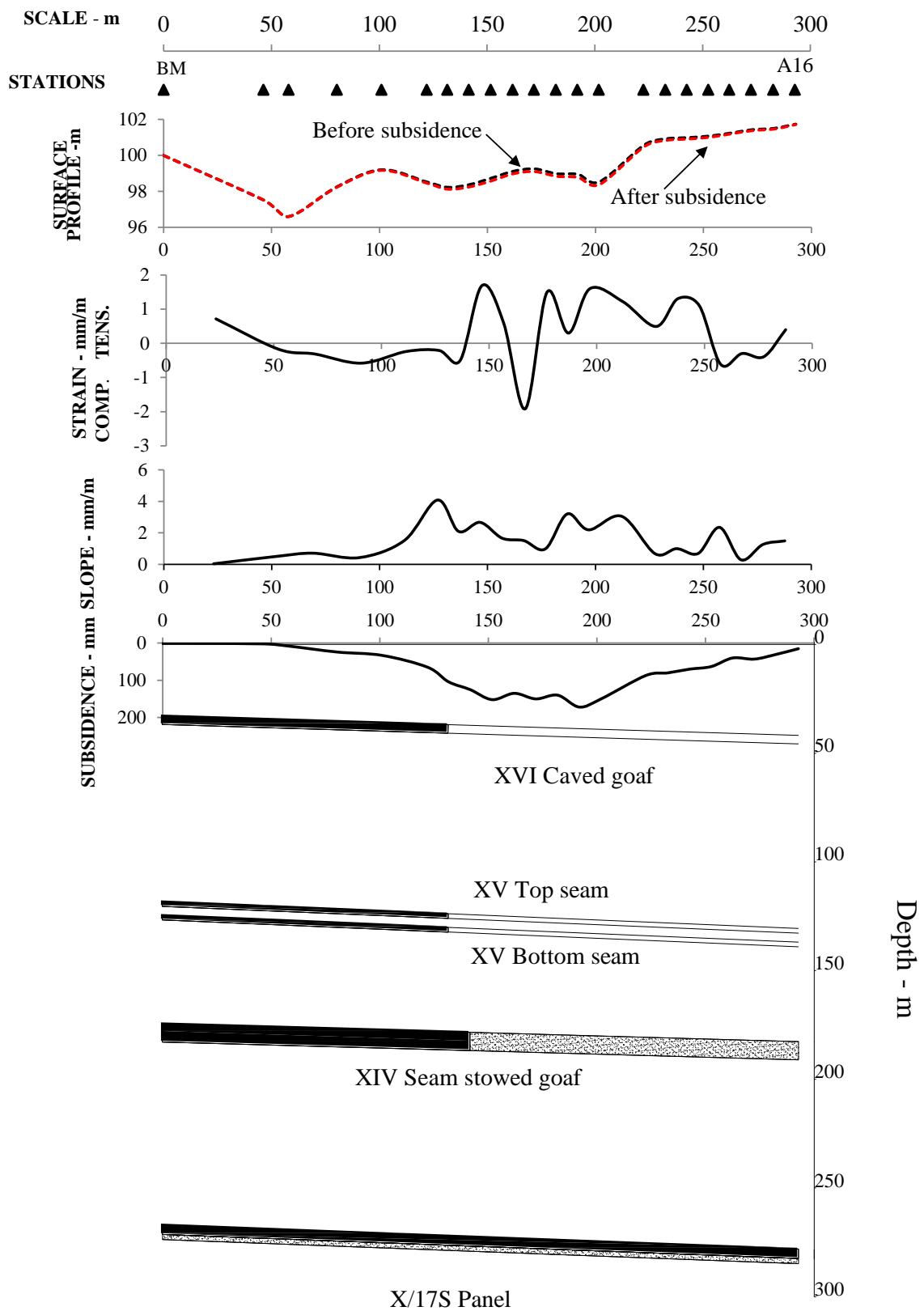


Fig. 15: Surface, strain, slope and subsidence profiles along A-line of monitoring stations over 17S panel in X seam at Sijua colliery

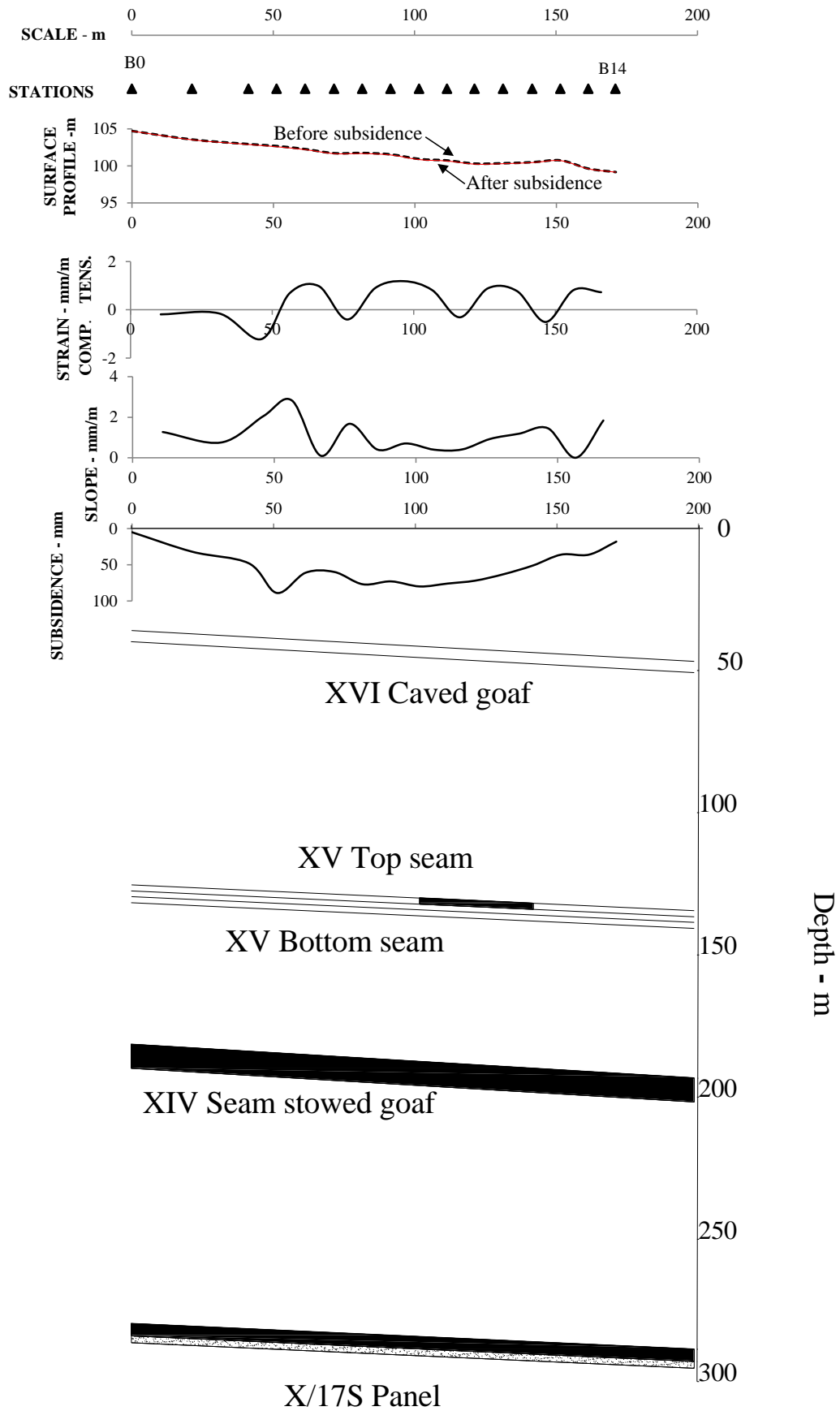


Fig. 16: Surface, strain, slope and subsidence profiles along B-line of monitoring stations over 17S panel in X seam at Sijua colliery

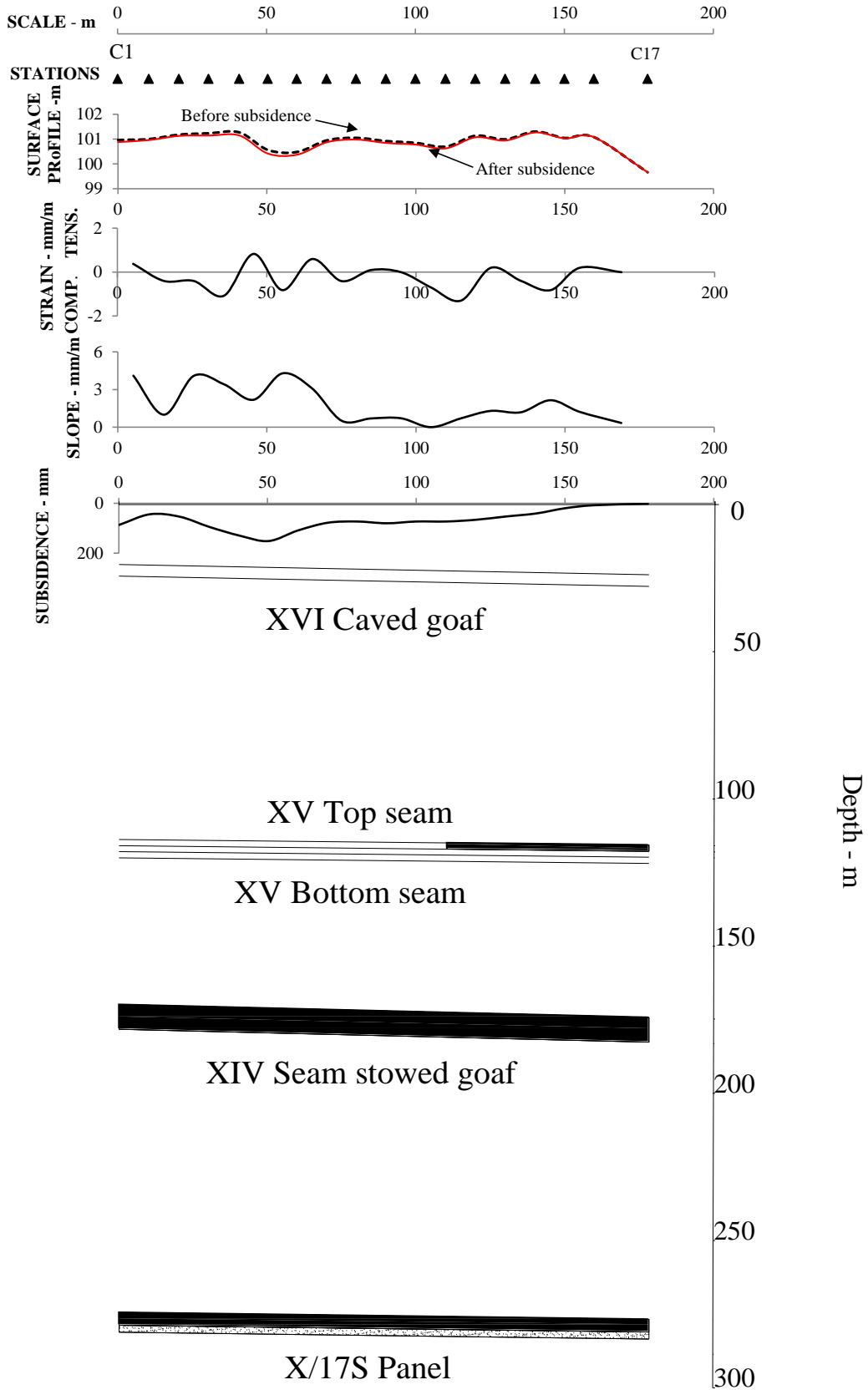


Fig. 17: Surface, strain, slope and subsidence profiles along C-line of monitoring stations over 17S panel in X seam at Sijua colliery



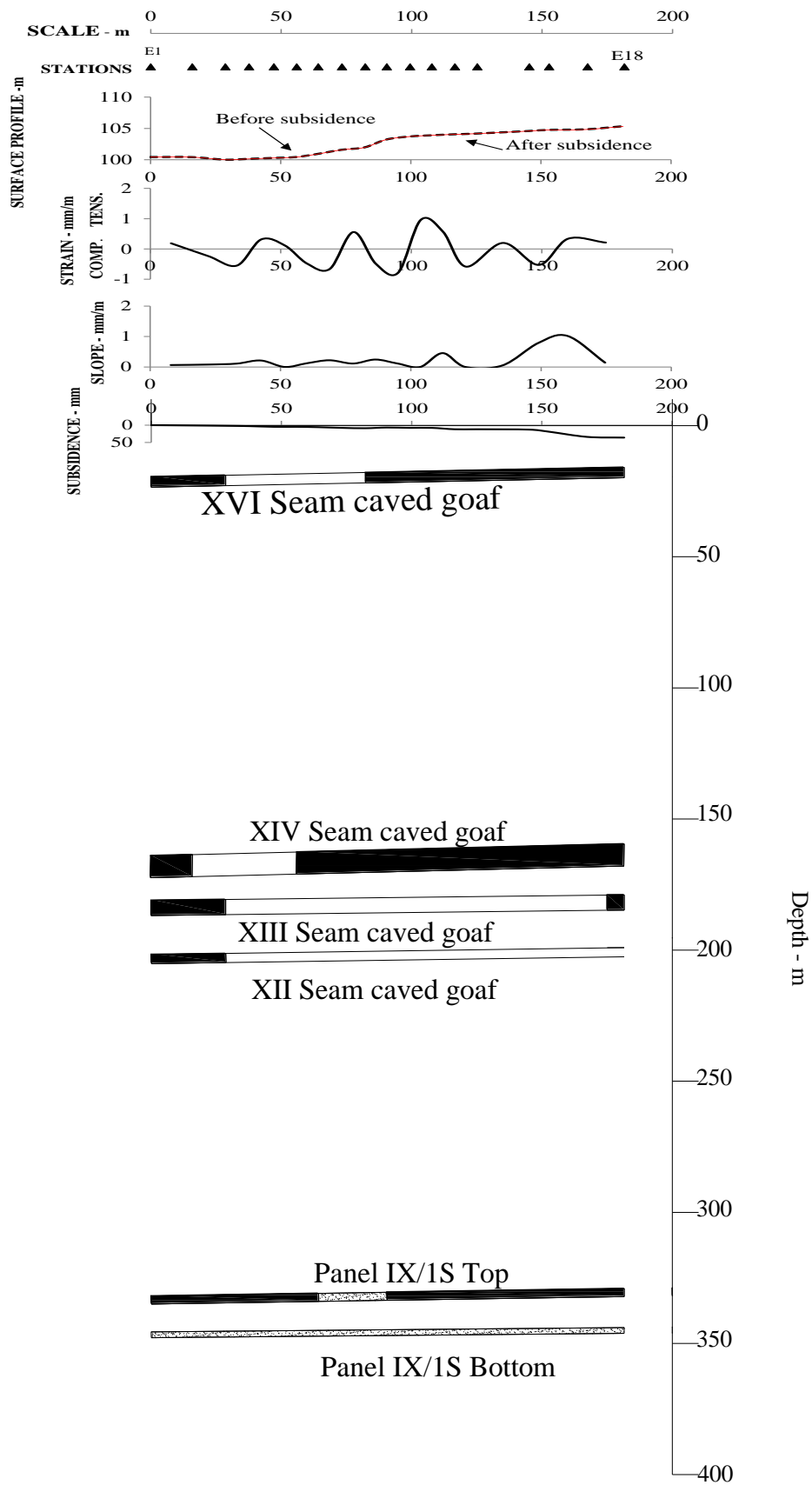


Fig. 18: Surface, strain, slope and subsidence profiles along E-line of monitoring stations over 1S (Ext.) panel in IX seam at Sijua colliery

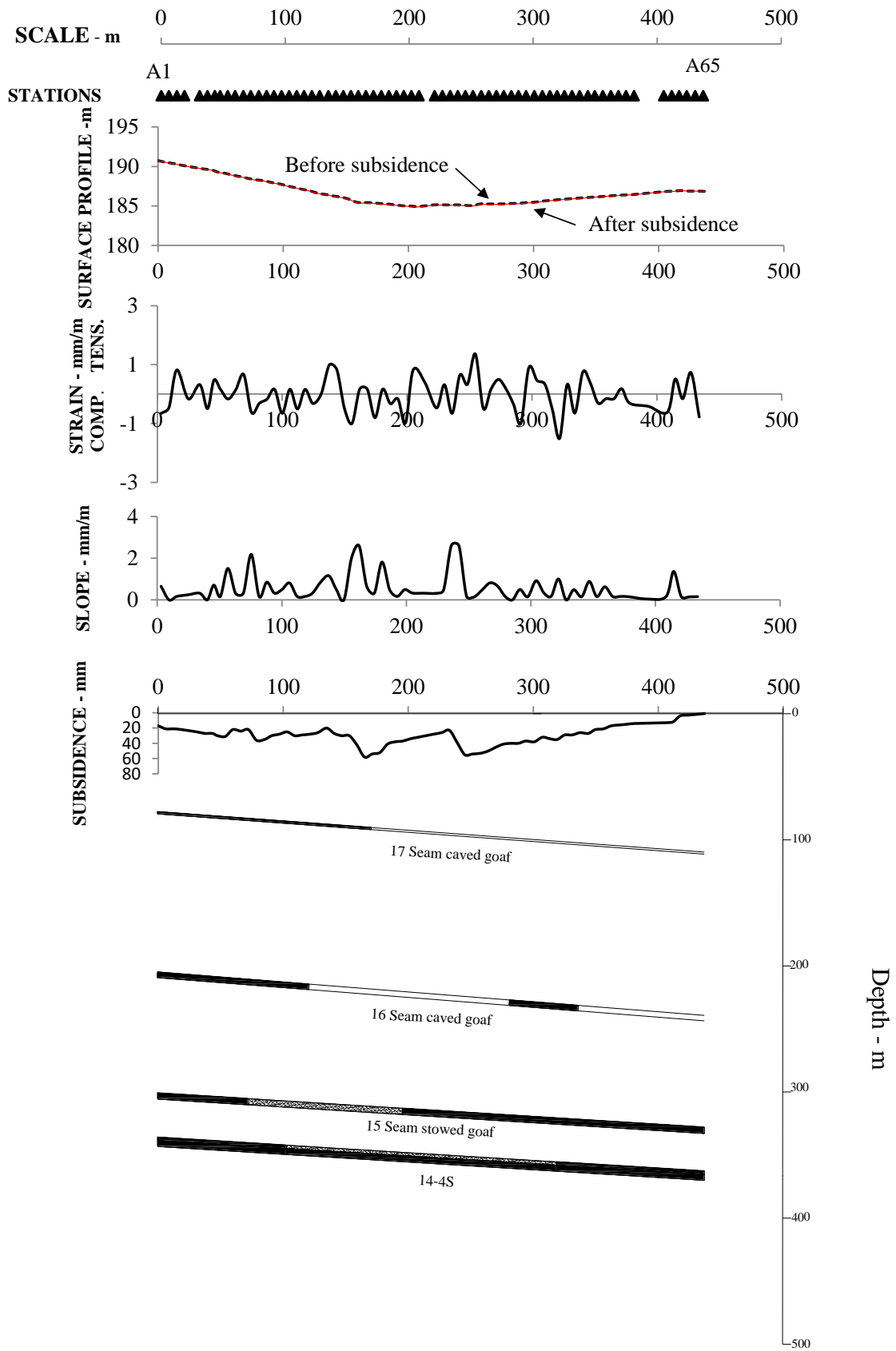


Fig. 19: Surface, strain, slope and subsidence profiles along A-line of monitoring stations over 4S panel in XIV(E) seam at Bhelatand colliery

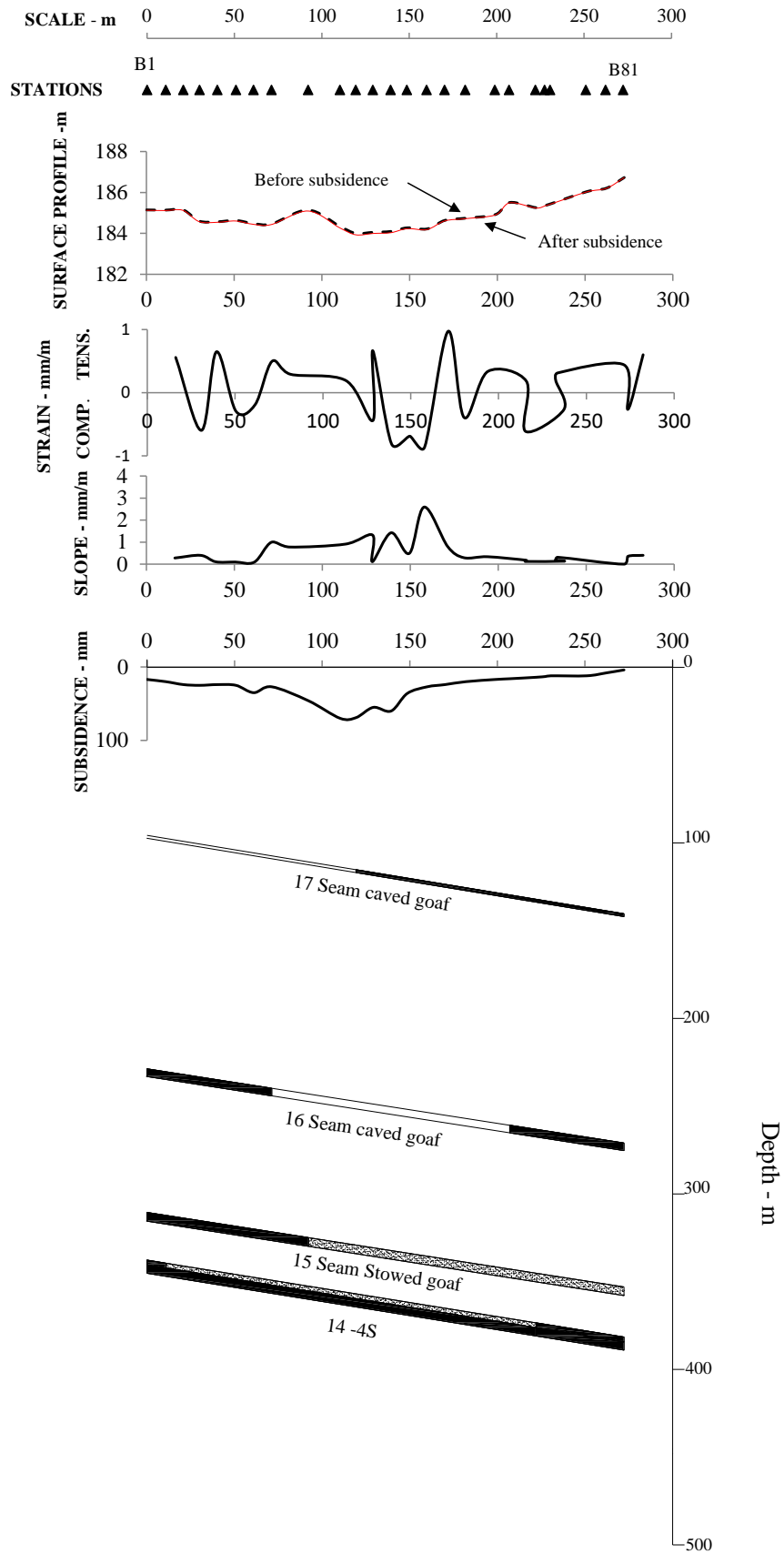


Fig. 20: Surface, strain, slope and subsidence profiles along B-line of monitoring stations over 4S panel in XIV(E) seam at Bhelatand colliery

Profile was not prepared for D-line of 1S (Ext.) panel of IX seam, Sijua, as most of the pillars were damaged. The subsidence, slope and strain measured over five panels with reference to the mining parameters i.e. depth and width-to-depth ratio are summarized in Fig. 21.

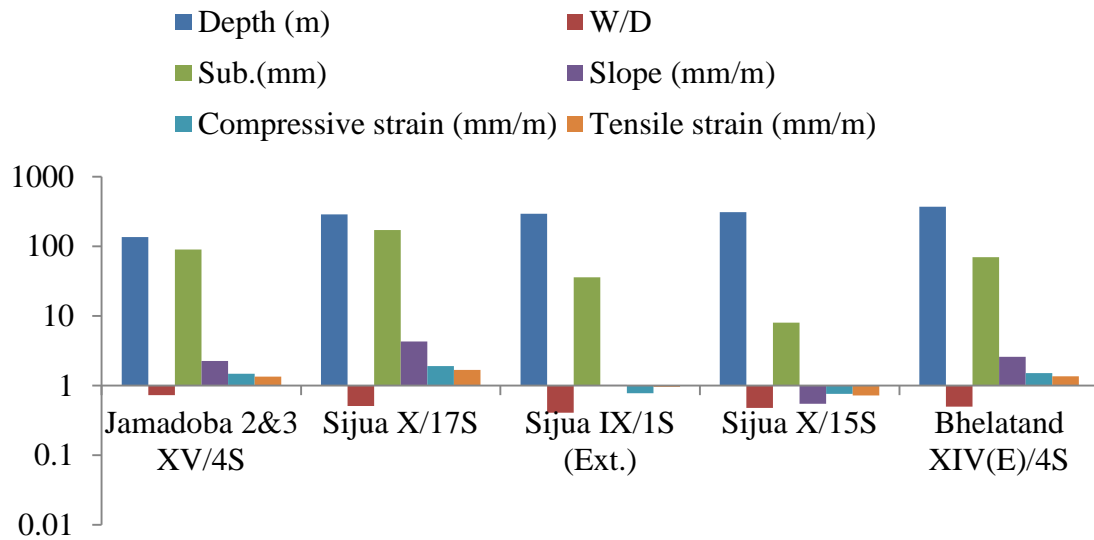


Fig. 21: Subsidence, slope and strain with respect to mining parameters

## 5.0 IMPACT OF SUBSIDENCE MOVEMENTS

Surface subsidence movements did not cause any adverse impact on surface features and structures as the magnitude of strains were within safe limit of 3 mm/m (Table 3). No surface cracks were noticed during the course of measurement. The overall surface topography was intact.

## 6.0 CONCLUSIONS

Subsidence investigations conducted over 5 stowed panels during March, 2021 to December, 2021 at Jamadoba 2&3 Pit, Sijua and Bhelatand collieries of the Tata Steel in Jharia Coalfield led to the following conclusions:

1. Maximum subsidence movement was 2.56% of extraction thicknesses over the 17S panel of X seam at Sijua colliery amounting to 172 mm and the depillaring operation was completed.
2. Maximum slope, compressive and tensile strains observed over measured panels was 4.30 mm/m, 1.91 mm/m and 1.68 mm/m respectively.
3. Subsidence, slope and strains profiles were influenced by the overlying old goaves, position of goaf edges, inclination of the seam, topography of the surface profiles as



well as left out stooks/ribs in the overlying seams worked by bord & pillar method of mining. Hence, the profiles were not symmetric.

4. Subsidence movements did not cause any adverse impact on surface features and structures.

## **7.0 RECOMMENDATIONS**

The following recommendations are proposed for effective subsidence investigations over the Tata Steel collieries of Jharia Coalfield:

1. It is recommended to erect subsidence monitoring stations at least one month before the commencement of depillaring over new panels. Layout of subsidence monitoring stations should be made as proposed.
2. It is also recommended to extend subsidence monitoring stations outside the panel boundary equal to panel depth for proper evaluation of extent of subsidence.
3. It is recommended to continue subsidence investigations for the safety evaluation of different surface features and structures lying over different on-going and future depillaring panels.