



The Additional PCCF (C)
MoEF & CC, Govt. of India
Bungalow No. A-2, Shyamali Colony
Ranchi-834002, Jharkhand
Tel: 0651-2410007, 2410002, Email: ro.ranchi-mef@gov.in

MD/ENV/ 664 /101/2020
Date: 26.05.2020

Ref: Environmental Clearance letter no. J-11015/104/2011.IA.II (M) dated: 10.06.2013.

Sub: **Half-yearly compliance status report of Environmental Clearance conditions for the period October'19 - March'20 in respect of Noamundi Iron Mine, M/s Tata Steel Ltd.**

Dear Sir,

Kindly find attached herewith submitting the six monthly compliance report as on date in respect of the stipulated Environmental Clearance conditions of Noamundi Iron Mine, Tata Steel Ltd. for the period from **October'2019 - March'2020** as per EIA Notification, 2006. Also for the same period vide office memorandum no. Z-11013/57/2014-IA.II (M), dated 29.10.2014, is attached herewith as Annexure -I. The same has been mailed to your good office on email: ro.ranchi-mef@gov.in for your ready reference.

We trust that the measures taken towards environmental safeguards comply with the stipulated environmental conditions. We look forward to your further guidance which shall certainly help us in our endeavor for further improve upon our Environmental Management practices.

Thanking you,

Yours faithfully,
f: M/s Tata Steel Limited


Head (Planning), OMQ

Encl. : As above

Copy to : The Chairman, Central Pollution Control Board, Southern Conclave, Block 502, 5th & 6th Floors, 1582 Rajdanga Main Road, Kolkata - 700107 (W. B.)
: The Member Secretary, State Pollution Control Board, T.A. Division (Ground Floor), H.E.C. Dhurwa, Ranchi - 834004 (Jharkhand)
: The Regional Officer, JSPCB, MB/12, New Housing Colony, Adityapur, Jamshedpur - 831013 (Jharkhand)

TATA STEEL LIMITED

Mines Division Joda Keonjhar Odisha 758 034 India
Tel 91 7440037036

Registered Office Bombay House 24 Homi Mody Street Fort Mumbai 400 001
Tel 91 22 66658282 Fax 91 22 66657724



Compliance
to
Environmental Clearance Conditions
of
Noamundi Iron Mine
M/s. Tata Steel Limited

For the period: October 2019 - March -2020

(EC Letter No. J-11015/104/2011-IA.II (M) 10/06/2013)

26th May., 2020

**ENVIRONMENTAL CLEARANCE
OF
NOAMUNDI IRON MINE OF TATA STEEL LIMITED**
(Oct 2019 to Mar 2020)



(MoEF & CC Letter No. J-11015/104/2011-IA.II (M), DATED: 10/06/2013)
**FOR PRODUCTION OF 10 MTPA (ROM) &
BENEFICIATION OF 18 MTPA (THROUGHPUT) OF IRON ORE**

Sl. No.	EC Conditions	Compliance Status
<p>Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020</p>		
Specific Conditions		
i.	No mining activities will be allowed in forest area for which the Forest Clearance is not available.	<p>Complied with.</p> <p>Noamundi Iron Mine of TATA Steel has restricted its operations in diverted forest and non-forest area as per approvals obtained. The mine has 1160.06 ha lease area, out of which 762.42 ha is a forest land & rest is non-forest. Out of 762.42 ha, forest land diverted for mining is 370.92 ha vide letter no. 8-279, 1985 FC (Pt) dated 4th Sept., 2014 & for rest 383.37 ha including safety zone of 8.14 ha, forest diversion proposal has already been applied & at advanced stage of clearance.</p>
ii.	The project proponent will seek and obtain approval under the FC Act, 1980 for diversion of the entire forest land located within the mining lease within a period of two years from 01.02.2013 i.e. the date of issue of guidelines by FC vide there letter F. No. 11-362/ 2012-FC, failing which the mining lease area will be reduced to the non-forest area plus the forest area for which the project proponent has been able to obtain the FC at the end of this time period. In the case of reduction in mine lease area, the project proponent will need to get a revised mining plan approved from the competent authority for reduced area and enter into a new mining lease as per reduced lease area. The EC will be construed to be available for the mining lease area as per the revised mining lease deed.	<p>Complied.</p> <p>New Guidelines for Forest Diversion Proposal by FC vide letter F. No. 11-599/2014-FC dated: 01.04.2015 has been issued by MoEF&CC regarding this matter which suppressed the previous guidelines issued vide letter F. No. 11-362/2012-FC dated: 01.02.2013. None of the forest land has been reduced. The mine has already obtained Forest Clearance for 370.92 ha and for balance forest land 383.37 ha forest diversion already applied and is well advance stage before MoEF&CC Govt of India of clearance as per law. The mine has also paid till date Rs. 59,21,75,354.5 as NPV over total forest land of 762.42 ha. Noamundi mine has valid lease as per the amendment of MMDR Act on 2015 till 31.03.2030 and has approved mine plan till 31.03.2022 vide no. RAN/WSP/Fe/MP-06/2019-20, dated 13.08.2019 by Indian Bureau of Mines, Govt. of India.</p>








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Specific Conditions		
iii.	Environmental clearance is subject to obtaining clearance under the Wildlife (Protection) Act, 1972 from the Competent authority, as may be applicable to this project.	Not applicable. As no specific clearance under the Wildlife (Protection) Act, 1972 is required for the project. However, we have submitted details of Protection & Conservation of Wildlife measures to MoEF&CC good office vide our letter No. MD/ENV/204/101/15 dated: 20.04.2015.
iv.	Prior environmental clearance from the Standing Committee of the National Board for Wildlife shall be obtained if applicable, due to location of the mine within the core zone of Singhbhum Elephant Reserve, before starting any activity relating to the project at site. All the conditions stipulated by the Standing Committee shall be effectively implemented in the project. It shall be noted that this clearance does not necessarily imply that wildlife clearance shall be granted to the project and that your proposal for wildlife clearance shall be considered by the competent authorities on its merit and decision taken. The investment made in the project, if any based on environmental clearance granted to the project, in anticipation of the clearance from wildlife clearance shall be entirely at the cost and risk of the project proponent and ministry of Environment & Forests shall not be responsible in this regard in any manner.	Not applicable. Prior Environmental Clearance is not required from the Standing Committee of the National Board for Wildlife as per letter no. Vanya Prani-19/2012/1310, dated. 19.03.2013 of State Govt. of Jharkhand.
v.	The project proponent shall obtain Consent to Establish and Consent to Operate from the State Pollution Control Board, Jharkhand and effectively implement all the conditions stipulated therein.	Complied with. Consent to Establish has been obtained from the Jharkhand State Pollution Control Board vide letter no. PC/NOC/JSR/26/12/B-1848, dated: 09.06.2015. Consent to Operate has also been obtained from State Pollution Control Board, Jharkhand vide letter No. JSPCB/HO/RNC/CTO-1162982 /2017/ 779, dated: 13.06.2017, which is valid till 31.12.2020. All the conditions are being effectively implemented & complied. The annual compliance report is also regularly been submitted to JSPCB.
vi.	Environmental Clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of	Noted down. However, there is no National Park, Sanctuaries, Elephant corridor and tiger reserves within 10

Sr. MANAGER (ENV)-OMQ
TATA STEEL LIMITED


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Specific Conditions		
	India in Writ Petition (Civil) No. 460 of 2004, as may be applicable to this project.	Km radius of the core zone.
vii.	As part of ambient air quality monitoring during operational phase of the project, the air samples shall also be analysed for their mineralogical composition and records maintained.	Complied with. As a part of regular Ambient Air Quality Monitoring, mineralogical composition of air samples are being analysed on monthly basis and submitted to regulatory agency. All the records are adequately maintained. The mineralogical composition report of ambient air for last six months is attached herewith (annexure-I).
viii.	The beneficiated ore shall be transported to railway sidings only through closed conveyor.	Complied with. The beneficiated ore from processing plant to railway sidings being transported through covered conveyors only. <div data-bbox="842 943 1453 1144" style="text-align: center;">  </div> <p style="text-align: center;"><i>Closed conveyor used in mineral transport</i></p>
ix.	Effective safeguard measures such as conditioning of ore with water, regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of particulate matter such as around crushing and screening plant, loading and unloading point and transfer points. It should be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.	Being complied with. The effective safeguard measures such as conditioning of ore before transportation by wet process is regularly being done. Fixed and mobile water sprinklers are installed and used in the area. Regular water sprinkling is also being done on the haul roads. Mist sprays are also installed in the area along in high dust generated areas. Fog based dust separators also installed and used. <div data-bbox="858 1529 1469 1883" style="text-align: center;">  </div> <p style="text-align: center;"><i>Mobile water sprinkler at Noamundi mines</i></p> <p>Two water tankers of 50KL with spray mist are</p>



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		<p>also installed in mines for effective dust control.</p> <p>Apart from above, the area is adequately covered with mass plantation. Thus, dust generation has been controlled and eliminated.</p>  <p><i>Mist type dust suppression measures</i></p> <p>As per last site visit of MoEF&CC officials of Ranchi and kind instructions a new fixed water sprinkler suggested to install adjacent to the roads near hopper and crusher area which dust prone due to frequent dumper movement. At two new location in area fixed water sprinkling system were installed.</p>  <p><i>Newly installed fixed water sprinkler at near hopper area.</i></p> <p>The mobile sprinkler water tankers shall also been operated for 3 hours in a shift, especially in summer as per kind suggestions of MoEF&CC officials. However, to reduce the water in dust suppression various initiatives are under progress.</p>
<p>x.</p>	<p>The project authority shall implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board.</p>	<p>The rainwater collected in the mine pits and allowed to be collected in the lowest level sumps to augment the ground water resources gradually. Rainwater harvesting (RWH) ponds and ground water recharge structures have been constructed and approved by the Ground Water Directorate, Jharkhand, Ranchi.</p>  <p><i>RWH structure for ground water augmentation in the area</i></p> <p>The unit has rainwater harvesting approval from</p>



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		<p>Hon. Director, Ground Water Directorate, Water Resources Dept. Jharkhand vide letter no. GWD 317/Ranchi, dated 14th Jun, 2012. At Noamundi area the various RWH structures in the form of Check Dams, Saucer ponds, Gabion Structures, Trenches and contour are made based on recommendation in available area.</p>  <p><i>RWH structure for ground water augmentation in the area</i></p> <p>To augment the ground water about 06 new additional ponds are constructed in year 2019-20 around Noamundi mine lease at Leping, Mahudi, Jampani & Sarbil villages.</p>  <p><i>Newly constructed ponds in surrounding villages (2019-20)</i></p> <p>As per kind suggestions of CGWA Bhubaneshwar officials during site visit of adjacent mine water harvesting in surrounding villages can also made. We welcome all valuable suggestions for ground water augmentation from state ground water board and Central ground water board.</p>
xi.	<p>Regular monitoring of ground water level and quality shall be carried out in and around the mine lease by establishing a network of existing wells and installing new piezometers during the mining operation. The periodic monitoring [(at least four times in a year- pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January); once in each season)] shall be carried out in consultation with the State Ground Water Board/Central Ground Water Authority and the data thus collected may be sent regularly to the Ministry of Environment and Forests and its Regional Office</p>	<p>Complied with.</p> <p>Ground water quality and Ground water level are being monitored periodically in and around the lease areas. All the monitoring results are being submitted to regulatory agencies. At five locations, new piezometric borewell are installed. In one of well a telemetric system with online data facility for water level is also been installed. The monitoring details are attached as annexure-II.</p>

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Specific Conditions		
xii.	<p>The mining operations shall be restricted to above ground water table and it should not intersect groundwater table. In case of working below ground water table, prior approval of the Ministry of Environment and Forests and Central Ground Water Authority shall be obtained, for which a detailed hydro-geological study shall be carried out.</p>	<p>Being complied with.</p> <p>The mining operations are being restricted to above the ground water table. However, in case of working below ground water table prior approval for CGWA shall be taken. An application is made for ground water withdrawal of 500m³/day for domestic purpose to Central Ground Water Authority.</p>
xiii.	<p>The project proponent shall ensure that no natural watercourse and/or water resources shall be obstructed due to any mining operations. The Balijore Nallah shall be left undisturbed and protected.</p>	<p>Complied with.</p> <p>Balijore nallah is a natural nallah flows within lease area from North to South direction. The nallah has huge ground water recharge potential as lies between two hills of Noamundi on either side. To protect the nallah from soil erosion & siltation the pitching work at some part was done. Various water recharge structures such as storage cum percolation ponds injection wells, contour trenches were also made adjacent of it along with other areas as per hydrogeology study and recommendations from State Ground Water Board. However, the nallah kept protected and undisturbed at various places.</p>  <p><i>Natural flow of Balijore nala, at Noamundi</i></p> <p>Any kind suggestion from good office of MoEF&CC, Ranchi shall be welcome for protection of Balijore Nallah.</p>
xiv.	<p>The project proponent shall regularly monitor the flow rate of the Balijore Nallah flowing through the mine lease and maintain the records.</p>	<p>Complied with.</p> <p>The flow rate of the Balijore Nallah is been done on monthly basis along with regular submission of monitoring report to the JSPCB, Ranchi, which is also enclosed as annexure-III.</p>
xv.	<p>There shall be no external over burden dumps at the end of the mine life. The reclaimed and rehabilitated area shall be afforested. Monitoring and management of rehabilitated areas shall continue until the vegetation</p>	<p>Complied with.</p> <p>There shall not be any external over burden dumps at the end of mine life. Currently two Over Burden (OB) dumped are being made as per plan at earmarked area. Which are progressively</p>

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	<p>becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional Office located at Bhubaneswar on six monthly basis.</p>	<p>stabilized by native species plantation and grass vegetation as per direction of MoEF&CC.</p> <p>Last year (2018-19) the slime (waste material after beneficiation) dump area has been stabilized by using geo-jute mat (~20,000m²) with grass plantation.</p>  <p><i>Jute matting & local grass plantation over slime dump</i></p> <p>In this year (2019-20) the OB dump area covered stabilized by using geo-jute mat (~10,000m²) with grass plantation. A new viewpoint also made in that location.</p> <p>As per practice, the slope of O/B dumps was provided with grassing and vegetation. Also, actions have already been initiated for grassing & vegetation cover by use of seed ball, organic manure, vermicompost & leaf compost in dump area.</p>  <p><i>Geo-Jute matting & grass plantation over OB dump</i></p> <p>Grassing on bunds (~1500m) of haul roads to control erosion also been practiced as per kind suggestion from MoEF&CC regional office.</p>  <p><i>Local grass plantation on bunds of haul roads at mine.</i></p>

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<p>xvi.</p>	<p>Catch drains and siltation ponds of appropriate size shall be constructed around the mine working, soil, mineral and temporary OB dump(s) to prevent run off of water and flow of sediments directly into Balijore Nallah, Kundra Nallah, Jojo Nallah, Mahadev Nallah, Baitarni River and other water bodies. The water so collected should be utilized for watering the mine area, roads, green belt development etc. The drains shall be regularly de-silted particularly after monsoon and maintained properly. Garland drains, settling tanks and check dams of appropriate size, gradient and length shall be constructed both around the mine pit and over burden dump(s) to prevent run off of water and flow of sediments directly into Balijore Nallah, Kundra Nallah, Jojo Nallah, Mahadev Nallah, Baitarni River and other water bodies and sump capacity should be designed keeping 50% safety margin over and above peak sudden rainfall (based on 50 years data) and maximum discharge in the area adjoining the mine site. Sump capacity should also provide adequate retention period to allow proper settling of silt material. Sedimentation pits shall be constructed at the corners of the garland drains and de-silted at regular intervals.</p>	<p>Garland drains with settling pits have been constructed all along the OB dumps to arrest the silt & runoff from area. The de-siltation of these check dams, settling pits are done regularly. Sedimentation pits have been constructed at the corners of the garland drains to take care of run off of water even during peak rain fall and they are being de-silted regularly before and after the monsoon. Garland drains, settling tanks and Check dams had been constructed both around the mine pit and over burden dump(s).</p>  <p><i>De-siltation of slime & check dams before monsoon.</i></p> <p>Garland drain from jig waste to hopper area has been made newly as per kind suggestion of MoEF&CC officials.</p>  <p><i>garland drains, Settling pits at mine</i></p> <p>Various structural measures were also made.</p> <p>Structural measure developed:</p> <table border="1" data-bbox="831 1570 1441 2074"> <thead> <tr> <th rowspan="2">Year</th> <th rowspan="2">Activity Details</th> <th colspan="2">Area</th> <th rowspan="2">Location</th> </tr> <tr> <th>Plan</th> <th>Achieved</th> </tr> </thead> <tbody> <tr> <td rowspan="4">2017-18 (FY-18)</td> <td>Toe wall construction</td> <td>250 m</td> <td>1771.3 m</td> <td>CWS area & waste dump 4</td> </tr> <tr> <td>Garland drain</td> <td>250 m</td> <td>300 m</td> <td>CWS area</td> </tr> <tr> <td>De-siltation of ponds</td> <td>6000 m³</td> <td>7200 m³</td> <td>drains & ponds</td> </tr> <tr> <td>Any other measures</td> <td>1 ha</td> <td>2.25 ha</td> <td>Dump plantation</td> </tr> <tr> <td rowspan="5">2018-19 (FY-19)</td> <td>Toe wall construction</td> <td>225 m</td> <td>1429 m</td> <td>Waste dump 1 & subgrade dump 1</td> </tr> <tr> <td>Check dam</td> <td>--</td> <td>651 m</td> <td>Backside of plant area</td> </tr> <tr> <td>Garland drain</td> <td>250 m</td> <td>1017 m</td> <td>Subgrade dump & OL-2 area</td> </tr> <tr> <td>Settling Tanks</td> <td>240 m</td> <td>480 m</td> <td>De-silting done</td> </tr> <tr> <td>De-siltation of ponds</td> <td>--</td> <td>All ponds</td> <td>De-silting done</td> </tr> <tr> <td></td> <td>Any other measures</td> <td colspan="3">Plantation on dump area</td> </tr> </tbody> </table>	Year	Activity Details	Area		Location	Plan	Achieved	2017-18 (FY-18)	Toe wall construction	250 m	1771.3 m	CWS area & waste dump 4	Garland drain	250 m	300 m	CWS area	De-siltation of ponds	6000 m ³	7200 m ³	drains & ponds	Any other measures	1 ha	2.25 ha	Dump plantation	2018-19 (FY-19)	Toe wall construction	225 m	1429 m	Waste dump 1 & subgrade dump 1	Check dam	--	651 m	Backside of plant area	Garland drain	250 m	1017 m	Subgrade dump & OL-2 area	Settling Tanks	240 m	480 m	De-silting done	De-siltation of ponds	--	All ponds	De-silting done		Any other measures	Plantation on dump area		
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Specific Conditions		
		<p>The Water quality report of surrounding natural nallahs such as Balijore Nallah, Kundra Nallah, Jojo Nallah, Mahadev Nallah, Baitarni River is also enclosed here with as annexure IV.</p>
xvii.	<p>Dimension of the retaining wall at the toe of temporary over burden dumps and OB benches within the mine to check run-off and siltation shall be based on the rain fall data.</p>	<p>Retaining wall and Garland drains of appropriate size have been constructed around the OB dumps to check mine run-off.</p>  <p><i>Toewall & garland drain in OB dumps</i></p> <p>The retaining wall at temporary waste / tailing desilting area is done on both sides as per kind instruction of MoEF&CC officials.</p>  <p><i>Retaining wall creation at temporary dump area</i></p>
xviii.	<p>Plantation shall be raised in an area of 990.601ha including a 7.5m wide green belt in the safety zone around the mining lease, backfilled and reclaimed area, around the higher benches of excavated void to be converted in to water body, roads etc. by planting the native species in consultation with the local DFO/Agriculture Department. The density of the trees should be around 2500 plants per ha.</p>	<p>In the year 2019-20 the plantation of about 6011 saplings is done in an additional area of mine OB dump & safety zone gap plantations.</p>  <p><i>Planation at Noamundi Mines</i></p>

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<p><i>Specific Conditions</i></p>		
<p>xix.</p>	<p>Effective safeguard measures such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of SPM and RPM such as haul road, loading and unloading point and transfer points. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.</p>	<p>Complied with. Fixed and mobile water sprinklers are installed and operated by Noamundi continuously. Regular water sprinkling is also being done on the haul roads and other critical dust prone areas. Mist sprays are also installed in the area along in high dust generated areas such as loading unloading area. Dry fog-based dust separators also installed at crushers, dust extraction system also been used in area.</p> <div data-bbox="826 846 1444 1070"> </div> <p style="text-align: center;"><i>Dust control measures in area</i></p> <div data-bbox="826 1131 1444 1406"> </div> <p style="text-align: center;"><i>Dry fog at Railway sidings (Bottom Bin) area</i></p> <p>New fixed water sprinkling points were installed near junction point and at near to the hopper area as per kind suggestion from MoEF&CC officials.</p> <div data-bbox="826 1563 1444 1758"> </div> <p style="text-align: center;"><i>Newly installed fixed water sprinkler at near hopper area.</i></p> <div data-bbox="826 1809 1444 2004"> </div> <p style="text-align: center;"><i>Newly installed fixed water sprinkler at near hopper area.</i></p>
<p>xx.</p>	<p>Mine water discharge and/or any wastewater shall be properly treated to meet the prescribed standards before reuse/discharge. The runoff</p>	<p>There is no wastewater discharge from the mine and mineral processing plant, entire unit is "Zero Discharge Unit". The high rate thickener (HRT),</p>


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	<p>from temporary OB dumps and other surface run off shall be analysed for iron and in case its concentration is found higher than the permissible limit, the wastewater should be treated before discharge/reuse.</p>	<p>slime pond and processing plant storage tanks acts as Primary Effluent Treatment Circuit (PETP). After mineral processing (wet plant) the water is collected in slime pond, where decanted water from the slime dam is completely recycled & reused to the beneficiation plant and slime is recovered and stored for future use by using HRT. Thus, no water is being discharged to environment.</p> <p>Grassing on berms adjacent to mine haul road going to adjacent forest area/ green belt area to minimize the erosion bunds is been practiced as per kind suggestion from MoEF&CC regional office.</p>  <p><i>Local grass plantation on bunds of haul roads at mine.</i></p>
xxi.	<p>The decanted water from the beneficiation plant and slime/tailing pond shall be re-circulated within the mine and there shall be zero discharge from the mine.</p>	<p>Complied with. Decanted water from slime pond and beneficiation plant is recycled & reused and thus become zero discharge.</p>
xxii.	<p>Regular monitoring of the flow rate of the springs and perennial nallahs shall be carried out and records maintained.</p>	<p>Being regularly complied with. Details are attached as annexure-III.</p> <p>The Water quality report of surrounding natural nallahs such is also enclosed here with as annexure IV.</p>
xxiii.	<p>Regular monitoring of water quality upstream and downstream of Balijore Nallah, Kundra Nallah, Jojo Nallah, Mahadev Nallah shall be carried out and record of monitoring data should be maintained and submitted to Ministry of Environment and Forests, its Regional Office, Bhubneswar, Central Groundwater Authority, Regional Director, Central Ground Water Board, State Pollution Control Board and Central Pollution Control Board.</p>	<p>Water quality monitoring of Balijore Nallah, Kundra Nallah, Jojo Nallah, Mahadev Nallah, are being carried out and record of monitoring data maintained. The results, so obtained are sent to Regional office, MoEF&CC, Jharkhand State Pollution Control Board, Ranchi and Central Pollution Control Board. Water Quality Analysis is attached as annexure-IV.</p>

Devi



Sr. MANAGER (ENV)-OMQ
TATA STEEL LIMITED

Sl. No.	EC Conditions	Compliance Status
<p>Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020</p>		
<i>Specific Conditions</i>		
xxiv.	<p>Appropriate mitigate measures shall be taken to prevent pollution of Baitarni River, if any, in consultation with the State Pollution Control Board.</p>	<p>Baitarani River is flowing at about 12 Km from the mine and is not being polluted because of mining operations of Noamundi Iron Mine. A consultation letter submitted to State Pollution Control Board is enclosed herewith. However, it is ensured that any mitigation measures suggested by State Pollution Control Board shall be abided.</p>
xxv.	<p>The project proponent shall obtain necessary prior permission of the competent authorities for drawl of requisite quantity of surface water for the project. Ground water shall not be used for the mining operations.</p>	<p>Complied with. Only Surface water from Baitarani is being used for mining and processing purpose. At present, we have permission for drawl of 9786 KLD of surface water and our operation is being managed well within that quantity. Apart from this, we are recycling our slime dam water to meet basic water requirement of wet plant up to some extent. However, for increased requirement, we have applied for drawl of additional quantity of water to the regulatory agency.</p>
xxvi.	<p>Suitable rainwater harvesting measures on long term basis shall be planned and implemented in consultation with Regional Director, Central Ground Water Board.</p>	<p>Being complied with. Three rain water harvesting ponds and several ground water recharge structures have been constructed at the mine site hiring the expertise of KRG Foundation, Chennai and they are now operational.</p> <p>Technical approval for design and Plan of Rain Water Harvesting (RWH) for Ground Water Recharge has already been approved by Hon. Director, Ground Water Directorate, Water Resources Dept. Jharkhand vide letter no. GWD 317/Ranchi, dated 14th Jun, 2012.</p> <p>At Noamundi area the various RWH structures in the form of Check Dams, Saucer ponds, Gabion Structures, Trenches and contour are made based on recommendation of Hon. Director, Ground Water Directorate, Water Resources Dept. Jharkhand and available land in the area.</p> <div data-bbox="836 1827 1433 1966" data-label="Image"> </div> <p><i>RWH structure for ground water augmentation in the area</i></p> <p>To augment the ground water about 06 new additional ponds are constructed in year 2019-20 around Noamundi mine lease at Leping, Mahudi,</p>

Sl. No.	EC Conditions	Compliance Status
<p>Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020</p>		
<p>Specific Conditions</p>		
		<p>Jampani & Sarbil villages.</p>  <p><i>Newly constructed ponds in surrounding villages (2019-20)</i></p> <p>As per kind suggestions of CGWA Bhubaneswar officials during site visit of adjacent mine water harvesting in surrounding villages can also made. We welcome all valuable suggestions for ground water augmentation from state ground water board and Central ground water board.</p>
xxvii.	<p>Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral from mine face to the beneficiation plant. The vehicles shall be covered with a tarpaulin and shall not be overloaded.</p>	<p>Being Complied with. All the vehicles used in mining operations are maintained regularly. Due to advancement of mine new mega centre (infrastructure facility -workshop) is also being made.</p>
xxviii.	<p>Blasting operation shall be carried out only during the daytime. Controlled blasting shall be practiced. The mitigative measures for control of ground vibrations and to arrest fly rocks and boulders should be implemented.</p>	<p>Being complied with. Blasting is carried out during daytime only. Controlled blasting is practiced with delay detonators for control of ground vibrations and to arrest fly rocks. Scientific studies are also being conducted from reputed agencies such as CIMFR, Dhanbad and all the recommendations followed for control of ground vibrations and fly rocks & boulders. A recommendation copy is also enclosed herewith as annexure-V.</p>
xxix.	<p>Drills shall either be operated with dust extractors or equipped with water injection system.</p>	<p>Being complied with. All the drills are wet operated only.</p>
xxx.	<p>Mineral handling plant shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all the transfer points should also have efficient dust control arrangements. These should be properly maintained and</p>	<p>Being complied with. De-dusting unit are installed at crushing plant & is being regularly monitored. The last report is attached in annexure-VI.</p>



Sr. MANAGER (ENV)-OMQ
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<p>Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020</p>		
<p>Specific Conditions</p>		
	<p>operated.</p>	 <p><i>Dust Extraction system at crusher Noamundi</i></p>
<p>xxxi.</p>	<p>Consent to operate shall be obtained from State Pollution Control Board prior to start of enhanced production from the mine.</p>	<p>Noamundi has valid consent to operate from Jharkhand State Pollution Control Board, which is valid till 31 12 2020.</p>
<p>xxxii.</p>	<p>Sewage treatment plant shall be installed for the colony. ETP shall also be provided for workshop and wastewater generated during mining operation.</p>	<p>Being complied with. Two Sewage Treatment Plant (STP) of 50 KLD & one STP of 10 KLD capacity installed at mine. Two Effluent Treatment Plant (ETP) of 10 KLD are working smoothly in colony area and canteen in Bottom bin area</p>  <p><i>Sewage & Effluent Treatment Plant at Noamundi</i></p> <p>For the workshops and all other areas and oil trap is installed with collection system. The entire water is reused in other activities such as gardening & dust suppressions. No wastewater is being generated from mining operations.</p>
<p>xxxiii.</p>	<p>Digital processing of the entire lease area using remote sensing technique shall be carried out regularly once in three years for monitoring land use pattern and report submitted to Ministry of Environment and Forests and its Regional Office, Bhubaneswar.</p>	<p>The digital processing of entire lease area is being carried out regularly. The current land use pattern is made by M/s Geo Consultants Private Limited the authorized agency by ORSAC, Bhubaneswar in August 2018. The Resourcesat-II with multispectral bands LISS IV (13th Jan 2018) & Cartosat-I (3rd Feb 2018 & 2nd Dec 2017) with monochromatic band of year 2018 & 2017 respectively used based on clear vision. The land use land cover map prepared on date is attached as annexure-VII. Authorization details of M/s Geo Consultants Private Limited is enclosed herewith.</p>

Qon Sr. MANAGER (ENV)-OMQ
TATA STEEL LIMITED

Sl. No.	EC Conditions	Compliance Status
<p>Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020</p>		
Specific Conditions		
xxxiv.	Regular monitoring of ambient air quality including free silica shall be carried out and records maintained.	Ambient air quality including free silica is regularly monitored and records maintained. All the monitoring details are attached as annexure-VIII.
xxxv.	Pre-placement medical examination and periodical medical examination of the workers engaged in the project shall be carried out and records maintained. For the purpose, schedule of health examination of the workers should be drawn and followed accordingly.	<p>Pre-placement medical examination and periodical examination of the workers engaged is being conducted & record maintained. The schedule of Periodical Medical Examination is once in every 3 years for the employees of age more than 40 years and once in 5 years for the employees of age less than 45 years.</p> <p>In the year 2019-20, the pre-medical examination of the 228 workers done which is more than yearly plan (219) from Noamundi Iron Mine.</p>
xxxvi.	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna such as wolf, elephant, sloth bear, rhesus macaque etc. spotted in the core and buffer zone of the mine and contribute towards the cost of implementation of the plan and/or Regional Wildlife Management Plan for conservation of flora and fauna so prepared by the State Forest and Wildlife Department. The amount so contributed shall be included in the project cost. A copy of action plan shall be submitted to the Ministry and its Regional Office, Bhubaneswar within 3 months.	<p>Tata Steel is taking all the precautionary measures towards conservation and protection of endangered flora and fauna. The mine has previously in year 2011-12 prepared a wildlife management plan and deposited Rs. 59,85,000/- towards implementation of the wildlife management plan in order to protect them. The same was also been submitted to Ministry and its Regional Office, Bhubaneswar vide letter No. MD/ENV/ 409A/101/2011, dated: 21.10.2013. A site-specific wildlife conservation plan is enclosed herewith.</p> <p>As per recent instruction from Divisional Forest Department, Chaibasa new site-specific wildlife conservation plan is under preparation.</p> <p>Further, Company has submitted an undertaking to bear the proportionate cost towards the execution of comprehensive Wildlife Management plan in the area to be prepared by the state government. also.</p>
xxxvii.	A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.	A progressive mine closure plan approved by IBM is in place. The final mine closure plan along with details of Corpus fund will be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.




Sr. MANAGER (ENV)-OMQ
TATA STEEL LIMITED

Sl. No.	EC Conditions	Compliance Status
Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020		
General Conditions		
i.	No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.	Being complied with. We are operating as per the approved mining technology and scope of working mentioned in Environmental Clearance granted to us and No change in mining technology and scope of working shall be made and adhered to the condition of MoEF&CC.
ii.	No change in the calendar plan including excavation, quantum of mineral iron ore and waste should be made.	Being complied with. No change in calendar plan is made. The production details from 2013-14 submitted vide letter no. MD/ENV/533/101/2020, dated 11.02.2020. The OB generated in the year 2016-17 was 1.52 million tons and exceeds the mine plan proposal limit due to sudden occurrence of OB in area. Due to which an additional quantity of 0.12 million tons of OB get generated. However, it is within the total excavation capacity as per the approved mine plan.
iii.	At least four ambient air quality-monitoring should be established in the core zone as well as in the buffer zone for RSPM (Particulate matter with size less than 10 micron i.e., PM ₁₀) and NO _x monitoring. Location of the stations should be decided based on the meteorological data, topographical features and ecologically sensitive targets and frequency of monitoring should be undertaken in consultation with the State Pollution Control Board. The data so recorded should be regularly submitted to the Ministry including its Regional office located at Bhubaneswar and the State Pollution Control Board /Central Pollution Control Board once in six months.	Ambient Air Quality monitoring is being regularly carried out at four different stations within the core zone and Buffer zone respectively, which were located in consultation with the visiting officers of State Pollution control Board, Jharkhand and reports are being submitted to Regional office, MoEF&CC, Ranchi half yearly and to JSPCB monthly. Ambient Air Quality report is attached as Annexure-VIII. Apart from above three numbers of continuous online ambient quality stations (CAAQMS) are also installed in the core buffer area of mine. Various parameters such as PM ₁₀ , PM _{2.5} , SO _x , NO _x is being monitored for every 15 minutes and the date of same is continuously uploaded in Jharkhand Pollution Control Board server. The environmental data is same is also been displayed using electronic display board in public domain.



CAAQMS with data connectivity of Noamundi

Sl. No.	EC Conditions	Compliance Status
Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020		
General Conditions		
		 <p style="text-align: center;"><i>Display of environmental information at Noamundi</i></p>
iv.	Measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in operations of HEMM etc. should be provided with ear plugs / muffs.	Adequate measures are being taken care. All the machines of high noise generated are covered with acoustic enclosure, in separate closed room. Noise generation is eliminated at source by regular maintenance of machines and proper enclosures. Apart from above for adequate PPE is also provided to all persons working in the area. All HEMM operator's cabins are made of soundproofs with air conditioning system. Noise monitoring of area is regularly being done the data of same is attached as Annexure-IX.
v.	There will be zero wastewater discharge from the plant.	Being complied. No water is being discharged from plant. Entire process water is recycled and reused. The High Rate Thickener is installed for rapid recovery of water from system in place of conventional thickeners.
vi.	Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.	Adequate dust masks are provided to employees engaged in dusty areas. The employees are also given regular awareness training on safety and health aspects as part of implementation process of ISO:45001 & SA 8001 systems.
vii.	Occupational health surveillance program of the workers should be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed.	Periodical Medical Examination of employees and contractor workers are organized regularly to observe any contractions due to exposure to dust and other occupational hazards.
viii.	A separate environmental management cell with suitable qualified personnel should be set-up under the control of a Senior Executive who will report directly to the Head of the Organization.	Complied with. A separate environmental management cell is in place with the people having relevant qualification on environmental science.

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Sr. MANAGER (ENV)-OMQ
TATA STEEL LIMITED

Sl. No.	EC Conditions	Compliance Status
<p>Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020</p>		
General Conditions		
ix.	<p>The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional Office located at Bhubaneswar.</p>	<p>Noamundi Iron Mine is a captive Iron Mine of Tata Steel Ltd. The funds earmarked for environmental protection are kept in separate cost code unit wise as per norms However, separate account for same is not possible.</p> <p>The funds allocated for environmental management are spent only for environment related purposes and not diverted to any other purpose. Expenditure details of environmental protection measures during 2019-20 is attached as annexure-X.</p>
x.	<p>The project authorities should inform to the Regional Office located at Bhubaneswar regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.</p>	<p>The date of financial closures of mine is 31.03.2030 as Noamundi Iron Mine is captive iron mine of Tata Steel Ltd. As the mine is operational since last several decades, the final approval and the date of start of land development work is not applicable.</p>
xi.	<p>The Regional Office of this Ministry located at Bhubaneswar shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data/ information/ monitoring reports.</p>	<p>Being complied with.</p> <p>We extend full co-operation to the officers of the Regional Office during their visit and furnish the required data, information and monitoring reports.</p>
xii.	<p>The project proponent shall submit six monthly reports on the status of compliance of the stipulated environmental clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the Ministry of Environment and Forests, its Regional Office Bhubaneswar, the respective Zonal Office of Central Pollution Control Board and the State Pollution Control Board. The proponent shall upload the status of compliance of the environmental clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of the Ministry of Environment and Forests, Bhubaneswar, the respective Zonal Officer of Central Pollution Control Board and the State Pollution Control Board.</p>	<p>Complied with.</p> <p>Six monthly compliance reports are being submitted regularly on the status of implementation of the stipulated environmental safeguards to the MoEF&CC, its Regional Office Ranchi, Central Pollution Control Board Kolkata and State Pollution Control Board Jharkhand. Further, the six-monthly compliance reports along with the monitoring results is being uploaded on Tata Steel's website www.tatasteelindia.com and updated periodically.</p>

Sl. No.	EC Conditions	Compliance Status
<p>Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020</p>		
General Conditions		
xiii.	<p>A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parisad/ Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the Company by the proponent.</p>	Complied with
xiv.	<p>The State Pollution Control Board should display a copy of the clearance letter at the Regional office, District Industry Centre and the Collector's office/ Tehsildar's Office for 30 days.</p>	Complied with
xv.	<p>The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and shall also be sent to the respective Regional Office of the Ministry of Environment and Forests, Bhubaneswar by email</p>	<p>The environmental statement for financial year 2018-19 has been submitted to the State Pollution Control Board on vide letter no. MD/ENV/351/125/2019, dated: 25.09.2019 and the same has been hosted on Company's website www.tatasteelindia.com. Further, compliance status on environmental clearance conditions was also sent to the Regional Office of the Ministry of Environment and Forests, Ranchi by e-mail.</p>
xvi.	<p>The project authorities should advertise at least in two local newspapers of the District or State in which the project is located and widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at web site of the Ministry of Environment and Forests at http://envfor.nic.in and a copy of the same should be forwarded to the Regional Office of this Ministry located at Bhubaneswar.</p>	<p>Details of Environment Clearance with regard to Noamundi Iron Mine were published both in English and Hindi in local newspapers named "The Hindustan Times" and "Dainik Jagran" respectively on 15th June, 2013. The copy of the newspaper advertisement was sent to the Regional Office, MoEF, Bhubaneswar vide our letter no. MD/ENV/245A/101/ 2013, dated. 19th June'2013, same is attached as Annexure-XI.</p>



Compliance status
on
Impact of Mining on Habitations-Issue ..related




Noamundi Iron Mine, TATA Steel Ltd.
(Oct 2019 to Mar 2020)

Conditions based on OM dated 29th Oct., 2014 vide no. Z-11013/57/2014-IA.II(M)

S. No.	Condition	Compliance Status
<p>Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020</p>		
A	<p>The Project Authority shall adopt Best Mining Practice for the given mining conditions. In the mining area, adequate number of check dams, retaining walls/structures, garland drains and settling ponds should be provided to arrest the wash – off with rain water in catchment area.</p>	<p>Being complied. Adequate no. of check dams, retaining walls / structures, garland drains and settling ponds are made in mine to arrest the rain water. In addition to that various rain water harvesting structures are also made in and around mine.</p>
B	<p>The natural water bodies and or streams which are flowing in and around the village should not be disturbed. The Water Table should be nurtured so as not to go down below the pre-mining period. In case of any water scarcity in the area, the Project Authorities have to provide water to the villagers for their use. A provision for regular monitoring of water table in open dug well located in village should be incorporated to ascertain the impact of mining over ground water table.</p>	<p>Complied with. The water level in open dug well are regularly been monitored at desired frequency of various villages in & around mine of Noamundi. Various rain water harvesting structures are also made in and around mine.</p>
C	<p>The illumination and sound at night at project sites disturb the villages in respect of both human and animal population. Consequent sleeping disorders and stress may affect the health in the villages located close to mining operations. Habitations have a right to darkness and minimal noise levels at night. The Project Proponents (PPs) must ensure that the biological clock of the villagers is not disturbed by orienting the floodlights/ masks away from the noise levels well within the prescribed limit's for day/night hours.</p>	<p>Being complied. The mine is being operated in hill top of iron ore deposit & the habitation is far away from mining operations. However, various technologies are used to reduce the noise level from mining & processing operations. Thick green vegetation cover is also being maintained to absorb noise from the area apart from various other measures.</p>
D	<p>The Project Authority shall make necessary alternative arrangements, where required, in consultation with the State Government to provide alternate areas for livestock grazing. In this context, Project Authority should implement the directions of the Hon'ble Supreme Court with regard to acquiring grazing land. The sparse trees on such grazing ground, which provide mid-which provide mid – day shelter from the scorching sun should be scrupulously guarded against felling lest the cattle abandon the grazing ground or return home by noon.</p>	<p>Complied with.</p>


Signature

Sr. MANAGER (ENV)-OMQ
TATA STEEL LIMITED

S. No.	Condition	Compliance Status
<p>Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020</p>		
E	<p>Where ever blasting is undertaken as part of mining activity, the Project Authority shall carry out vibration studies well before approaching any such habitats or other buildings to evaluate the Zone of influence and impact of blasting on the neighbourhood. Within 500 meters of such sites vulnerable to blasting vibrations, avoidance of use of explosives and adoption of alternative means of mineral extraction, such as ripper/dozer combination/rock breakers/ surface miners etc. should be seriously considered and practiced wherever practicable.</p>	<p>Vibration study for scientific blasting is regularly been done from CSIR recognized agency. And as per recommendations the blasting is been done only in day time with electronic delay detonators for adequate blast and fragmentation. The data for each blast is been maintained and no mining is being done within 50m of public works.</p>
F	<p>Main haulage road in the mine should be provided with permanent water sprinklers and other roads should be regularly wetted with water tankers fitted with sprinklers. Crusher and material transfer points should invariably be provided with Bag filters and or dry logging system. Belt- conveyors should be fully covered to avoid air borne dust.</p>	<p>The main haulage road in the mine is provided with permanent water sprinklers. Apart from above, mobile and spray mist type sprinklers are also used in mine.</p>  <p><i>Mobile & Fixed water sprinklers in Noamundi mines</i></p>  <p><i>Mist type dust suppression measures</i></p> <p>All the mineral transport shall be done through closed conveyors.</p>  <p><i>Closed conveyor used in mineral transport</i></p>
G	<p>The Project Authority shall ensure that the productivity of agricultural crops is not affected due to mining operations. Crop Liability Insurance Policy has to be taken by the PP as a precaution to compensate for any crop loss. The impact zone shall be 5km from the boundary of mine lease-area for such insurance policy. In case, several mines are located in a cluster, the Associations of owners of the cluster mines, formed inter-alia, to sub-serve such an objective, shall take responsibility for securing such Crop Liability Policy.</p>	<p>Not applicable</p> <p>Noamundi Iron mine is an operational mine since last several decades, and scientific & sustainable mining practices are been adopted.</p>

S. No.	Condition	Compliance Status
<p>Name of Project: Noamundi Iron Mine, Tata Steel Ltd. Clearance Letter no.: J-11015/104/2011-IA.II (M), dated: 10/06/2013 Period of Compliance: October 2019 to March 2020</p>		
H	<p>In case any village is located within the mining leasehold which is not likely to be affected due to mining activities during the life of mine, the Expert. Appraisal Committee (EAC) should consider the proposal of Environmental Clearance (EC) for reduced mining area. The Mining lease may be executed for the area for which EC is accorded. The mining plan may also be accordingly revised and required stipulations under the MMDR Act, 1957 and MCR, 1960 met.</p>	<p>Noted. However, no village is located within mine lease area and all mining lease area are mineralized.</p>
I	<p>Transportation of the minerals by road passing through the village shall not be allowed. A 'bypass' road should be constructed (say, leaving a gap of at least 200 meters) for the purpose of transportation of the minerals so that the impact of sound, dust and accidents could be mitigated. The PP shall bear the cost towards the widening and strengthening of existing public road network in case the same is proposed to be used for the Project. No road movement should be allowed on existing village road network without appropriately increasing the carrying capacity of such roads.</p>	<p>No road transportation is done from mine in public road. All the material is transferred by railways.</p>
J	<p>Likewise, alteration or re-routing of foot paths, pagdandies, cart roads, and village infrastructure/public utilities or roads (for purposes of land acquisition for mining) shall be avoided to the extent possible and in case such acquisition is inevitable, alternative arrangements shall be made first and then only the area acquired. In these types of cases, Inspection Reports by site visit by experts may be insisted upon which should be done through reputed Institutes.</p>	<p>Not applicable</p>
K	<p>As CSR activities by Companies including the Mining Establishments has become mandatory up to 2% of their financial turn-over, Socio Economic Development of the neighborhood Habitats could also be planned and executed by the PPs more systematically based on the 'Need based door to door survey' by established Social Institutes/Workers on the lines as required under TOR. "R&R Plan/compensation details for the Project affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SC's /ST's and other weaker sections of the society in the study area, a need based sample survey, family wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village located in the mine lease area will be shifted or not. The issues related to shifting of village including their R&R and socio-economic aspects should be discussed in the EIA Report."</p>	<p>Complied. As Noamundi Iron Mine is an operational mine from several decades the PAP is not applicable. However, various surveys are been done as per requirement for social beneficitation.</p>


Signature

List of Annexures

**Noamundi Iron Mine
Tata Steel Ltd.**

(October 2019 – March 2020)

Sr. No.	Annexure Details
Annexure - I	Mineralogical Composition Report
Annexure - II	Ground Water Level & Quality Report
Annexure – III	Flow Rate of Balijhore Nalla
Annexure – IV	Surface Water Analysis Report
Annexure – V	CIMFR Report
Annexure - VI	Stack Monitoring (De-Dusting Unit) & Dust Fall Report
Annexure – VII	Land Use & Land Cover Map (Core & Buffer Zone) & Accreditation of Agency
Annexure - VIII	Dust Analysis Report (Free Silica) & Ambient Air Quality Report
Annexure - IX	Ambient Noise Report
Annexure – X	Environmental Expenditure 2019-20
Annexure – XI	Env. Clearance Paper Advertisement

Mineralogical Composition

Noamundi Iron Mine

(October 2019 – March 2020)

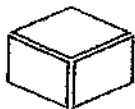
Month	Silica (%)	FeO (%)	CaO (%)	Al ₂ O ₃ (%)
Oct-19	0.44	0.51	0.028	<0.01
Nov-19	0.46	0.6	0.032	<0.01
Dec-19	0.32	0.63	0.041	<0.01
Jan-20	0.58	0.61	0.036	<0.01
Feb-20	0.64	0.71	0.042	<0.01
Mar-20	0.66	0.72	0.041	<0.01


Lab in Charge

Mineralogical Composition Analysis Report

(October 2019 – March 2020)

Noamundi Iron Mine



Visiontek Consultancy Services Pvt. Ltd.

(An Enviro Engineering Consulting Cell)

(ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified)



NABL ACCREDITED

Certificate No.: TC-7944

Format No.: 7.8.2/FMT/TR-06

TEST REPORT

(MINERALOGICAL COMPOSITION ANALYSIS REPORT - OCTOBER-2019)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	ENVLAB/19/R-5250	Report Release Date	04/11/19
Sample Code	A-1	Sampled By	VCSPL Representative
Sample Name	Mineralogical Composition	Sampled On	12.10.2019
Sample Condition	Sealed	Sampling Location	A-1: Near Mines Area
Test Started On	14.10.2019	Sample Received On	14.10.2019
		Test Completed On	18.10.2019

Monitoring Date	Parameters	Analysis Results
12.10.2019	*Silica(%)	A-1 0.44
	*FeO (%)	0.51
	*CaO (%)	0.028
	*Al ₂ O ₃ (%)	<0.01
	*P ₂ O ₅ (%)	<0.01

Note Above (*) parameters are not in our scope.

1. The test values are reported based on the samples received.
2. Samples will be destroyed after 7 days from date of issues of the test report subject to nature of preservation. Sample will be preserved as per standard method.
3. The test report shall not be reproduced, without written approval of laboratory.



Mineralogical Composition Analysis Report



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TEST REPORT

(MINERALOGICAL COMPOSITION ANALYSIS REPORT - NOVEMBER-2019)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Env/106/119/R-6068	Report Release Date	03-12-19
Sample Code	A-1	Sampled By	VC SPL Representative
Sample Name	Mineralogical Composition	Sampled On	05.11.2019
Sample Condition	Sealed	Sampling Location	A-1: Near Mines Area
Test Started On	06.11.2019	Sample Received On	06.11.2019
		Test Completed On	11.11.2019

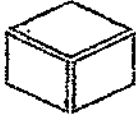
Monitoring Date	Parameters	Analysis Results
		A-1
05.11.2019	*Silica(%)	0.46
	*FeO (%)	0.6
	*CaO (%)	0.032
	*Al ₂ O ₃ (%)	<0.01
	*P ₂ O ₅ (%)	<0.01

Note Above (*) parameters are not in our scope.

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Mineralogical Composition Analysis Report



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Env/ab/19/R-6871

03.01.2020

TEST REPORT

(MINERALOGICAL COMPOSITION ANALYSIS REPORT - DECEMBER-2019)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Env/ab/19/R-6871	Report Release Date	03.01.2020
Sample Code	A-1	Sampled By	VCSPIL Representative
Sample Name	Mineralogical Composition	Sampled On	16.12.2019
Sample Condition	Sealed	Sampling Location	A-1: Near Mines Area
Test Started On	17.12.2019	Sample Received On	17.12.2019
		Test Completed On	21.12.2019

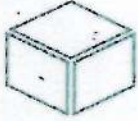
Monitoring Date	Parameters	Analysis Results
16.12.2019		A-1
	*Silica(%)	0.62
	*FeO (%)	0.48
	*CaO (%)	0.034
	*Al ₂ O ₃ (%)	<0.01
	*P ₂ O ₅ (%)	<0.01

Note Above (*) parameters are not in our scope.

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Mineralogical Composition Analysis Report



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TEST REPORT

(MINERALOGICAL COMPOSITION ANALYSIS REPORT - JANUARY-2020)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Amlak / 191 R - 7525	Report Release Date	01/02/2020
Sample Code	A-1	Sampled By	VCSPL Representative
Sample Name	Mineralogical Composition	Sampled On	12.01.2020
Sample Condition	Scaled	Sampling Location	A-1: Near Mines Area
Test Started On	13.01.2020	Sample Received On	13.01.2020
		Test Completed On	17.01.2020

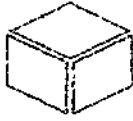
Monitoring Date	Parameters	Analysis Results
		A-1
12.01.2020	*Silica(%)	0.38
	*FeO (%)	0.66
	*CaO (%)	0.032
	*Al ₂ O ₃ (%)	<0.01
	*MnO ₅ (%)	<0.05
	*P ₂ O ₅ (%)	<0.01

Note Above (*) parameters are not in our scope.

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Mineralogical Composition Analysis Report



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TEST REPORT

(MINERALOGICAL COMPOSITION ANALYSIS REPORT - FEBRUARY-2020)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	ENV/06/19/R-8291	Report Release Date	02.03.20
Sample Code	A-1	Sampled By	VCSPJ. Representative
Sample Name	Mineralogical Composition	Sampled On	05.02.2020
Sample Condition	Sealed	Sampling Location	A-1: Near Mines Area
Test Started On	06.02.2020	Sample Received On	06.02.2020
		Test Completed On	10.02.2020

Monitoring Date	Parameters	Analysis Results
		A-1
05.02.2020	*Silica(%)	0.64
	*FeO (%)	0.71
	*CaO (%)	0.042
	*Al ₂ O ₃ (%)	<0.01
	*MnO ₂ (%)	<0.05
	*P ₂ O ₅ (%)	<0.01

Note: Above (*) parameters are not in our scope

- The test values are reported based on the samples received.
- Samples will be destroyed after 7 days from date of issues of the test report subject to nature of preservation. Sample will be preserved as per standard method.
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TEST REPORT (MINEROLOGICAL COMPOSITION REPORT- MARCH- 2020)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	ENVLAB/19/R-9228	Report Release Date	03.04.2020
Sample Code	A-1	Sampled By	VCSPL Representative
Sample Name	Mineralogical Composition	Sampled On	12.03.2020
Sample Condition	Scaled	Sampling Location	A-1: Near Mines Area
Test Started On	13.03.2020	Sample Received On	13.03.2020
		Test Completed On	18.03.2020

Monitoring Date	Parameters	Analysis Results
		A-1
12.03.2020	*Silica(%)	0.66
	*FeO (%)	0.72
	*CaO (%)	0.041
	*Al ₂ O ₃ (%)	<0.01
	*P ₂ O ₅ (%)	<0.01

Note Above (*) parameters are not in our scope.

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Authorized Signatory

**Ground Water Level
Noamundi Iron Mine
(October 2019 – March 2020)**

Noamundi Iron Mine of M/s Tata Steel Limited is an operational opencast captive iron mine. Regular monitoring of ground water level in and around the mine lease of existing well is regularly been done in desired frequency. The detailed quality report is attached herewith.

As per recent hydro-geological study & regulatory approval, few additional locations are also incorporated along with proposed piezometers in the area. Monitored water level for of area for the month of November 2019 and February 2020 are as follows:

Sl. No.	LOCATION	MONTH	
		November 2019	February 2020
Existing Dug Well Locations:			
1.	Mohudi Railway Station, Kash Moudi Inside Home	1 m 85 cm	2 m
2.	Noamundi Basti, Near Football field	4 m 59cm	4 m 66 cm
3.	Near Plant Site, In front of Bottom Bin back Gate	2 m 67 cm	2 m 10 cm
4.	Serbil	2 m 10 cm	2 m 57 cm
6.	Mohudi Village exit	1 m 70 cm	1 m 98 cm
7.	Mohudi Village near road	2 m 56 cm	2 m 75 cm
8.	Kash Mohudi Railway Station (Near road)	1 m 52 cm	1 m 68 cm
9.	Natho Sahi (near pond)	1 m 94 cm	1 m 95 cm
10.	Natho Sahi (on the road to Matia home)	1 m 28 cm	1 m 51 cm
11.	Noamundi Basti (inside house)	1 m 62 cm	2 m 26 cm
12.	Noamundi Basti (near pond)	1 m 50cm	1 m 77 cm
New Dug Well Locations:			
13.	Natho Sahi (near Rain water harvesting)	1m 32 cm	1 m 59 cm
14.	College Road	1 m 79 cm	2 m 15 cm
15.	Noamundi Bazar (In front of Petrol Pump)	2 m 94 cm	3 m 25 cm
16.	Lakhansahi (Near Manish House)	8 m 49 cm	8 m 57 cm
17.	New Township, Near DAV School, Noamundi	21 m 54 cm	24m
18.	New Township, Near Aqua Park, Noamundi	22 m 49 cm	23 m 80 cm
19.	Jojo Camp Security Gate, Noamundi	4 m 29 cm	4 m 06 cm
20.	Bottom Bin near security Barrack	6 m 89 cm	8 m 79 cm
21.	Bottom bin near well	1 m 30 cm	1 m 60 cm
22.	Bore well near power house	16 m 66 cm	17m 02 cm



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TEST REPORT

(GROUND WATER QUALITY ANALYSIS REPORT- NOV-2019)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Nov/20/19/R-628	Report Release Date	03.12.19
Sample Code	GW-1-GW-2	Sampled By	VCSPL Representative
Sample Name	Ground Water	Sampled On	17.11.2019
Sample Condition	Sealed & Ice Preserved	Sampling Location	GW-1: Noamundi Basti GW-2: Noamundi Bazar Near Petrol Pump
Test Started On	18.11.2019	Sample Received On	18.11.2019
		Test Completed On	25.11.2019

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS-10500:2012 Amended on 2015 & 2018		Analysis Results	
				Acceptable Limit	Permissible Limit	GW-1	GW-2
Essential Characteristics							
1	*Colour	APHA23 rd Edn,2017: 2120 B, C	Hazen	5	15	CL	CL
2	*Odour	APHA23 rd Edn,2017: 2150 B	--	Agreeable	Agreeable	Agreeable	Agreeable
3	*Taste	APHA23 rd Edn,2017: 2160 C	--	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	APHA23 rd Edn,2017: 2130 B	NTU	1	5	<1	<1
5	pH Value	APHA23 rd Edn,2017: 4500H ¹ B	--	6.5-8.5	No relaxation	7.28	7.39
6	Total Hardness(as CaCO ₃)	APHA23 rd Edn,2017: 2340 C	mg/l	200	600	124.0	142.0
7	Iron (as Fe)	APHA23 rd Edn,2017: 3111 B	mg/l	1.0	No relaxation	0.21	0.24
8	Chloride (as Cl ⁻)	APHA23 rd Edn,2017: 4500CF B	mg/l	250	1000	26.8	30.8
9	*Residual, free Chlorine	APHA23 rd Edn,2017:4500Cl, B	mg/l	0.2	1	ND	ND
Desirable Characteristics							
10	Dissolved Solids	APHA23 rd Edn,2017: 2540 C	mg/l	500	2000	168.0	196.0
11	Calcium (as Ca)	APHA23 rd Edn,2017: 3500Ca B	mg/l	75	200	24.8	30.2
12	Magnesium (as Mg)	APHA23 rd Edn,2017: 3500Mg B	mg/l	30	100	11.8	12.6
13	Copper (as Cu)	APHA23 rd Edn,2017: 3111 Cu B	mg/l	0.05	1.5	<0.02	<0.02
14	Manganese (as Mn)	APHA23 rd Edn,2017: 3111 B	mg/l	0.1	0.3	0.016	0.014
15	*Sulphate (as SO ₄)	APHA23 rd Edn,2017: 4500 SO ₄ ²⁻ E	mg/l	200	400	4.4	4.8
16	*Nitrate (as NO ₃)	APHA23 rd Edn,2017:4500 NO ₃ ⁻ E	mg/l	45	No relaxation	2.2	2.8
17	*Fluoride (as F)	APHA23 rd Edn,2017: 4500F C	mg/l	1	1.5	0.011	0.014
18	*Phenolic Compounds (as C ₆ H ₅ OH)	APHA23 rd Edn,2017: 5530 B,D	mg/l	0.001	0.002	<0.001	<0.001
19	Mercury (as Hg)	APHA23 rd Edn,2017:3112 B	mg/l	0.001	No relaxation	<0.001	<0.001
20	Cadmium (as Cd)	APHA23 rd Edn,2017: 3111 B	mg/l	0.003	No relaxation	<0.001	<0.001
21	*Selenium (as Se)	APHA23 rd Edn,2017: 3114 B	mg/l	0.01	No relaxation	<0.001	<0.001
22	*Arsenic (as As)	APHA23 rd Edn,2017: 3114 B	mg/l	0.01	No relaxation	<0.004	<0.004
23	*Cyanide (as CN)	APHA23 rd Edn,2017: 4500 CN C,D	mg/l	0.05	No relaxation	ND	ND
24	Lead (as Pb)	APHA23 rd Edn,2017:3111 B	mg/l	0.01	No relaxation	<0.01	<0.01
25	Zinc (as Zn)	APHA23 rd Edn,2017: 3111 B	mg/l	5	15	<0.01	<0.01
26	*Anionic Detergents (as MBAS)	APHA23 rd Edn,2017: 5540 C	mg/l	0.2	1	<0.2	<0.2
27	*Chromium (as Cr ⁶⁺)	APHA23 rd Edn,2017: 3500Cr B	mg/l	--	--	<0.01	<0.01
28	*Mineral Oil	APHA23 rd Edn,2017: 5220 B	mg/l	0.5	No relaxation	<0.1	<0.1
29	Alkalinity	APHA23 rd Edn,2017: 2330 D	mg/l	200	600	90.8	96.6
30	*Aluminium as(Al)	APHA23 rd Edn,2017: 3500Al B	mg/l	0.03	0.2	<0.01	<0.01
31	*Boron (as B)	APHA23 rd Edn,2017: 4500B, B	mg/l	0.05	2.4	<0.1	<0.1
32	*Poly Aromatic Hydrocarbon as PAH	APHA23 rd Edn,2017: 6440 B	mg/l	0.0001	No relaxation	<0.001	<0.001
33	*Pesticide	APHA23 rd Edn,2017: 6630 B,C	µg/l	--	No relaxation	Absent	Absent
34	*EColi	APHA23 rd Edn,2017: 9221 F	MPN/100ml	Shall not be detectable in any 100ml sample	--	<1.1	<1.1

Note Above (*) parameters are not in our NABLscope. Note: CL: Colorless, ND: Not Detected.
IDL (Below Detectable Limits) Values: Cu- 0.025 mg/l, Mn- 0.05 mg/l, Cr⁶⁺/SOH- 0.001 mg/l, Hg- 0.001 mg/l, Cd- 0.001 mg/l, Se- 0.001 mg/l, Pb- 0.01 mg/l, Zn- 0.05 mg/l, Cr⁶⁺- 0.01 mg/l, Al- 0.01 mg/l, B- 0.01 mg/l, PAH- 0.0001 mg/l

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TEST REPORT (GROUND WATER QUALITY ANALYSIS REPORT- NOV-2019)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	ENVLAB/191R-622	Report Release Date	03.12.19
Sample Code	GW-3-GW-4	Sampled By	VCSPL Representative
Sample Name	Ground Water	Sampled On	17.11.2019
Sample Condition	Sealed & Ice Preserved	Sampling Location	GW-3 Near Plant Site GW-4 Maudi Railway Station
Test Started On	18.11.2019	Sample Received On	18.11.2019
		Test Completed On	25.11.2019

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS -10500:2012 Amended on 2015 & 2018		Analysis Results	
				Acceptable Limit	Permissible Limit	GW-3	GW-4
Essential Characteristics							
1	*Colour	APHA23 rd Edn,2017: 2120 B, C	Hazen	5	15	CL	CL
2	*Odour	APHA23 rd Edn,2017: 2150 B	--	Agreeable	Agreeable	Agreeable	Agreeable
3	*Taste	APHA23 rd Edn,2017: 2160 C	--	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	APHA23 rd Edn,2017: 2130 B	NTU	1	5	<1	<1
5	pH Value	APHA23 rd Edn,2017: 4500H th B	--	6.5-8.5	No relaxation	7.34	7.38
6	Total Hardness (as CaCO ₃)	APHA23 rd Edn,2017: 2340 C	mg/l	200	600	132.0	138.0
7	Iron (as Fe)	APHA23 rd Edn,2017: 3111 B	mg/l	1.0	No relaxation	0.26	0.24
8	Chloride (as Cl)	APHA23 rd Edn,2017: 4500C th B	mg/l	250	1000	28.8	30.4
9	*Residual, free Chlorine	APHA23 rd Edn,2017:4500Cl, B	mg/l	0.2	1	ND	ND
Desirable Characteristics							
10	Dissolved Solids	APHA23 rd Edn,2017: 2540 C	mg/l	500	2000	196.0	218.0
11	Calcium (as Ca)	APHA23 rd Edn,2017: 3500Ca B	mg/l	75	200	34.8	36.6
12	Magnesium (as Mg)	APHA23 rd Edn,2017: 3500Mg B	mg/l	30	100	13.2	14.8
13	Copper (as Cu)	APHA23 rd Edn,2017: 3111 Cu B	mg/l	0.05	1.5	<0.02	<0.02
14	Manganese (as Mn)	APHA23 rd Edn,2017: 3111 B	mg/l	0.1	0.3	0.01	0.016
15	*Sulphate (as SO ₄)	APHA23 rd Edn,2017: 4500 SO ₄ ²⁻ E	mg/l	200	400	4.8	5.1
16	*Nitrate (as NO ₃)	APHA23 rd Edn,2017: 4500 NO ₃ ⁻ E	mg/l	45	No relaxation	3.2	2.8
17	*Fluoride (as F)	APHA23 rd Edn,2017: 4500F C	mg/l	1	1.5	0.021	0.018
18	*Phenolic Compounds (as C ₁₂ H ₁₀ O ₁₁)	APHA23 rd Edn,2017: 5530 B,D	mg/l	0.001	0.002	<0.001	<0.001
19	Mercury (as Hg)	APHA23 rd Edn,2017:3112 B	mg/l	0.01	No relaxation	<0.001	<0.001
20	Cadmium (as Cd)	APHA23 rd Edn,2017: 3111 B	mg/l	0.003	No relaxation	<0.001	<0.001
21	*Selenium (as Se)	APHA23 rd Edn,2017: 3114 B	mg/l	0.01	No relaxation	<0.001	<0.001
22	*Arsenic (as As)	APHA23 rd Edn,2017: 3114 B	mg/l	0.01	No relaxation	<0.004	<0.004
23	*Cyanide (as CN)	APHA23 rd Edn,2017: 4500 CN C,D	mg/l	0.05	No relaxation	ND	ND
24	Lead (as Pb)	APHA23 rd Edn,2017: 3111 B	mg/l	0.01	No relaxation	<0.01	<0.01
25	Zinc (as Zn)	APHA23 rd Edn,2017: 3111 B	mg/l	5	15	<0.01	<0.01
26	*Anionic Detergents (as MBAS)	APHA23 rd Edn,2017: 5540 C	mg/l	0.2	1	<0.2	<0.2
27	*Chromium (as Cr ⁶⁺)	APHA23 rd Edn,2017: 3500Cr B	mg/l	--	--	<0.01	<0.01
28	*Mineral Oil	APHA23 rd Edn,2017: 5220 B	mg/l	0.5	No relaxation	<0.1	<0.1
29	Alkalinity	APHA23 rd Edn,2017: 2320 B	mg/l	200	600	106.0	114.2
30	*Aluminium as(Al)	APHA23 rd Edn,2017: 3500Al B	mg/l	0.03	0.2	<0.01	<0.01
31	*Boron (as B)	APHA23 rd Edn,2017: 4500B, B	mg/l	0.05	2.4	<0.1	<0.1
32	*Poly Aromatic Hydrocarbon as PAH	APHA23 rd Edn,2017: 6440 B	mg/l	0.0001	No relaxation	<0.001	<0.001
33	*Pesticide	APHA23 rd Edn,2017: 6630 B,C	µg/l	--	No relaxation	Absent	Absent
34	*E.Coli	APHA23 rd Edn,2017: 9221 F	MPN/100ml	Shall not be detectable in any 100ml sample	--	<1	<1

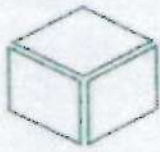
Note Above (*) parameters are not in our NABL scope. Note: CL: Colorless, ND: Not Detected.
 SDI (Below Detectable Limits) Values: Cu- 0.025 mg/l, Mn- 0.05 mg/l, Cr⁶⁺- 0.001 mg/l, Hg- 0.001 mg/l, Cd- 0.001 mg/l, Se- 0.001 mg/l, Pb- 0.01 mg/l, Zn- 0.05 mg/l, Cr³⁺- 0.01mg/l, Al- 0.01 mg/l, B- 0.01 mg/l, PAH- 0.0001 mg/l

- The test values are reported based on the samples received. 2. Samples will be destroyed after 7 days from date of report subject to nature of preservation. Sample will be preserved as per standard method.
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Committed For Better Environment



TEST REPORT

(GROUND WATER QUALITY ANALYSIS REPORT- FEBRUARY-2020)

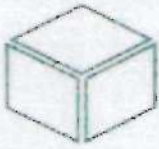
Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Env/16/19/R-2020	Report Release Date	02.03.20
Sample Code	GW1-GW2	Sampled By	VCSPL Representative
Sample Name	Ground Water	Sampled On	16.02.2020
Sample Condition	Ice Preserved	Sampling Location	GW-1: Noamundi Basti GW-2: Noamundi Bazar Near Petrol Pump
Test Started On	17.02.2020	Sample Received On	17.02.2020
		Test Completed On	24.02.2020

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS-10500:2012 Amended on 2015 & 2018		Analysis Results	
				Acceptable Limit	Permissible Limit	GW-1	GW-2
Essential Characteristics							
1	*Colour	APHA23 rd Edn,2017: 2120 D, C	Hazen	5	15	CL	CL
2	*Odour	APHA23 rd Edn,2017: 2130 B	--	Agreeable	Agreeable	Agreeable	Agreeable
3	*Taste	APHA23 rd Edn,2017: 2160 C	--	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	APHA23 rd Edn,2017: 2130 D	NTU	1	5	<0.2	<0.2
5	pH Value	APHA23 rd Edn,2017: 4500H B	--	6.5-8.5	No relaxation	7.51	7.39
6	Total Hardness (as CaCO ₃)	APHA23 rd Edn,2017: 2340 C	mg/l	200	600	142.0	151.0
7	Iron (as Fe)	APHA23 rd Edn,2017: 3111 B	mg/l	1.0	No relaxation	0.26	0.22
8	Chloride (as Cl)	APHA23 rd Edn,2017: 4500CT D	mg/l	250	1000	28.0	34.0
9	*Residual, free Chlorine	APHA23 rd Edn,2017: 4500CL B	mg/l	0.2	1	ND	ND
Desirable Characteristics							
10	Dissolved Solids	APHA23 rd Edn,2017: 2540 D	mg/l	500	2000	262.0	226.0
11	Calcium (as Ca)	APHA23 rd Edn,2017: 3500Ca B	mg/l	75	200	36.0	40.2
12	Magnesium (as Mg)	APHA23 rd Edn,2017: 3500Mg D	mg/l	30	100	13.2	14.1
13	Copper (as Cu)	APHA23 rd Edn,2017: 3111 Cu B	mg/l	0.05	1.5	<0.05	<0.05
14	Manganese (as Mn)	APHA23 rd Edn,2017: 3111 B	mg/l	0.1	0.3	0.028	0.041
15	*Sulphate (as SO ₄)	APHA23 rd Edn,2017: 4500 SO ₄ E	mg/l	200	400	4.8	5.6
16	*Nitrate (as NO ₃)	APHA23 rd Edn,2017: 4500 NO ₃ F	mg/l	45	No relaxation	3.4	3.2
17	*Fluoride (as F)	APHA23 rd Edn,2017: 4500F C	mg/l	1	1.5	0.021	0.052
18	*Phenolic Compounds (as C ₁₂ H ₁₀ OH)	APHA23 rd Edn,2017: 5530 B, D	mg/l	0.001	0.002	<0.001	<0.001
19	Mercury (as Hg)	APHA23 rd Edn,2017: 3112 B	mg/l	0.001	No relaxation	<0.001	<0.001
20	Cadmium (as Cd)	APHA23 rd Edn,2017: 3114 D	mg/l	0.003	No relaxation	<0.001	<0.001
21	*Selenium (as Se)	APHA23 rd Edn,2017: 3114 B	mg/l	0.01	No relaxation	<0.001	<0.001
22	*Arsenic (as As)	APHA23 rd Edn,2017: 3114 B	mg/l	0.01	No relaxation	<0.001	<0.001
23	*Cyanide (as CN)	APHA23 rd Edn,2017: 4500 CN C, D	mg/l	0.05	No relaxation	ND	ND
24	Lead (as Pb)	APHA23 rd Edn,2017: 3111 B	mg/l	0.01	No relaxation	<0.001	<0.001
25	Zinc (as Zn)	APHA23 rd Edn,2017: 3111 B	mg/l	5	15	<0.05	<0.05
26	*Anionic Detergents (as MBAS)	APHA23 rd Edn,2017: 5540 C	mg/l	0.2	1	<0.2	<0.2
27	*Chromium (as Cr ⁶⁺)	APHA23 rd Edn,2017: 3500Cr B	mg/l	--	--	<0.05	<0.05
28	*Mineral Oil	APHA23 rd Edn,2017: 5220 B	mg/l	0.5	No relaxation	<0.01	<0.01
29	Alkalinity	APHA23 rd Edn,2017: 2520 B	mg/l	100	600	130.0	132.0
30	*Aluminium (as Al)	APHA23 rd Edn,2017: 3500Al B	mg/l	0.03	0.2	<0.001	<0.001
31	*Boron (as B)	APHA23 rd Edn,2017: 4500B, D	mg/l	0.05	2.4	<0.01	<0.01
32	*Poly Aromatic Hydrocarbon as PAH	APHA23 rd Edn,2017: 6440 B	mg/l	0.0001	No relaxation	<0.001	<0.001
33	*Pesticide	APHA23 rd Edn,2017: 6630 B, C	µg/l	--	No relaxation	Absent	Absent
34	*ECols	APHA23rd Edn,2017: 9221 F	MPN/100ml	Shall not be detectable in any 100ml sample	--	<1.1	<1.1

Note: Above (*) parameters are not in our scope. Note: CL: Colorless, ND: Not Detected.
 SDL (Below Detectable Limits) Values: Cu- 0.02 mg/l, Mn- 0.03 mg/l, Cr⁶⁺ 0.01 mg/l, Al- 0.01 mg/l, B- 0.1 mg/l, PAH- 0.0001 mg/l, Se- 0.01 mg/l, As- 0.01 mg/l, Pb- 0.01 mg/l, Zn- 0.03 mg/l, Cr⁶⁺ 0.01 mg/l, Al- 0.01 mg/l, B- 0.1 mg/l, PAH- 0.0001 mg/l.

1. The test values are reported based on the samples received. 2. Samples will be destroyed after 7 days from date of issue of the report subject to nature of preservation. Sample will be preserved as per standard method.





Visiontek Consultancy Services Pvt. Ltd.

(An Enviro Engineering Consulting Cell)
(ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified)



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Certificate No.: TC-7944
Format No.: 7.8.2/FMT/TR/06

TEST REPORT

(GROUND WATER QUALITY ANALYSIS REPORT- FEBRUARY-2020)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	ENV/106/19/18-8789	Report Release Date	02.03.20
Sample Code	GW3-GW4	Sampled By	VCSPL Representative
Sample Name	Ground Water	Sampled On	15.02.2020
Sample Condition	Ice Preserved	Sampling Location	GW-3: Near Plant Site GW-4: Maudhi Railway Station
Test Started On	17.02.2020	Sample Received On	17.02.2020
		Test Completed On	24.02.2020

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS-10500:2012 Amended on 2015 & 2018		Analysis Results	
				Acceptable Limit	Permissible Limit	GW-3	GW-4
Essential Characteristics							
1	*Colour	APHA23 rd Edn,2017: 2120 B, C	Hazen	5	15	CL	CL
2	*Odour	APHA23 rd Edn,2017: 2150 B	--	Agreeable	Agreeable	Agreeable	Agreeable
3	*Taste	APHA23 rd Edn,2017: 2160 C	--	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	APHA23 rd Edn,2017: 2130 B	NTU	1	5	<0.2	<0.2
5	pH Value	APHA23 rd Edn,2017: 4500H ¹ B	--	6.5-8.5	No relaxation	7.34	7.36
6	Total Hardness(as CaCO ₃)	APHA23 rd Edn,2017: 2340 C	mg/l	200	600	136.0	136.0
7	Iron (as Fe)	APHA23 rd Edn,2017: 3111 B	mg/l	1.0	No relaxation	0.24	0.21
8	Chloride (as Cl ⁻)	APHA23 rd Edn,2017: 4500C ¹ B	mg/l	250	1000	36.8	42.0
9	*Residual, free Chlorine	APHA23 rd Edn,2017:4500CL B	mg/l	0.2	1	ND	ND
Desirable Characteristics							
10	Dissolved Solids	APHA23 rd Edn,2017: 2540 D	mg/l	500	2000	194.0	193.0
11	Calcium (as Ca)	APHA23 rd Edn,2017: 3500Ca B	mg/l	75	200	38.0	41.8
12	Magnesium (as Mg)	APHA23 rd Edn,2017: 3500Mg B	mg/l	30	100	12.6	13.8
13	Copper (as Cu)	APHA23 rd Edn,2017: 3111 Cu B	mg/l	0.05	1.5	<0.05	<0.05
14	Manganese (as Mn)	APHA23 rd Edn,2017: 3111 B	mg/l	0.1	0.3	0.026	0.027
15	*Sulphate (as SO ₄)	APHA23 rd Edn,2017: 4500 SO ₄ E	mg/l	200	400	6.6	6.2
16	*Nitrate (as NO ₃)	APHA23 rd Edn,2017:4500 NO ₃ E	mg/l	45	No relaxation	3.6	5.2
17	*Fluoride (as F)	APHA23 rd Edn,2017: 4500F ¹ C	mg/l	1	1.5	0.028	0.034
18	*Phenolic Compounds (as C ₆ H ₅ OH)	APHA23 rd Edn,2017: 5530 B,D	mg/l	0.001	0.002	<0.001	<0.001
19	Mercury (as Hg)	APHA23 rd Edn,2017:3112 D	mg/l	0.001	No relaxation	<0.001	<0.001
20	Cadmium (as Cd)	APHA23 rd Edn,2017: 3111 B	mg/l	0.003	No relaxation	<0.001	<0.001
21	*Selenium (as Se)	APHA23 rd Edn,2017: 3114 B	mg/l	0.01	No relaxation	<0.001	<0.001
22	*Arsenic (as As)	APHA23 rd Edn,2017: 3114 B	mg/l	0.01	No relaxation	<0.001	<0.001
23	*Cyanide (as CN)	APHA23 rd Edn,2017: 4500 CN ¹ C,D	mg/l	0.05	No relaxation	ND	ND
24	Lead (as Pb)	APHA23 rd Edn,2017: 3111 B	mg/l	0.01	No relaxation	<0.001	<0.001
25	Zinc (as Zn)	APHA23 rd Edn,2017: 3111 B	mg/l	5	15	<0.05	<0.05
26	*Anionic Detergents (as MBAS)	APHA23 rd Edn,2017: 5540 C	mg/l	0.2	1	<0.2	<0.2
27	*Chromium (as Cr ^{VI})	APHA23 rd Edn,2017: 3500Cr B	mg/l	--	--	<0.05	<0.05
28	*Mineral Oil	APHA23 rd Edn,2017: 5220 B	mg/l	0.5	No relaxation	<0.01	<0.01
29	Alkalinity	APHA23 rd Edn,2017: 2320 D	mg/l	200	600	156.0	134.0
30	*Aluminium (as Al)	APHA23 rd Edn,2017: 3500Al B	mg/l	0.03	0.2	<0.001	<0.001
31	*Boron (as B)	APHA23 rd Edn,2017: 4500B, B	mg/l	0.05	2.4	<0.01	<0.01
32	*Poly Aromatic Hydrocarbon as PAH	APHA23 rd Edn,2017: 6440 D	mg/l	0.0001	No relaxation	<0.001	<0.001
33	*Pesticide	APHA23 rd Edn,2017: 6630 B,C	µg/l	--	No relaxation	Absent	Absent
34	*EColi	APHA23 rd Edn,2017: 9221 F	MPN/100ml	Shall not be detectable in any 100ml sample	--	<1.1	<1.1

Note Above (*) parameters are not in our scope. Note: CL: Colorless, ND: Not Detected.

30L (Below Detectable Limits) Values: Cu- 0.02 mg/l, Mn- 0.03 mg/l, Cr(VI)- 0.05 mg/l, Hg- 0.001 mg/l, Cd- 0.01 mg/l, Se- 0.001 mg/l, As- 0.001 mg/l, CN- 0.01 mg/l, Pb- 0.01 mg/l, Zn- 0.03 mg/l, Cr^{VI}- 0.01 mg/l, Al- 0.03 mg/l, B- 0.3 mg/l, PAH- 0.0001 mg/L.

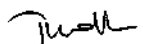
1. The test values are reported based on the samples received. 2. Samples will be destroyed after 7 days from date of issue of the test report subject to nature of preservation. Sample will be preserved as per standard method.

Authorized Signatory
Visiontek Consultancy Services Pvt. Ltd.

Flow Rate of Balijhor Nalla**(October 2019 – March 2020)****ANALYSIS OF WATER QUALITY
Sample collected from Balijhore Nalla**

Parameters	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
BOD mg/l	1.80	0.90	1.30	1.40	2.60	2.10
CPCB Limit (30 mg/l)						
TSS mg/l	59.40	9.20	15.80	7.50	68.20	27.80
CPCB Limit (100 mg/l)						
Flow Rate Cum/hr	136.28	12.53	29.72	9.26	396.46	83.21

There is no any industrial effluents discharge from the mine.


Lab-in-charge

Surface Water Analysis Report

(October 2019 – March 2020)

Noamundi Iron Mine



Visiontek Consultancy Services Pvt. Ltd.

(An Enviro Engineering Consulting Cell)
(ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified)



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Certificate No.: TC-7944
Format No.: 7.8.2/FMT/TR/06

TEST REPORT

(SURFACE WATER QUALITY ANALYSIS REPORT- NOVEMBER-2019)

Customer Name & Address	M/s NOAMUNDI Iron Mines (M/s TATA Steel Limited)		
Test Report No	ENVLAB/19/R-6286	Report Release Date	03.12.2019
Sample Code	SW1-SW2	Sampled By	VCSPL Representative
Sample Name	Surface Water	Sampled On	17.11.2019
Sample Condition	Ice Preserved	Sampling Location	SW1: Balijharan Upstream SW2: Balijharan Downstream
Test Started On	18.11.2019	Sample Received On	18.11.2019
		Test Completed On	25.11.2019

Sl. No.	Parameter	Unit	Testing Methods	Standards as per IS-2296:1992 Class - 'C'	Analysis Results	
					SW-1	SW-2
1	Dissolved Oxygen (mm)	mg/l	APHA 21 ⁰⁰ Ed.2017 4500 O C	4.0	6.4	6.2
2	Total Suspended Solids as TSS	mg/l	APHA 21 ⁰⁰ Ed.2017 2540 C	--	28	30
3	BOD (5 days at 27°C) (max)	mg/l	IS 3025(P-4) : 1993 RA 2003	1500	<1.8	<1.8
4	Chemical Oxygen Demand (COD)	mg/l	APHA 21 ⁰⁰ Ed.2017 5220 C	--	34	32
5	Total Coli form	mg/l	APHA 21 ⁰⁰ Ed.2017 9221 B	5000	210	240
6	pH at 25°C	mg/l	APHA 21 ⁰⁰ Ed.2017 4500H B	6.0-9.0	7.51	7.58
7	Colour	mg/l	APHA 21 ⁰⁰ Ed.2017 3120 B, C	300	CL	CL
8	Total Dissolved Solids	mg/l	APHA 21 ⁰⁰ Ed.2017 2540 D	600	196	174
9	Copper as Cu (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 3111 B	1.5	<0.02	<0.02
10	Iron as Fe (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 3500Fe, B	0.5	0.31	0.28
11	Chloride (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 4500C B	--	51.2	56.1
12	Sulphates (SO ₄) (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 4500 SO ₄ E	400	5.2	5.6
13	Nitrate as NO ₃ (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 4500 NO ₃ E	50	3.8	3.2
14	Fluoride as F (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 4500F C	1.5	0.024	0.028
15	Phenolic Compounds as C ₁₂ H ₁₀ OH (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 5530 B,D	0.005	<0.001	<0.001
16	Cadmium as Cd (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 3111 B	0.01	<0.001	<0.001
17	Selenium as Se (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 3500 Se C	0.05	<0.001	<0.001
18	Arsenic as As	mg/l	APHA 21 ⁰⁰ Ed.2017 3114 B	0.2	<0.001	<0.001
19	Cyanide as CN (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 4500 CN C,D	0.05	ND	ND
20	Lead as Pb	mg/l	APHA 21 ⁰⁰ Ed.2017 3111 B	0.1	<0.01	<0.01
21	Zinc as Zn (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 3111 B	15	<0.05	<0.05
22	Hexa Chromium as Cr ⁶⁺	mg/l	APHA 21 ⁰⁰ Ed.2017 3500Cr B	0.05	<0.05	<0.05
23	Anionic Detergents (max)	mg/l	APHA 21 ⁰⁰ Ed.2017 5540 C	1.0	<0.2	<0.2
24	Mercury as Hg	mg/l	APHA 21 ⁰⁰ Ed.2017 3112 B	--	<0.001	<0.001
25	Manganese as Mn	mg/l	APHA 21 ⁰⁰ Ed.2017 3111 B	--	<0.005	<0.005

Note: Above (*) parameters are not in our scope.

1. The test values are reported based on the samples received.

2. Samples will be destroyed after 7 days from date of issues of the test report subject to nature of preservation. Sample will be preserved as per standard method.

3. The test report shall not be reproduced, without written approval of laboratory.





TEST REPORT

(SURFACE WATER QUALITY ANALYSIS REPORT- FEBRUARY-2020)

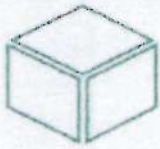
Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Zw/lab/19/R-8296	Report Release Date	02.03.20
Sample Code	SW1-SW2	Sampled By	VCSPL Representative
Sample Name	Surface Water	Sampled On	16.02.2020
Sample Condition	Ice Preserved	Sampling Location	SW-1: Balijhuran Upstream SW-2: Balijhuran Downstream
Test Started On	17.02.2020	Sample Received On	17.02.2020
		Test Completed On	24.02.2020

Sl. No.	Parameter	Unit	Testing Method	Standards as per IS 2296:1992 Class C	Analysis Results	
					SW-1	SW-2
1	Dissolved Oxygen (minimum)	mg/l	APHA23 rd Edn, 2017: 4500 O ₂ C	4	6.2	6.6
2	Total Suspended Solids as TSS	mg/l	APHA23 rd Edn, 2017: 2540 C	-	32.8	30.6
3	BOD (3) days at 270C (max)	mg/l	IS 3025 (P-44) 1995 RA 2002	3	2.2	2.8
4	Chemical Oxygen Demand as COD	mg/l	APHA23 rd Edn, 2017: 5220 B	-	26	34
5	Total Coli form	MPN/100ML	APHA23 rd Edn, 2017: 9221 D	5000	260	260
6	pH Value	-	APHA23 rd Edn, 2017: 4500 H ₂ B	6.0-9.0	7.44	7.52
7	Colour (max)	Hazen	APHA23 rd Edn, 2017: 2120 B,C	300	1	2
8	Total Dissolved Solids	mg/l	APHA23 rd Edn, 2017: 2540 D	1500	140.0	152.0
9	Copper as Cu (max)	mg/l	APHA23 rd Edn, 2017: 3111 B,C	1.5	<0.05	<0.05
10	Iron as Fe (max)	mg/l	APHA23 rd Edn, 2017: 3111 B	0.5	0.44	0.52
11	Chloride (max)	mg/l	APHA23 rd Edn, 2017: 4500 Cl ⁻ B	600	28.0	30.6
12	Sulphates (SO ₄) (max)	mg/l	APHA23 rd Edn, 2017: 4500 SO ₄ ²⁻ E	400	4.2	5.2
13	Nitrate as NO ₃ (max)	mg/l	APHA23 rd Edn, 2017: 4500 NO ₃ ⁻ E	50	1.88	1.92
14	Fluoride as F (max)	mg/l	APHA23 rd Edn, 2017: 4500 F ⁻ C	1.5	0.026	0.034
15	Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	APHA23 rd Edn, 2017: 5550 B,D	0.005	<0.001	<0.001
16	Cadmium as Cd (max)	mg/l	APHA23 rd Edn, 2017: 3111 B	0.01	<0.001	<0.001
17	Selenium as Se (max)	mg/l	APHA23 rd Edn, 2017: 3114 D	0.05	<0.001	<0.001
18	Arsenic as As	mg/l	APHA23 rd Edn, 2017: 3114 B	0.2	<0.001	<0.001
19	Cyanide as CN (max)	mg/l	APHA23 rd Edn, 2017: 4500 CN C,D	0.05	ND	ND
20	Lead as Pb(max)	mg/l	APHA23 rd Edn, 2017: 3111 B	0.1	<0.01	<0.01
21	Zinc as Zn(max)	mg/l	APHA23 rd Edn, 2017: 3111 B	15	<0.05	<0.05
22	Hexa Chromium as Cr +6	mg/l	APHA23 rd Edn, 2017: 3111 B	0.05	<0.05	<0.05
23	Anionic Detergents (max)	mg/l	APHA23 rd Edn, 2017: 2540 C	1	<0.2	<0.2
24	Mercury as Hg	mg/l	APHA23 rd Edn, 2017: 3112 B	-	<0.001	<0.001
25	Manganese as Mn	mg/l	APHA23 rd Edn, 2017: 3111 B	-	<0.005	<0.005

Note Above (*) parameters are not in our scope. Note: CL: Colorless, ND: Not Detected.
 HDL (Below Detectable Limit) Values: Cu- 0.02 mg/l, Mn- 0.05 mg/l, Cr(VI) 0.02 mg/l, Hg- 0.004 mg/l, Cd- 0.01 mg/l, Se- 0.001 mg/l, As- 0.004 mg/l, CN- 0.01 mg/l, Pb- 0.01 mg/l, Zn- 0.03 mg/l, Cr³⁺- 0.01 mg/l, Al- 0.01 mg/l, B- 0.1 mg/l, Hg- 0.001 mg/l, BOD- 1.8 mg/l, COD- 4 mg/l, NO₃⁻- 1.8 mg/l

1. The test values are reported based on the samples received. 2. Samples will be destroyed after 7 days from date of the test report subject to nature of preservation. Sample will be preserved as per standard method.





TEST REPORT (SURFACE WATER QUALITY ANALYSIS REPORT- NOVEMBER-2019)

Customer Name & Address	M/s Joda East Iron Mines (M/s TATA Steel Limited)		
Test Report No	ENVLAB/19/R-6234	Report Release Date	03.12.2019
Sample Code	SW1-SW2	Sampled By	VCSPL Representative
Sample Name	Surface Water	Sampled On	12.11.2019
Sample Condition	Ice Preserved	Sampling Location	SW1: Kundra Nallah Upstream SW2: Kundra Nallah Downstream
Test Started On	13.11.2019	Sample Received On	13.11.2019
		Test Completed On	20.11.2019

Sl. No.	Parameter	Unit	Testing Methods	Standards as per IS-2296:1992 Class - 'C'	Analysis Results	
					SW-1	SW-2
1	Dissolved Oxygen (min)	mg/l	APIA 23 RD Ed,2017: 4500 O ⁻ C	4.0	6.1	6.4
2	Total Suspended Solids as TSS	mg/l	APHA 23 RD Ed,2017: 2540 C	--	28	32
3	BOD (3) days at 27°C (max)	mg/l	IS 3025(P-44) : 1993 RA 2003	1500	<1.8	<1.8
4	Chemical Oxygen Demand (COD)	mg/l	APHA 23 RD Ed,2017: 5220 C	--	23	26
5	Total Coli form	mg/l	APHA 23 RD Ed,2017: 9221 B	5000	120	180
6	pH at 25°C	mg/l	APHA 23 RD Ed,2017: 4500H ⁺ B	6.0-9.0	7.42	7.48
7	Colour	mg/l	APHA 23 RD Ed,2017: 2120 B, C	300	CL	CL
8	Total Dissolved Solids	mg/l	APHA 23 RD Ed,2017: 2540 D	600	192	210
9	Copper as Cu (max)	mg/l	APHA 23 RD Ed,2017: 3111 B	1.5	<0.02	<0.02
10	Iron as Fe (max)	mg/l	APHA 23 RD Ed,2017: 3500Fe, B	0.5	0.34	0.36
11	Chloride (max)	mg/l	APHA 23 RD Ed,2017: 4500Cl ⁻ B	--	51.2	56.4
12	Sulphates (SO ₄) (max)	mg/l	APHA 23 RD Ed,2017: 4500 SO ₄ ²⁻ E	400	5.4	6.8
13	Nitrate as NO ₃ (max)	mg/l	APHA 23 RD Ed,2017: 4500 NO ₃ ⁻ E	50	3.4	4.6
14	Fluoride as F (max)	mg/l	APHA 23 RD Ed,2017: 4500F ⁻ C	1.5	0.012	0.026
15	Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	APHA 23 RD Ed,2017: 5530 B,D	0.005	<0.001	<0.001
16	Cadmium as Cd (max)	mg/l	APHA 23 RD Ed,2017: 3111 B	0.01	<0.001	<0.001
17	Selenium as Se (max)	mg/l	APHA 23 RD Ed,2017: 3500 Se C	0.05	<0.001	<0.001
18	Arsenic as As	mg/l	APHA 23 RD Ed,2017: 3114 B	0.2	<0.001	<0.001
19	Cyanide as CN (max)	mg/l	APHA 23 RD Ed,2017: 4500 CN ⁻ C,D	0.05	ND	ND
20	Lead as Pb	mg/l	APIA 23 RD Ed,2017: 3111 B	0.1	<0.01	<0.01
21	Zinc as Zn(max)	mg/l	APHA 23 RD Ed,2017: 3111 B	15	<0.05	<0.05
22	Hexa Chromium as Cr ⁺⁶	mg/l	APHA 23 RD Ed,2017: 3500Cr B	0.05	<0.05	<0.05
23	Anionic Detergents (max)	mg/l	APHA 23 RD Ed,2017: 5540 C	1.0	<0.2	<0.2
24	Mercury as Hg	mg/l	APHA 23 RD Ed,2017: 3112 B	--	<0.001	<0.001
25	Manganese as Mn	mg/l	APHA 23 RD Ed,2017: 3111 B	--	<0.005	<0.005

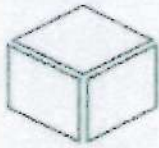
Note Above (*) parameters are not in our scope.

1. The test values are reported based on the samples received.

2. Samples will be destroyed after 7 days from date of issues of the test report subject to nature of preservation. Sample will be preserved as per standard method.

3. The test report shall not be reproduced, without written approval of laboratory.

Visiontek Consultancy Services Pvt. Ltd.
 Authorized Signatory



Visiontek Consultancy Services Pvt. Ltd.

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(ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified)



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Certificate No.: TC-7944
Format No.: 7.8.2/FMT/TR/06

TEST REPORT

(SURFACE WATER QUALITY ANALYSIS REPORT- FEBRUARY-2020)

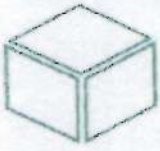
Customer Name & Address	M/s Joda East Iron Mines (M/s TATA Steel Limited)		
Test Report No	ENV/19/R-0371	Report Release Date	02-03-20
Sample Code	SW1-SW2	Sampled By	VCSPL Representative
Sample Name	Surface Water	Sampled On	04.02.2020
Sample Condition	Ice Preserved	Sampling Location	SW-1: Kumorjoda SW-2: Bangani
Test Started On	05.02.2020	Sample Received On	05.02.2020
		Test Completed On	11.02.2020

Sl. No	Parameter	Unit	Testing Method	Standards as per IS 2296:1992 Class C	Analysis Results	
					SW-1	SW-2
1	Dissolved Oxygen (minimum)	mg/l	APHA23 rd Edn, 2017: 4500 O' C	4	6.4	6.8
2	Total Suspended Solids as TSS	mg/l	APHA23 rd Edn, 2017: 2540 C	-	32	34
3	BOD (3) days at 27°C (max)	mg/l	IS 5025 (P-44) 1995 RA 2005	3	3.2	3.8
4	Chemical Oxygen Demand as COD	mg/l	APHA23 rd Edn, 2017: 5220 B	-	20	24
5	Total Coli form	MPN/100ML	APHA23 rd Edn, 2017: 9221 B	5000	260	280
6	pH Value	-	APHA23 rd Edn 2017: 4500 H' B	6.0-9.0	7.41	7.44
7	Colour (max)	Hazen	APHA23 rd Edn, 2017: 2120 H, C	300	2	2
8	Total Dissolved Solids	mg/l	APHA23 rd Edn, 2017: 2540 D	1500	148.0	152.0
9	Copper as Cu (max)	mg/l	APHA23 rd Edn, 2017: 3111 D, C	1.5	<0.05	<0.05
10	Iron as Fe (max)	mg/l	APHA23 rd Edn, 2017: 3111 B	0.5	0.38	0.42
11	Chloride (max)	mg/l	APHA23 rd Edn, 2017: 4500 CF B	600	32.0	38.0
12	Sulphates (SO4) (max)	mg/l	APHA23 rd Edn, 2017: 4500 SO ₄ ²⁻ E	400	4.8	5.6
13	Nitrate as NO ₃ (max)	mg/l	APHA23 rd Edn, 2017: 4500 NO ₃ ⁻ E	50	1.98	1.81
14	Fluoride as F (max)	mg/l	APHA23 rd Edn, 2017: 4500 F C	1.5	0.026	0.031
15	Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	APHA23 rd Edn, 2017: 5570 B, D	0.005	<0.001	<0.001
16	Cadmium as Cd (max)	mg/l	APHA23 rd Edn, 2017: 3111 D	0.01	<0.001	<0.001
17	Selenium as Se (max)	mg/l	APHA23 rd Edn, 2017: 3114 B	0.05	<0.001	<0.001
18	Arsenic as As	mg/l	APHA23 rd Edn, 2017: 3114 B	0.2	<0.001	<0.001
19	Cyanide as CN (max)	mg/l	APHA23 rd Edn, 2017: 4500 CN C, D	0.05	ND	ND
20	Lead as Pb (max)	mg/l	APHA23 rd Edn, 2017: 3111 B	0.1	<0.01	<0.01
21	Zinc as Zn (max)	mg/l	APHA23 rd Edn, 2017: 3111 B	15	<0.05	<0.05
22	Hexa Chromium as Cr +6	mg/l	APHA23 rd Edn, 2017: 3111 B	0.05	<0.05	<0.05
23	Anionic Detergents (max)	mg/l	APHA23 rd Edn, 2017: 5540 C	1	<0.2	<0.2
24	Mercury as Hg	mg/l	APHA23 rd Edn, 2017: 3112 B	-	<0.001	<0.001
25	Manganese as Mn	mg/l	APHA23 rd Edn, 2017: 3111 B	-	<0.065	<0.065

Note Above (*) parameters are not in our scope. Note: CL: Colorless, ND: Not Detected
 BSE (Below Detectable Limit) Value: Cu- 0.02 mg/l, Mn- 0.05 mg/l, C₆H₅OH- 0.05 mg/l, Hg- 0.001 mg/l, Cd- 0.01 mg/l, Se- 0.001 mg/l, As- 0.01 mg/l, CN- 0.01 mg/l
 Pb- 0.01 mg/l, Zn- 0.02 mg/l, Cr⁶⁺- 0.01 mg/l, Al- 0.01 mg/l, B- 0.1 mg/l, Hg- 0.001 mg/l, BOD- 1.8 mg/l, COD- 4 mg/l, DO- 1.8 mg/l

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TEST REPORT (SURFACE WATER QUALITY ANALYSIS REPORT- NOVEMBER-2019)

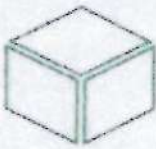
Customer Name & Address	M/s KATAMATI Iron Mines (M/s TATA Steel Limited)		
Test Report No	ENVLAB/19/-6317	Report Release Date	03.12.2019
Sample Code	SW1-SW2	Sampled By	VCSPL Representative
Sample Name	Surface Water	Sampled On	18.11.2019
Sample Condition	Ice Preserved	Sampling Location	SW1: Jojo Spring Upstream SW2: Jojo Spring Downstream
Test Started On	19.11.2019	Sample Received On	19.11.2019
		Test Completed On	25.11.2019

Sl. No.	Parameter	Unit	Testing Methods	Standards as per IS-2296:1992 Class - 'C'	Analysis Results	
					SW-1	SW-2
1	Dissolved Oxygen (min)	mg/l	APHA 23 RD Ed.2017 : 4500 O' C	4.0*	6.2	6.6
2	Total Suspended Solids as TSS	mg/l	APHA 23 RD Ed.2017: 2540 C	--	30	38
3	BOD (3) days at 27°C (max)	mg/l	IS 3025(P-44) : 1993 RA 2003	1500	<1.8	<1.8
4	Chemical Oxygen Demand (COD)	mg/l	APHA 23 RD Ed.2017: 5220 C	--	24	30
5	Total Coli form	mg/l	APHA 23 RD Ed.2017: 9221 B	5000	210	280
6	pH at 25°C	mg/l	APHA 23 RD Ed.2017 4500H' B	6.0-9.0	7.48	7.56
7	Colour	mg/l	APHA 23 RD Ed.2017 : 2120 B, C	300	CL	CL
8	Total Dissolved Solids	mg/l	APHA 23 RD Ed.2017: 2540 D	600	242	224
9	Copper as Cu (max)	mg/l	APHA 23 RD Ed.2017: 3111 B	1.5	<0.02	<0.02
10	Iron as Fe (max)	mg/l	APHA 23 RD Ed.2017: 3500Fe, B	0.5	0.32	0.38
11	Chloride (max)	mg/l	APHA 23 RD Ed.2017: 4500Cl' B	--	54.6	58.2
12	Sulphates (SO ₄) (max)	mg/l	APHA 23 RD Ed.2017: 4500 SO ₄ ²⁻ E	400	6.1	6.4
13	Nitrate as NO ₃ (max)	mg/l	APHA 23 RD Ed.2017: 4500 NO ₃ ' E	50	3.6	3.2
14	Fluoride as F (max)	mg/l	APHA 23 RD Ed.2017: 4500F' C	1.5	0.021	0.026
15	Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	APHA 23 RD Ed.2017: 5530 B,D	0.005	<0.001	<0.001
16	Cadmium as Cd (max)	mg/l	APHA 23 RD Ed.2017: 3111 B	0.01	<0.001	<0.001
17	Selenium as Se (max)	mg/l	APHA 23 RD Ed.2017: 3500 Se C	0.05	<0.001	<0.001
18	Arsenic as As	mg/l	APHA 23 RD Ed.2017: 3114 B	0.2	<0.001	<0.001
19	Cyanide as CN (max)	mg/l	APHA 23 RD Ed.2017: 4500 CN' C,D	0.05	ND	ND
20	Lead as Pb	mg/l	APHA 23 RD Ed.2017 3111 B	0.1	<0.01	<0.01
21	Zinc as Zn(max)	mg/l	APHA 23 RD Ed.2017: 3111 B	15	<0.05	<0.05
22	Hexa Chromium as Cr ^{VI}	mg/l	APHA 23 RD Ed.2017: 3500Cr B	0.05	<0.05	<0.05
23	Anionic Detergents (max)	mg/l	APHA 23 RD Ed.2017: 5540 C	1.0	<0.2	<0.2
24	Mercury as Hg	mg/l	APHA 23 RD Ed.2017: 3112 B	--	<0.001	<0.001
25	Manganese as Mn	mg/l	APHA 23 RD Ed.2017: 3111 B	--	<0.005	<0.005

Note Above (*) parameters are not in our scope.

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TEST REPORT

(SURFACE WATER QUALITY ANALYSIS REPORT- FEBRUARY-2020)

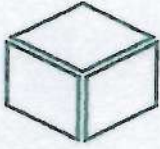
Customer Name & Address	M/S. KATAMATI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Envlab/119/R- 818	Report Release Date	02.03.20
Sample Code	SW1-SW2	Sampled By	VCSPL Representative
Sample Name	Surface Water	Sampled On	10.02.2020
Sample Condition	Ice Preserved	Sampling Location	SW-1 JojoSpring Upstream SW-2 JojoSpring Downstream
Test Started On	11.02.2020	Sample Received On	11.02.2020
		Test Completed On	17.02.2020

Sl. No.	Parameter	Unit	Testing Method	Standards as per IS 2296:1992 Class C	Analysis Results	
					SW-1	SW-2
1	Dissolved Oxygen (minimum)	mg/l	APHA23 rd Edn,2017: 4500 O ₂ C	4	6.4	6.8
2	Total Suspended Solids as TSS	mg/l	APHA23 rd Edn,2017: 2540 C	--	32	40
3	BOD (3) days at 27°C (max)	mg/l	IS 3025 (P-44) 1993 RA 2001	3	3.2	3.8
4	Chemical Oxygen Demand as COD	mg/l	APHA23 rd Edn,2017: 5220 D	--	22	28
5	Total Coli form	MPN/100ML	APHA23 rd Edn,2017: 9221 B	5000	260	320
6	pH Value	--	APHA23 rd Edn,2017: 4500 H'B	6.0-9.0	7.41	7.44
7	Colour (max)	Hazen	APHA23 rd Edn,2017: 2120 D,C	300	2	2
8	Total Dissolved Solids	mg/l	APHA23 rd Edn,2017: 2540 D	1500	148.0	152.0
9	Copper as Cu (max)	mg/l	APHA23 rd Edn,2017: 3111 B,C	1.5	<0.05	<0.05
10	Iron as Fe (max)	mg/l	APHA23 rd Edn,2017: 3111 B	0.5	0.48	0.52
11	Chloride (max)	mg/l	APHA23 rd Edn,2017: 4500 Cl B	600	32.0	36.0
12	Sulphates (SO ₄) (max)	mg/l	APHA23 rd Edn,2017: 4500 SO ₄ E	400	5.2	5.8
13	Nitrate as NO ₃ (max)	mg/l	APHA23 rd Edn,2017: 4500 NO ₃ F	50	1.82	1.94
14	Fluoride as F (max)	mg/l	APHA23 rd Edn,2017: 4500 F' C	1.5	0.016	0.026
15	Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	APHA23 rd Edn,2017: 5530 B,D	0.005	<0.001	<0.001
16	Cadmium as Cd (max)	mg/l	APHA23 rd Edn,2017: 3111 B	0.01	<0.001	<0.001
17	Selenium as Se (max)	mg/l	APHA23 rd Edn,2017: 3114 B	0.05	<0.001	<0.001
18	Arsenic as As	mg/l	APHA23 rd Edn,2017: 3114 B	0.2	<0.001	<0.001
19	Cyanide as CN (max)	mg/l	APHA23 rd Edn,2017: 4500 CN C,D	0.05	ND	ND
20	Lead as Pb(max)	mg/l	APHA23 rd Edn,2017: 3111 B	0.1	<0.01	<0.01
21	Zinc as Zn(max)	mg/l	APHA23 rd Edn,2017: 3111 D	15	<0.05	<0.05
22	Hexa Chromium as Cr +6	mg/l	APHA23 rd Edn,2017: 3111 B	0.05	<0.05	<0.05
23	Anionic Detergents (max)	mg/l	APHA23 rd Edn,2017: 5530 C	1	<0.2	<0.2
24	Mercury as Hg	mg/l	APHA23 rd Edn,2017: 3112 B	--	<0.001	<0.001
25	Manganese as Mn	mg/l	APHA23 rd Edn,2017: 3111 B	--	<0.005	<0.005

Note Above (*) parameters are not in our scope. Note: CL: Colorless, ND: Not Detected.
BOD: (Below Detectable Limit) Values: Cu: 0.02 mg/l, Mn: 0.05 mg/l, C₆H₅OH: 0.03 mg/l, Hg: 0.001 mg/l, Cd: 0.01 mg/l, Se: 0.001 mg/l, As: 0.001 mg/l, CN: 0.01 mg/l, Pb: 0.01 mg/l, Zn: 0.02 mg/l, Cr⁶⁺: 0.01 mg/l, Al: 0.01 mg/l, B: 0.1 mg/l, Hg: 0.001 mg/l, BOD: 1.5 mg/l, COD: 2 mg/l, DO: 1.5 mg/l

1. The test values are reported based on the samples received. 2. Samples will be destroyed after 7 days from date of issues of test report subject to nature of preservation. Sample will be preserved as per standard method.

Authorized Signatory
P. Subey
VISIONTEK CONSULTANCY SERVICES LTD



Visiontek Consultancy Services Pvt. Ltd.

(An Enviro Engineering Consulting Cell)
(ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified)



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Certificate No.: TC-7944
Format No.: 7.8.2/FMT/TR/06

TEST REPORT

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Envilab/19/R-149	Report Release Date	02/01/19
Sample Code	SW5- SW6	Sampled By	VC SPL Representative
Sample Name	Surface Water	Sampled On	20.12.2018
Sample Condition	Sealed , Ice preservative	Sampling Location	SW-5: Murga Nallah U/S (Mahadev Nalla) SW-6: Murga Nallah D/S (Mahadev Nalla)
Test Started On	21.12.2018	Sample Received On	21.12.2018
		Test Completed On	27.12.2018

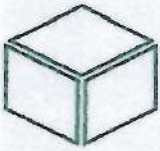
Sl. No.	Parameter	Testing Method	Unit	Standards as per IS 2296:1991 Class C	Analysis Results	
					SW-5	SW-6
1	Dissolved Oxygen (minimum)	APHA 4500O-C	mg/l	4	5.6	6.2
2	Total Suspended Solids as TSS	APHA 2540 D	mg/l	-	46	52
3	BOD (3) days at 270C (max)	IS 3025(P-44) 1993	mg/l	3	1.8	2.6
4	Chemical Oxygen Demand as COD	APHA 2320 B	mg/l	--	20	28
5	*Total Coli form	APHA 9221 B	MPN/100ML	5000	160	210
6	pH Value	APHA 4500H+B	-	6.0-9.0	7.38	7.51
7	*Colour (max)	APHA 2120 B,C	Hazen	300	1	3
8	Total Dissolved Solids	APHA 2540 C	mg/l	1500	145.0	160.0
9	Copper as Cu (max)	APHA 3111 Cu B	mg/l	1.5	<0.05	<0.05
10	Iron as Fe (max)	APHA 3111 B	mg/l	0.5	0.41	0.46
11	Chloride (max)	APHA 4500 Cl-B	mg/l	600	24.0	28.0
12	*Sulphates (SO ₄) (max)	APHA 4500 SO ₄ ²⁻ E	mg/l	400	3.9	4.2
13	*Nitrate as NO ₃ (max)	APHA 4500 NO ₃ ⁻ E	mg/l	50	2.10	2.60
14	*Fluoride as F (max)	APHA 4500F C	mg/l	1.5	0.061	0.064
15	*Phenolic Compounds as C ₆ H ₅ OH (max)	APHA 5530 B,D	mg/l	0.005	<0.001	<0.001
16	Cadmium as Cd (max)	APHA 3111 B	mg/l	0.01	<0.001	<0.001
17	*Selenium as Se (max)	APHA 3114 B	mg/l	0.05	<0.001	<0.001
18	*Arsenic as As	APHA 3114 B	mg/l	0.2	<0.001	<0.001
19	*Cyanide as CN (max)	APHA 4500 CN ⁻ C,D	mg/l	0.05	ND	ND
20	Lead as Pb(max)	APHA 3111 B	mg/l	0.1	<0.01	<0.01
21	Zinc as Zn(max)	APHA 3111 B	mg/l	15	<0.05	<0.05
22	*Hexa Chromium as Cr +6	APHA 3500Cr B	mg/l	0.05	<0.05	<0.05
23	*Anionic Detergents (max)	APHA 5540 C	mg/l	1	<0.2	<0.2
24	Mercury as Hg	APHA 3112 B	mg/l	-	<0.001	<0.001
25	Manganese as Mn	APHA 3111 B	mg/l	-	<0.005	<0.005

Note Above (*) parameters are not in our scope. Note: CL: Colorless, ND: Not Detected.

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Authorized Signatory

 P. S. Parashar
 Visiontek Consultancy Services Pvt. Ltd.



Visiontek Consultancy Services Pvt. Ltd.

(An Enviro Engineering Consulting Cell)

(ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified)



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Certificate No.: TC-7944
Format No.: 7.8.2/FMT/TR/06

TEST REPORT

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Env/05/19/R-472	Report Release Date	02/01/19
Sample Code	SW1- SW2	Sampled By	VCSPL Representative
Sample Name	Surface Water	Sampled On	20.12.2018
Sample Condition	Sealed , Ice preservative	Sampling Location	SW-1: Baitarani River U/S SW-2: Baitarani River D/S
Test Started On	21.12.2018	Sample Received On	21.12.2018
		Test Completed On	27.12.2018

Sl. No.	Parameter	Testing Method	Unit	Standards as per IS 2296:1991 Class C	Analysis Results	
					SW-1	SW-2
1	Dissolved Oxygen (minimum)	APHA 4500O-C	mg/l	4	5.8	5.9
2	Total Suspended Solids as TSS	APHA 2540 D	mg/l	--	40	42
3	BOD (3) days at 270C (max)	IS 3025(P-44) 1993	mg/l	3	2.2	2.4
4	Chemical Oxygen Demand as COD	APHA 2320 B	mg/l	--	32	38
5	*Total Coli form	APHA 9221 B	MPN/100ML	5000	180	260
6	pH Value	APHA 4500H+B	--	6.0-9.0	7.26	7.48
7	*Colour (max)	APHA 2120 B,C	Hazen	300	1	2
8	Total Dissolved Solids	APHA 2540 C	mg/l	1500	156.0	162.0
9	Copper as Cu (max)	APHA 3111 Cu B	mg/l	1.5	<0.05	<0.05
10	Iron as Fe (max)	APHA 3111 B	mg/l	0.5	0.36	0.41
11	Chloride (max)	APHA 4500 Cl-B	mg/l	600	27.0	30.0
12	*Sulphates (SO ₄) (max)	APHA 4500 SO ₄ ²⁻ E	mg/l	400	3.5	4.9
13	*Nitrate as NO ₃ (max)	APHA 4500 NO ₃ E	mg/l	50	1.45	1.57
14	*Fluoride as F (max)	APHA 4500F C	mg/l	1.5	0.051	0.058
15	*Phenolic Compounds as C ₆ H ₅ OH (max)	APHA 5530 B,D	mg/l	0.005	<0.001	<0.001
16	Cadmium as Cd (max)	APHA 3111 B	mg/l	0.01	<0.001	<0.001
17	*Selenium as Se (max)	APHA 3114 B	mg/l	0.05	<0.001	<0.001
18	*Arsenic as As	APHA 3114 B	mg/l	0.2	<0.001	<0.001
19	*Cyanide as CN (max)	APHA 4500 CN C,D	mg/l	0.05	ND	ND
20	Lead as Pb(max)	APHA 3111 B	mg/l	0.1	<0.01	<0.01
21	Zinc as Zn(max)	APHA 3111 B	mg/l	15	<0.05	<0.05
22	*Hexa Chromium as Cr +6	APHA 3500Cr B	mg/l	0.05	<0.05	<0.05
23	*Anionic Detergents (max)	APHA 5540 C	mg/l	1	<0.2	<0.2
24	Mercury as Hg	APHA 3112 B	mg/l	--	<0.001	<0.001
25	Manganese as Mn	APHA 3111 B	mg/l	--	<0.005	<0.005

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(Council of Scientific & Industrial Research)
BARWA ROAD, DHANBAD – 826 015



REPORT ON

**ADVICE FOR IMPROVEMENT IN ROCK FRAGMENTATION TO
ENHANCE PRODUCTION AND PRODUCTIVITY WITH GREATER
SAFETY AT NOAMUNDI IRON MINE OF TATA STEEL LIMITED**



Project No. CNP/4821/2019-20

January 2020

CSIR-CENTRAL INSTITUTE OF MINING & FUEL RESEARCH
(Council of Scientific & Industrial Research)
BARWA ROAD, DHANBAD – 826 015



REPORT ON

**ADVICE FOR IMPROVEMENT IN ROCK FRAGMENTATION TO
ENHANCE PRODUCTION AND PRODUCTIVITY WITH GREATER
SAFETY AT NOAMUNDI IRON MINE OF TATA STEEL LIMITED**

BY

Dr. M. P. Roy,	Principal Scientist & Project Leader
Dr. R. K. Paswan,	Scientist
Mr. V. K. Himanshu,	Scientist
Mr. R. K. Singh,	Sr. Technical Officer
Mr. R. S. Yadav,	Sr. Technical Officer
Mr. Suraj Kumar	Technical Officer
Dr. C. Sawmliana,	Sr. Principal Scientist & HOS
Dr. P. K. Singh,	Director & HORG

Project No. CNP/4821/2019-20

January 2020

Project Title

Advice for improvement in rock Fragmentation to enhance production and productivity with greater safety at Noamundi Iron Mine of Tata Steel Limited

Project No.: CNP/4821/2019-20

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Since the day-to-day blasting operations are not under the control of CSIR-CIMFR, the research team will not be held responsible for any untoward incidence caused by blasting.

SIGNATURE OF THE PROJECT PROPONENTS

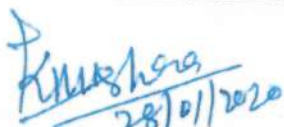
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EXECUTIVE SUMMARY

This report relates to the study conducted by CSIR-Central Institute of Mining and Fuel Research (CIMFR), Dhanbad to optimise the blast design parameters at Noamundi Iron mine of Tata Steel to achieve optimum fragmentation and to control vibration, air over-pressure/noise and fly rocks within safe limits for the safety of buildings and other structures in close proximity to the mine. The study involved experimental trials with varying blast designs and charging patterns, monitoring of ground vibration and air over-pressure/noise in the concerned locations/villages. The results of investigation, analyses of data are summarised below:

- ❖ Four blasts were conducted at different benches of Noamundi Iron mine. The maximum vibration recorded was 9.49 mm/s with dominant peak frequency of 5.75 Hz. The blast monitoring instrument was placed at Chemical filling station (at 130 m) from the Hill 04, 588 mRL bench face of Hill 04. In the same blast the vibration recorded near Mine Canteen (at 612 m from the blast face) was 2.59 mm/s with dominant peak frequency of 7.375 Hz.
- ❖ The maximum air over-pressures recorded was 124.4 dB (L) at 150 m Near Mine Pit office due to the blast conducted at Hill 04 face, 588 mRL on 24.05.2019. There was no ejection of fly rocks.
- ❖ All the recorded data (blast vibrations, air overpressures and fly rocks) were well within the safe limits at the houses/structures concerned in the periphery of the mine. The dominant peak frequencies of ground vibrations were in the range of 4.188 to 7.375 Hz. So, the safe level of vibration has been taken as 5 mm/s for the safety of houses/structures not belonging to owner and 10 mm/s for the houses/structures belonging to owner as per DGMS standard.
- ❖ The recorded in-the-hole VODs of the SME explosives of M/s IDL Explosives Limited was found in the range of 4521 to 5230 m/s. The surface VOD of emulsion boosters (125 gm) of M/s IDL Explosives Limited was recorded 5494 m/s. The density of the rock is very high (4.2 gm/cm^3), so the high strength explosives (in-the-hole VOD of explosives of more than 4800 m/s) are essentially required to achieve desired fragmentation.
- ❖ The scattering issue should be addressed to the suppliers/manufacturers. Scattering tests of delay detonators revealed that the sequence of detonation is not in order for few delays and scattering was observed in the entire NONEL delay detonator, which requires attention. In terms of controlling ground vibration amplitudes and frequencies, the choice of delay times is also crucial.
- ❖ The blast designs followed during the blasting were found to be safe. The analyses of data with linear superposition technique confirmed that the delay interval between the rows should be 25-30 ms/m of effective burden.
- ❖ The recommended blast designs (Figures A1) should be followed in day-to-day blasting operations for safe and efficient blasting operations with judicious modifications.

1. Introduction

The Purchase Department of OMQ, Noamundi, Tata Steel Ltd. entrusted CSIR-Central Institute of Mining and Fuel Research, Dhanbad, vide work order No. 3000120410/962 dated 13/17.07.2018 for scientific study to advice for improvement in rock fragmentation to enhance production and productivity with greater safety at Noamundi, Katamati, Joda East and Khondbond Iron Mines of M/s Tata Steel Ltd. The Research team from Rock Excavation Engineering Division of CSIR-CIMFR, Dhanbad carried out field investigations at Noamundi iron Mine of Tata Steel on 1st September 2018, 15th March 2019, 24th May 2019 and 24th July, 2019.

Four blasts were conducted at different benches of the Noamundi Iron Mine. The study involved experimental trials with varying blast designs and charging patterns, monitoring of ground vibration and air over-pressure/noise in the proximity to the mine. The fragmentation analyses were carried out for all the blasts. The outcome of the study was presented to the concerned mine officials for improvement in blasting operations after completion of visit.

The Site Mixed Emulsion (SME) explosives of M/s IDL explosives Limited were used in all these blasts. The SME explosive in a hole varied from 84 - 156 kg depending upon the depth of hole and the effective burden in front of the concerned hole. The cup density of SME explosives at the time of charging was in the range of 1.30 - 1.32 gm/cm³ and after gassing of 20 minutes it was found in between 1.05 - 1.1 gm/cm³. The pyrotechnic initiation systems (Nonel) and Electronic detonators (Ikon) initiation system were used in the blasts. Blast vibrations were monitored at important locations in the periphery of the mine.

2. Location & Geology

Noamundi is located at latitude/longitude of 22°15 00 N, 85°5 00 E. It has an average elevation of 487 meters (1597 feet) above MSL. The area falls in the Survey of India toposheet No. 73F/8 and 12. The place is connected by rail with Chaibasa district headquarters through Tatanagar-Gua branch of the S.E. Railway. Noamundi is located in the heart of Saranda forest, which is the densest deciduous forest of Asia. Noamundi iron ore deposit, one of the largest concentrations of iron ore deposit of India, lies in the southern Singhbhum district of Jharkhand state.

In Noamundi, iron ore occurs in parallel ridges referred to as eastern ridge and western ridge. The major product of the mines is iron ore (including blue dust-a high grade variety). Hematite ores of the Iron Ore Group in the Noamundi area are hosted by extensive, 220 m thick Banded Iron Formation (BIF) in a folded greenstone belt succession of Paleoproterozoic age (Nicolas et al. 2008). The quality of iron ores in the Noamundi region varies from low to high-grade and includes banded hematite jasper, ferruginous shale, brown powdery ore (brown dust) and blue dust.

3. Instrumentations

Blast induced vibrations were monitored by seismographs namely MiniMate Plus (Made in Canada by M/s Instantel Inc.). The MiniMate plus is an eight/four channel seismograph

provided with two/one tri-axial transducer for monitoring vibration (in mm/s) and two/one channel for monitoring air over-pressure/noise in dB(L) or Pa. The seismographs record vibration in three directions i.e. Longitudinal (L), Vertical (V) and Transverse (T). They also record peak frequency of vibration and compute the peak vector sum of the vibration.

The in-the-hole VOD of the explosives was recorded with the help of DataTrap-II (Made in Canada by M/s MREL Group of Companies). This is eight channel continuous VOD/Data recorder which can record VOD of explosives in the blast hole at the time of detonation. Blast face profiling was performed with Burden Ace before blasting. The Burden Ace is capable of profiling the blast face in two dimensions. The rock fragmentation analyses were carried out with the help of WipFrag software of M/s WipWare Inc., Canada.

Blaster's Ranger II™ high speed digital video camera system (made in Canada by M/s MREL Group of Companies Limited) was used to obtain the location of the first rock movement and the shape of the face movement; the firing sequence of the blast; the occurrence of gas venting at the face; the degree of confinement due to stemming; the occurrence and location of misfires; the nature of the muck-pile formation; the onset time for rock movement (both at the face and at the top of the bench); the hole venting and stemming ejection velocities; the actual hole/deck delay times; and the casting range of the muck.

4. Blasting details

Four blasts were conducted at different benches of the Noamundi Iron mine. Blast holes of 150 & 165 mm diameter was drilled for hole depth between 6 m to 12 m. Holes were charged with SME explosives of M/s IDL with average weight of explosive in a hole varying between 84 kg to 156 kg depending upon the bench height and effective burden in front of the hole. The total explosives weight detonated in a blasting round were between 4380 kg to 12645 kg with explosive weights per delay of 260 kg to 312 kg. Out of four blasts, three blasts were initiated with Nonel initiation system and Electronic initiation system was used in one blast. A view of blasting face along with charging for different benches has been shown in Photograph 1.



Photograph 1. View of the blast faces along with charging of blast holes at Noamundi Iron Mine, Tata Steel Limited.

5. Monitoring of blast vibration

The vibration monitoring locations were finalised in consultation with the mine officials. Seismographs were placed Near GM office, Near Mechanical shed, near rest shelter, near weighing Bridge, Near Chemical filling point, Near Mine pit office, 500 TPH, Near Mine Canteen to record the vibrations and air overpressure. The maximum vibration recorded was 9.49 mm/s with dominant peak frequency of 5.75 Hz recorded at 130 m (at Chemical filling station) from the blasting site (Hill 04, 588 mRL bench). In the same blast the vibration recorded near Mine Canteen (at 612 m from the blast face) was 2.59 mm/s with dominant peak frequency of 7.375 Hz. The maximum air over-pressures recorded was 124.4 dB (L) at 150 m Near Mine Pit office due to the same blast conducted on 24.05.2019. The blast wave signature recorded at 80 m (near GM Office) from the blast conducted at 604 mRL bench of western pit and their Fast Fourier Transform (FFT) analyses of frequency of vibration are shown in Figure 1 and Figure 2 respectively. It is evident from the FFT analyses that concentration of vibration energy is within 4.188 Hz – 7.375 Hz. The ground vibration and air over-pressure/noise data recorded at various locations are given in Annexure as Table A2. Blast vibration monitoring locations in the periphery of the mine is shown in Photograph 2.

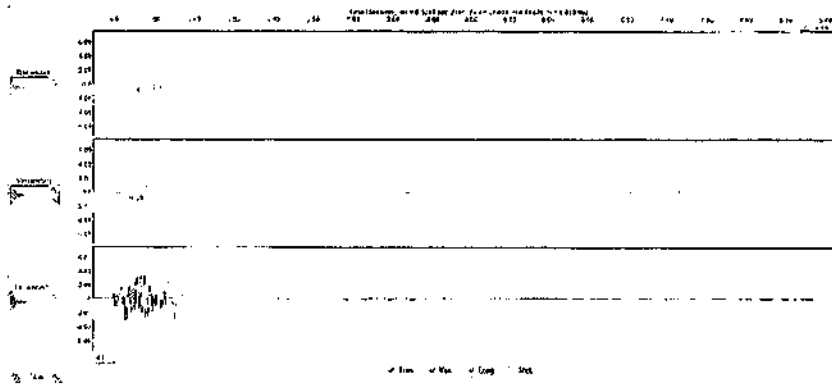


Figure 1. Blast time history recorded near GM Office at 80 m distance from the blast conducted at western pit, 604 mRL bench on 01.09.2018.

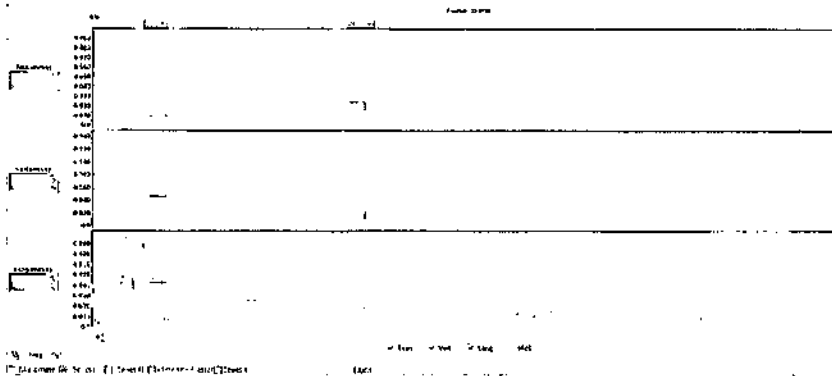


Figure 2. FFT analyses of recorded vibration data as presented in Figure 1.



Photograph 2. Monitoring of vibration at different locations of the Noamundi Iron mine of Tata Steel Ltd.

6. Existing vibration standard and criteria to prevent damage

Peak particle velocity has been globally used in practice for assessment of blast induced damage to structures. Different countries adopt different standards depending on their type of industrial/residential buildings. In India, presently DGMS technical circular 7 of 1997 is considered as vibration standard for the safety of surface structures in mining areas. The DGMS standard is given in Table 3.

Table 1. DGMS technical circular 7 of 1997, concerning to blast vibration standard in mm/s.

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

7. Air over-pressure/noise

Air overpressure in the mining or quarrying context is the superposition of a number of impulsive air pressures as a result of the detonation of explosive in the ground. Air over-pressure can be measured in pressure unit as well as sound pressure level (SPL).

$$\text{SPL (dB)} = 20 \log (p/p_0)$$

Where, p = measured over-pressure in Pascal (pa)

p_0 = reference pressure level of the lowest sound that can be heard, i.e.,
zero dB = 2×10^{-5} pa.

United State Bureau of Mines (USBM) has correlated the damage due to air over-pressure. The recommended values are given below:

Over-pressure (dB)	Over-pressure (KPa)	Air Blast Effects
177	14	All windows break
170	6	Most windows break
150	0.63	Some windows break
140	0.20	Some large plate glass windows may break, desk and windows rattle
136	0.13	USBM interim limit for allowable air blast
126	0.05	Complaints likely

The maximum air over-pressures recorded was 124.4 dB (L) at 150 m Near Mine Pit office due to the blast conducted at Hill 04, 588 mRL face on 24.05.2019. There was no ejection of fly rocks. The threshold level of air over pressure/noise is 136 dB (L) as per USBM standard.

8. Monitoring of in-the-hole Velocity of Detonation (VOD) of explosive

The performance of explosives depends upon a number of parameters and VOD is one of the important parameters. The detonation pressure associated with the reaction zone of a detonating explosive is directly proportional to the square of its VOD. It is measured in the C-J plane, behind the detonation front, during propagation through the explosive column. The detonation pressure (P_d) can be estimated by the following formula.

$$P_d = \frac{1}{2} \rho_e (VOD)^2 10^{-6}$$

Where,

P_d = Detonation pressure (MPa)

ρ_e = Density of explosive (kg/m^3)

VOD = Velocity of detonation (m/s)

Uniform VOD is essentially required throughout the blast holes in harder formations in order to produce sufficient detonation pressure to the borehole walls. Booster is provided in the explosive column at bottom to sustain and maintain the VOD for the uniform breakage of rock. In-the-hole VOD of SME explosives of M/s IDL explosive Limited & Boosters of 125 mm of M/s IDL explosive Limited recorded in different visits at Noamundi Iron Mine of Tata Steel under various conditions during July 2018 to July 2019. The recorded in-the-hole VODs of the SME explosives were in the range of 4521-5230 m/s at different locations of Noamundi Iron Mine. Figure 3 depicts one of the recorded in-the-hole VOD of M/s IDL explosives limited recorded at 648 mRL bench blast face on 15.03.2019 bench face of Noamundi Iron mine. The surface VOD of Boosters (125mm) of M/s IDL explosive Limited is presented in Figure 4. Plot of recorded VOD of SME explosives of M/s IDL explosive Limited is presented in Figure 5 during the different visits of Noamundi Iron mine at different locations during July 2018 to July 2019.

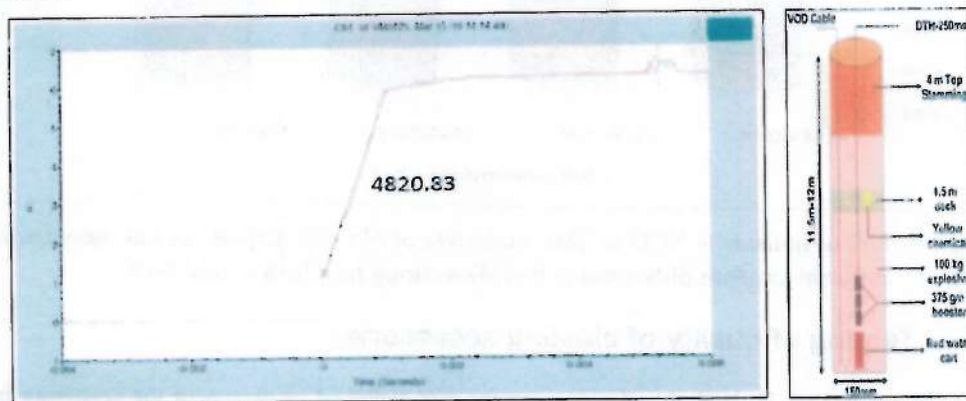


Figure 3. Trace of in-the-hole VOD of SME explosives of M/s IDL Explosives Ltd. recorded at 648 mRL bench blast face of Noamundi Iron Mine on 15.03.2019.

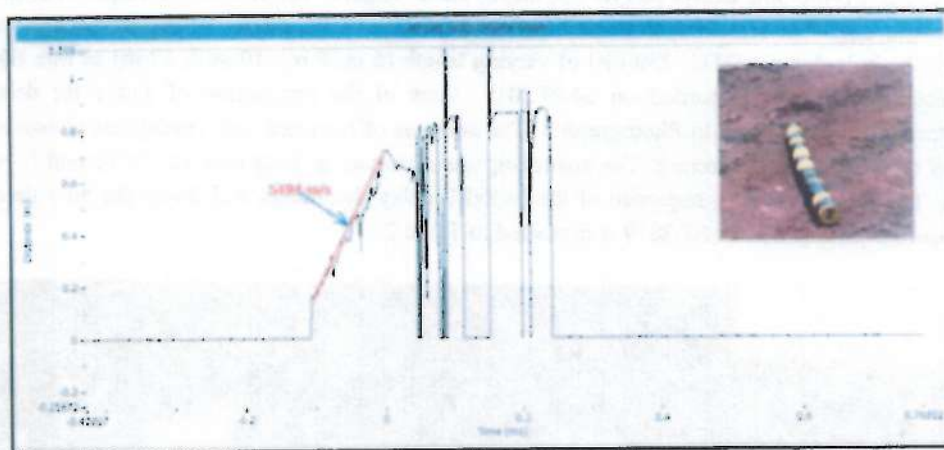


Figure 4. Trace of surface VOD of Emulsion booster explosives (125 gm) of M/s IDL Explosives Ltd. recorded at Hill-3 bottom bench blast face of Noamundi Iron Mine on 24.07.2019.

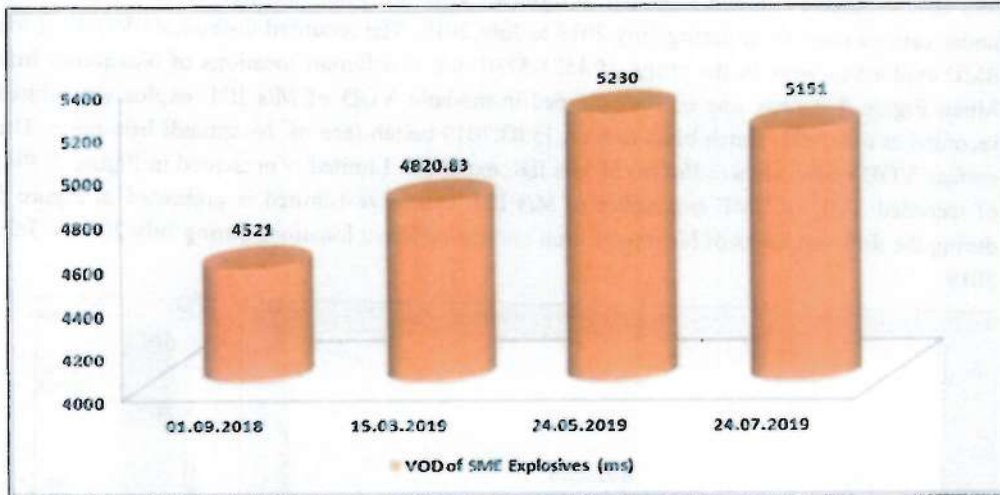


Figure 5. Plot of in-the-hole VOD of SME explosives of M/s IDL Explosives Ltd. recorded at different locations of Noamundi Iron Mine during July 2018 to July 2019.

9. Testing of quality of blasting accessories

The Blaster Ranger II, High speed video camera was deployed to document the scattering in shock tube (NONEL) delay detonators. Scattering test was conducted in both the visits. During the financial year 2018-2019 visit scattering of trunk line delays (TLD – 42 ms, 65 ms & 100 ms) and down-the-hole delays (DTH- 250 ms) of same length (5 m) of M/s IDL Explosives Ltd. were recorded. The scattering in trunk line delays (TLD – 17 ms, 42 ms, 65 ms & 100 ms) and down-the-hole delays (DTH- 250 ms) of varying length (6 m, 8 m, 10 m & 12 m) of M/s IDL Explosives Ltd. were recorded on 24.07.2019. View of the connection of TLDs for delay scattering test is depicted in Photograph 3. The analyses of recorded data reveal that almost all delay detonators has scattering. The scattering was observed in both way i.e. '+ve and '-ve side. The observed firing sequence of the NONEL delay detonators and down the hole delay detonators recorded on 24.07.2019 is presented in Table 2.



Photograph 3. Field arrangement to record the actual firing time of Trunk line delays (TLD) with the help of High Speed Video Camera.

Table 2. Results of quality test of Nonel delay detonators for surface and down the hole delays.

Date of Recording	TLD/DTH	Design Firing Time [ms]	Actual Firing Time [ms]	Scattering [ms]	% of scattering
24.07.2019	TLD-42 (5m)	42	39	-3	-7.1
24.07.2019	TLD-42 (5m)	42	42	0	0.0
24.07.2019	TLD-65 (5m)	65	61	-4	-6.2
24.07.2019	TLD-65 (5m)	65	57	-8	-12.3
24.07.2019	TLD-100 (5m)	100	101	1	1
24.07.2019	TLD-100 (5m)	100	98	-2	-2
24.07.2019	DTH-250 (6m)	250	243	-7	-2.8
24.07.2019	DTH-250 (6m)	250	245	-5	-2
24.07.2019	DTH-250 (8m)	250	240	-10	-4
24.07.2019	DTH-250 (8m)	250	246	-4	-1.6
24.07.2019	DTH-250 (10m)	250	253	3	1.2
24.07.2019	DTH-250 (10m)	250	248	-2	-0.8
24.07.2019	DTH-250 (12m)	250	5	-245	-98
24.07.2019	DTH-250 (12m)	250	235	-15	-6

Analysis of the recorded data of high speed video camera for NONEL scattering test confirmed that scattering was observed in all the delay detonators. The delay scattering value ranged from (-) 98 to 1.2 %. The acceptable scatterings for TLDs are ± 5 ms and for DTHs are ± 10 ms. The scattering issue should be addressed to the suppliers/manufacturers. Scattering tests of delay detonators revealed that the sequence of detonation is not in order for few delays and scattering was observed in the entire NONEL delay detonator, which requires attention.

10. Rock fragmentation analyses

The blast detonations were photographed and there was no ejection of flyrocks. The fragmentation achieved from this blast was excellent. The blasted muck pile was properly distributed for loading. The view of the muck pile and fragmentation resulted from the blast conducted at different locations of Noamundi Iron Mine is presented in Photograph 4.



Photograph 4. View of the blasted muck and fragmentation of the blasts conducted at different locations of Noamundi Iron Mine.

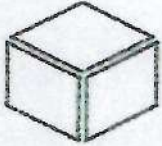
11. Conclusions and recommendations

- ❖ The maximum vibration recorded was 9.49 mm/s with dominant peak frequency of 5.75 Hz recorded at 130 m (at Chemical filling station) from the blasting site (588 mRL Hill 04). In the same blast the vibration recorded near Mine Canteen (at 612 m from the blast face) was 2.59 mm/s with dominant peak frequency of 7.375 Hz. It indicates that fast attenuation of vibration magnitude was recorded.
- ❖ The maximum air over-pressures recorded was 124.4 dB (L) at 150 m Near Mine Pit office due to the blast conducted at 588 mRL Hill 04 face on 24.05.2019.
- ❖ All the vibration data recorded at concerned locations were well within the safe limits. The blast detonation was photographed and there was no ejection of flyrocks. The fragmentations achieved from the blasts were excellent. The blasted muck pile was properly distributed for loading.
- ❖ The recorded in-the-hole VODs of the SME explosives of M/s IDL Explosives Limited was found in the range of 4521 – 5230 m/s. The surface VOD of emulsion boosters (125 gm) of M/s IDL Explosives Limited was detected 5494 m/s. The density of the rock is very high (4.2 gm/cm³), so the high strength explosives (in-the-hole VOD of explosives of more than 4800 m/s) are essentially required to achieve desired fragmentation. It is recommended that in case of emulsion boosters the desired amount of emulsion booster (0.2 % of column charge) must be used to ensure better runoff of VOD of explosives.
- ❖ The depth of holes should be decided on the basis of the bench height. The sub-grade length should be 5% of the bench height in case of bottom initiation.
- ❖ The delay interval between the rows in a blast should be from 65ms to 130ms depending upon the number of rows in a blast round. Analysis of the recorded data of high speed video camera for NONEL scattering test confirmed that scattering was observed in all the delay detonators. The delay scattering value ranged from (-) 98 % to 1.2 %. The acceptable scatterings for TLDs are ± 5 ms and for DTHs are ± 10 ms. The scattering issue should be addressed to the suppliers/manufacturers. Scattering tests of delay detonators revealed that the sequence of detonation is not in order for few delays and scattering was observed in the entire NONEL delay detonator, which requires attention. In terms of controlling ground vibration amplitudes and frequencies, the choice of delay times is also crucial.
- ❖ Marking of the position of shot holes especially in front rows should be done after thorough checking of the bench face and the toe in front of the respective holes. Drilling of shot holes, charge distribution and initiation sequences are the key parameters affecting blast results.
- ❖ The decking must be preferred, when there is a chance of generation of the boulders from the top portion of the bench. Decking should be at least 12 times of diameter of the drilled hole and it should not be more than 17 times of drill diameter. The stemming should not be less than 0.7 times of burden.

- ❖ The recommended blast designs (Figures A1) should be followed in day-to-day blasting operations for safe and efficient exploitation of mineral.

Acknowledgements

The research team is thankful to OMQ, Noamundi, Tata Steel Ltd. for sponsoring the study. The sincere co-operation and help extended to the team by the concerned officials of Noamundi Iron mine in completing the study successfully are thankfully acknowledged.



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Certificate No.: EC-7944

Format No.: 7.8.2/FMT/TR/06

TEST REPORT

(STACK ANALYSIS ANALYSIS REPORT- NOV-2019)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	ENV/106/19/R-6290	Report Release Date	03-12-19
Sample Code	ST-1	Sampled By	VCSP/ Representative
Sample Name	Stack	Sampled On	17.11.2019
Sample Condition	Sealed & Ice Preserved	Sampling Location	ST-1: Dedusting Unit at Primary Crusher
Test Started On	18.11.2019	Sample Received On	18.11.2019
		Test Completed On	25.11.2019

A	General Information about Stack	-	17.11.2019 at 4.05 PM
1	Stack Connected to	:	Dedusting Unit at Primary Crusher
2	Emission due to	:	Process Activities
3	Material of Construction of stack	:	MS
4	Shape of stack	:	Circular
5	Whether stack is provided with permanent platform & ladder	:	Yes
6	Generation capacity	:	---
B	Physical Characteristics of Stack:	-	
1	Height of the stack from ground level	:	15.0m (approx)
2	Diameter of the stack at sampling point	:	0.46m
3	Height of the sampling point from GL	:	9.5m (approx)
4	Area of Stack	:	0.166 m ²
C	Analysis / Characteristic of Stack:	-	
1	Fuel Used	:	---
2	Fuel consumption	:	---
D	Results of Sampling & Analysis of Gaseous Emission	-	Analysis Results
1	Temperature of emission (°C)	:	51.6
2	*Barometric pressure (mm of Hg)	:	714
3	Velocity of gas (m/sec.)	:	23.8
4	Quantity of gas flow (Nm ³ /hr.)	:	6341.6
5	Concentration of particulate Matters (mg/Nm ³)	:	44.2
E	Pollution control Device		
	Details of pollution control		
	Device attached with the stack	:	Pulse jet bag filter
F	Remarks		

Note Above (*) parameters are not in our NABL scope

1. The test values are reported based on the samples received. 2. Samples will be destroyed after 7 days from date of issue of the test report subject to nature of preservation. Sample will be preserved as per standard method.
3. The test report shall not be reproduced, without written approval of laboratory





TEST REPORT (STACK ANALYSIS REPORT- FEBRUARY-2020)

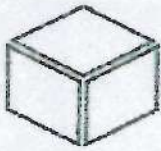
Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Env/102/19/8265	Report Release Date	02.03.20
Sample Code	ST-1	Sampled By	VCSP. Representative
Sample Name	Stack	Sampled On	25.02.2020
Sample Condition	--	Sampling Location	ST1: Dedusting Unit at Primary Crusher
Test Started On	26.02.2020	Sample Received On	26.02.2020
		Test Completed On	29.02.2020

A	General Information about Stack	DOS: 25.02.2020 4.05 PM
1	Stack Connected to	Dedusting Unit at Primary Crusher
2	Emission due to	Process Activities
3	Material of Construction of stack	MS
4	Shape of stack	Circular
5	Whether stack is provided with permanent platform & ladder	Yes
6	Generation capacity	---
B	Physical Characteristics of Stack:	
1	Height of the stack from ground level	15.0m (approx)
2	Diameter of the stack at sampling point	0.46m
3	Height of the sampling point from G.L.	9.5m (approx)
4	Area of Stack	0.166 m ²
C	Analysis / Characteristic of Stack:	
1	Fuel Used	
1	Fuel consumption	---
D	Results of Sampling & Analysis of Gaseous Emission	Analysis Results
1	Temperature of emission (°C)	53.8
2	Barometric pressure (mm of Hg)	714
3	Velocity of gas (m/sec)	26.6
4	Quantity of gas flow (Nm ³ /hr.)	6624.6
5	Concentration of particulate Matters (mg/Nm ³)	48.8
E	Pollution control Device	
	Details of pollution control	Pulse jet bag filter
	Device attached with the stack	
F	Remarks	

Note above (*) parameters are not in our scope.

- The test values are reported based on the samples received. 2. Samples will be destroyed after 7 days from date of issues of the test report subject to nature of preservation. Sample will be preserved as per standard method.
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Certificate No.: TC-7944
Format No.: 7.8.2/FMT/TR/06

TEST REPORT

(DUSTFALL ANALYSIS ANALYSIS REPORT- NOV-2019)

Customer Name & Address	M/s Joda East Iron Mines (M/s TATA Steel Limited)		
Test Report No	Envtlab/19/R-6285	Report Release Date	03.12.19
Sample Code	DF-1	Sampled By	VC/SPI Representative
Sample Name	Dust Fall	Sampled On	17.11.2019
Sample Condition	Sealed & Ice Preserved	Sampling Location	Dust Fall-1: Mines Area
Test Started On	18.11.2019	Sample Received On	18.11.2019
		Test Completed On	25.11.2019

DF-1 Parameters	Analysis Result					
	DF (t/km ² /month)	Ni(%)	Co (%)	Hg(%)	As (%)	Fe (%)
*DF & M	1.82	0.032	0.024	<0.001	<0.001	1.38

Note Above (*) parameters are not in our NABL scope.

1. The test values are reported based on the samples received. 2. Samples will be destroyed after 7 days from date of issues of the test report subject to nature of preservation. Sample will be preserved as per standard method.
3. The test report shall not be reproduced, without written approval of laboratory





TEST REPORT (DUST FALL ANALYSIS REPORT- FEBRUARY-2020)

Customer Name & Address	M/S. NOAMUNDI IRON MINES (M/s TATA Steel Limited)		
Test Report No	Env106/19/R-8287	Report Release Date	02.03.20
Sample Code	DF	Sampled By	VCSPL Representative
Sample Name	Dust Fall	Sampled On	16.02.2020
Sample Condition	--	Sampling Location	S1: Mines Area
Test Started On	17.02.2020	Sample Received On	17.02.2020
		Test Completed On	24.02.2020

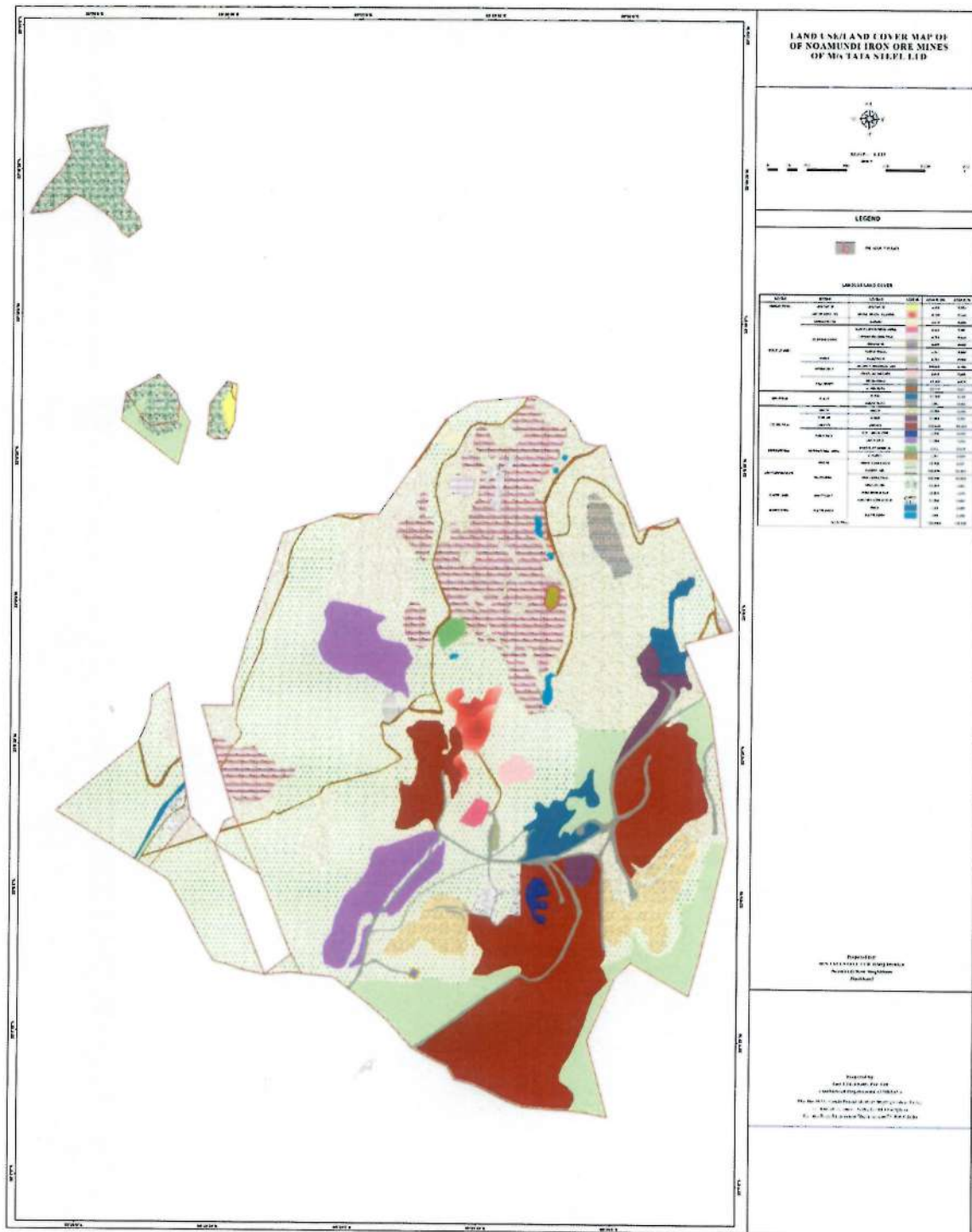
SL.No	Parameters	Unit	Analysis Result
1	*Nickel as Ni	%	0.091
2	*Cobalt as Co	%	0.058
3	*Mercury as Hg	%	<0.001
4	*Arsenic as As	%	<0.001
5	*Iron as Fe	%	1.52
6	*Dust Fall	t/km ² /month	2.8

Note Above (*) parameters are not in our scope.

1. The test values are reported based on the samples received.
2. Samples will be destroyed after 7 days from date of issues of the test report subject to nature of preservation. Sample will be preserved as per standard method.
3. The test report shall not be reproduced, without written approval of laboratory.

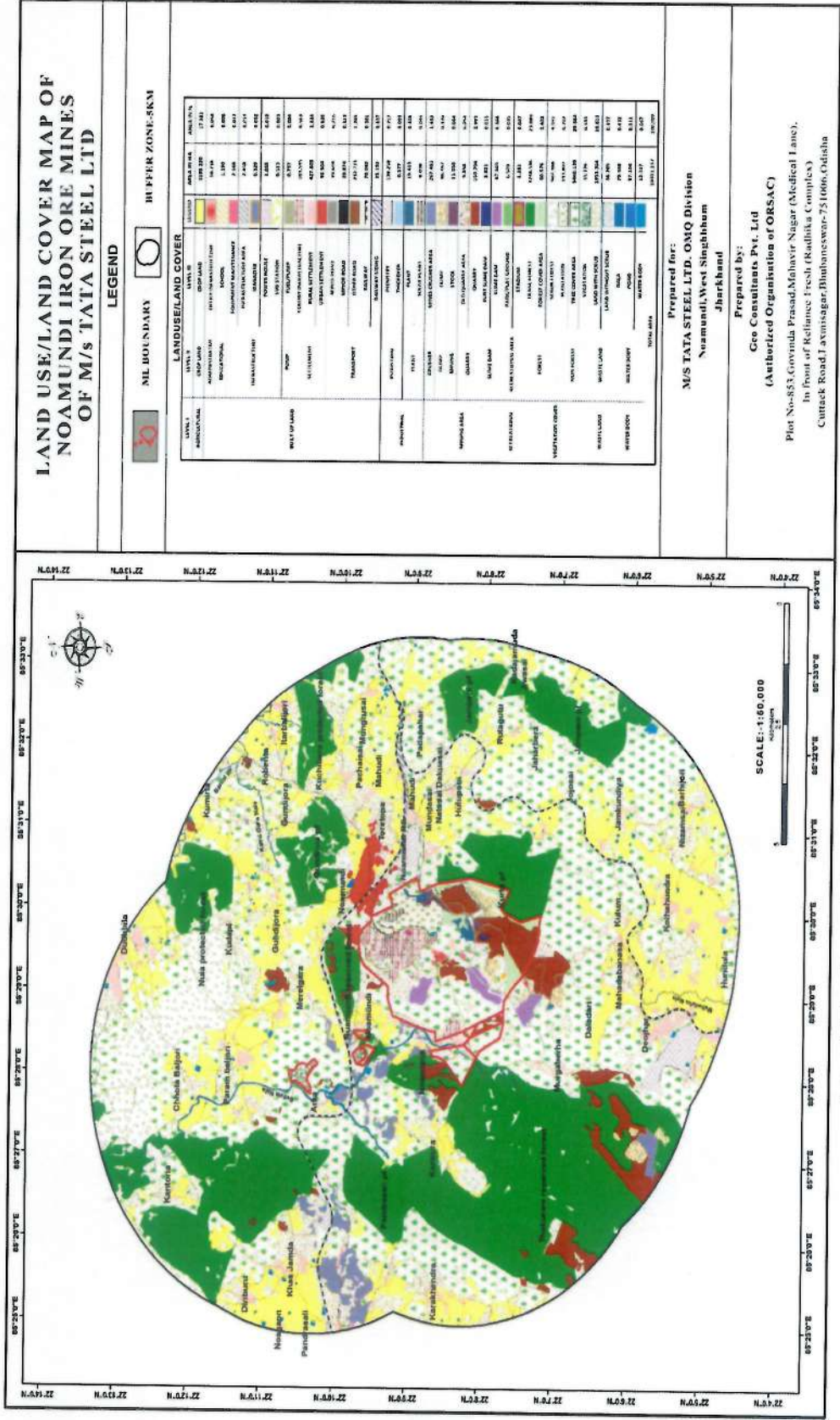


Annexure-VI



Land Use/Land Cover (Core Zone) - Noamundi Iron Mine

The Resource SAT-II with multispectral bands LISS IV & Carto SAT –I with monochromatic band of dates 13.01.2018 (LISS-IV), 03.02.2018 & 02.12.2017 respectively.



Land Use/Land Cover (Buffer Zone) - Noamundi Iron Mine

The Resource SAT-II with multispectral bands LISS IV & Carto SAT -I with monochromatic band of dates 13.01.2018 (LISS-IV), 03.02.2018 & 02.12.2017



ODISHA SPACE APPLICATIONS CENTRE (ORSAC)

Department of Science & Technology, Government of Odisha

No.: 3638(52) Date: 24/11/2017

To

Geo Consultants Pvt. Ltd.
Plot No. 853, Gobindaprasad,
Mahavir Nagar, Cuttack-Puri Road,
Laxmisagar, Bhubaneswar-751006

Sub: Empanellment under DGPS & ETS survey at ORSAC

Sir/Madam,

With reference to the aforementioned subject, I am directed to intimate you that ORSAC is currently in the process of empanellment of new firms. The tenure of existing empanellment of your firm at ORSAC will continue till the fresh empanellment process is completed.

Your present empanellment which expires on date 31.08.2017 is valid till further communication from ORSAC.

Yours faithfully,

Sanjib Kumar Mishra
24.11.2017

SCIENTIST



ODISHA SPACE APPLICATIONS CENTRE (ORSAC)

Department of Science & Technology, Government of Odisha

No.: 2558

Date: 29/8/13

A. K. Mohapatra, IFS
Chief Executive

To

M/s Geo Consultants Pvt. Ltd.,
853, Gobind Prasad (Medical Lane)
Mahavir Nagar,
(In front of Radhika Complex/Reliance Fresh)
Laxmisagar, Bhubaneswar -751 006.

Sub: Empanelment in DGPS & ETS survey at ORSAC.

Sir/Madam,

With reference to your application against ORSAC Advt. No.04/2013 and subsequent technical evaluation, I have the pleasure to inform you that your firm is empanelled at Odisha Space Applications Centre for two years w.e.f 01.09.2013 under the following category.

(A) DGPS & ETS survey

The terms and conditions as mentioned in the RFP document with reference to the ORSAC Advt. No.04/2013 will be maintained during allotment of any project by ORSAC to your firm. In that respect you have to sign a general MOU with ORSAC.

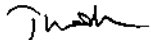
Yours faithfully,

Encl: Format of MOU.


29.08.13
CHIEF EXECUTIVE

**Analysis Report – Free Silica
Noamundi Iron Mine
(October 2019 – March 2020)**

Date of Sampling	Report No.	Free Silica (%)
12.10.2019	ENV LAB/19/R-5250	0.44
05.11.2019	ENV LAB/19/R-6068	0.46
16.12.2019	ENV LAB/19/R-6871	0.62
12.01.2020	ENV LAB/19/R-7225	0.38
05.02.2020	ENV LAB/19/R-8291	0.64
12.03.2020	ENV LAB/19/R-9228	0.66


Lab-in-Charge

**NOAMUNDI IRON MINE
AVERAGE AIR QUALITY REPORT (CORE ZONE)**

Month	MRSS Building				Bottom Bin				GMI's Office				Near Hospital			
	PM ₁₀	PM _{2.5}	SO ₂	NO _x	PM ₁₀	PM _{2.5}	SO ₂	NO _x	PM ₁₀	PM _{2.5}	SO ₂	NO _x	PM ₁₀	PM _{2.5}	SO ₂	NO _x
Oct 19	29.91	15.13	4.20	11.04	37.97	23.22	4.55	17.88	35.06	19.17	4.28	15.91	31.49	16.89	4.14	12.12
Nov 19	54.58	23.73	4.07	11.49	60.52	27.92	4.23	14.56	59.13	26.89	4.17	13.46	57.59	25.66	4.21	14.28
Dec 19	54.29	25.62	4.20	11.78	67.65	46.36	4.41	12.80	63.19	34.61	4.29	14.58	55.43	32.99	4.17	13.94
Jan 20	59.93	28.11	4.58	15.39	68.05	32.23	6.57	17.20	65.09	30.40	6.07	18.78	63.38	30.06	5.28	17.75
Feb 20	66.51	29.71	5.34	16.38	73.59	36.69	5.84	17.13	72.22	35.00	6.80	18.03	70.78	34.34	6.31	17.55
Mar 20	63.98	33.97	4.47	14.81	67.75	37.74	4.48	14.74	66.25	36.19	4.76	16.06	65.91	35.78	4.74	16.70

AVERAGE AIR QUALITY REPORT (BUFFER ZONE)

Month	Mahudi village				Noamundi village				Mirelbera village				Bada Baijori village							
	PM ₁₀	PM _{2.5}	SO ₂	NO _x	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	
Oct 19	40.05	22.43	<4.0	<9.0	0.19	36.90	20.66	<4.0	<9.0	0.19	41.50	23.24	<4.0	<9.0	0.29	41.20	23.07	<4.0	<9.0	0.20
Nov 19	43.70	24.47	<4.0	<9.0	0.22	40.70	22.79	<4.0	<9.0	0.22	43.20	24.19	<4.0	<9.0	0.34	45.20	25.31	<4.0	<9.0	0.25
Dec 19	46.60	26.10	<4.0	<9.0	0.30	48.90	27.38	<4.0	<9.0	0.25	45.70	25.59	<4.0	<9.0	0.36	47.43	26.56	<4.0	<9.0	0.26
Jan 20	48.00	26.88	<4.0	<9.0	0.30	50.50	28.28	<4.0	<9.0	0.29	43.70	24.47	<4.0	<9.0	0.34	48.50	27.16	<4.0	<9.0	0.29
Feb 20	51.00	28.56	<4.0	<9.0	0.34	53.20	29.79	<4.0	<9.0	0.36	58.50	32.76	<4.0	<9.0	0.40	61.20	34.27	<4.0	<9.0	0.36
Mar 20	52.80	29.57	<4.0	<9.0	0.41	57.50	32.20	<4.0	<9.0	0.43	54.50	30.52	<4.0	<9.0	0.34	56.40	31.58	<4.0	<9.0	0.29
Month	Kitabera				Mahadev Nasha village				Kudsum village				Hindula village							
Oct 19	40.85	22.88	5.40	10.9	0.27	38.30	21.45	6.45	11.5	0.22	41.70	23.35	6.85	12.0	0.27	40.00	22.40	5.65	12.85	0.31
Nov 19	49.00	27.44	6.00	11.9	0.29	41.50	23.24	6.65	11.9	0.28	46.40	25.98	7.10	12.9	0.27	48.20	26.99	5.90	13.50	0.35
Dec 19	43.20	24.19	6.45	11.1	0.31	41.50	23.24	6.90	12.6	0.27	44.20	24.75	7.10	12.8	0.33	48.40	27.10	7.45	14.00	0.35
Jan 20	41.20	23.07	6.85	10.7	0.30	41.90	23.46	7.10	12.9	0.29	46.90	26.26	7.65	14.4	0.34	49.70	27.83	8.20	14.65	0.32
Feb 20	49.40	27.66	8.50	11.1	0.34	48.00	26.88	8.20	13.0	0.39	51.40	28.78	8.50	15.5	0.37	54.90	30.74	8.70	15.10	0.37
Mar 20	44.80	25.09	7.65	10.1	0.30	45.40	25.42	7.50	12.1	0.35	50.90	28.50	8.35	14.9	0.38	53.70	30.07	8.40	14.00	0.34

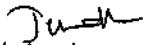
Unit of measurement for all parameters except CO is $\mu\text{g}/\text{m}^3$. Co is in mg/m^3

T. Kulkarni
Lab-in-charge

AMBIENT NOISE QUALITY AT NOAMUNDI

(October 2019 – March 2020)

	Location	Day Time 8.00 am to 10.00 pm	Limits in dB(A) Leq	Night Time 8.00 am to 10.00 pm	Limits in dB(A) Leq
Residential area	Hospital Premises	53.89	55.00	39.31	45.00
	Training Centre	53.27		38.33	
	GM's Office	53.69		38.10	
	Township	54.72		41.39	
Industrial area	Mining area	69.41	75.00	64.12	70.00
	Plant area	73.18		67.60	


 Lab-in-charge

Environmental Expenditure (2019-20)
Noamundi Iron Mine, TATA Steel Ltd

Sl. No.	Heads / Item	Expenditure (Lakhs)	
		Capital	Recurring
1.	General housekeeping at HEMM shed & upkeep of recycling pit at mega center	--	04,11,696.00
2.	Haz. waste disposal to common Haz. Waste facility	--	01,26,315.00
3.	Operation of Parks & Gardens at Railway sidings	--	02,45,232.00
4.	Operation of mobile water sprinklers at Railway sidings	--	11,64,000.00
5.	Spillage recover of material	--	64,00,000.00
6.	Operation & Maintenance of dry fog system at Railway sidings (1000TPH)	--	07,20,000.00
7.	Housekeeping & maintenance of Rapid Loading System, stackers, bins, Over Laying Conveyors at Railway siding areas	--	2,50,00,000.00
8.	Operation & maintenance of STPs & ETPs	--	36,00,000.00
9.	Operation & maintenance of municipal solid waste (collection, segregation, development of compost) in colony & Other area	--	36,00,000.00
10.	Development & maintenance of Gardens	--	1,23,00,000.00
11.	Development of Nursery & sapling for plantation	--	93,00,000.00
12.	Tree Planation & maintenance in & around Noamundi	--	56,28,000.00
13.	Special studies at Noamundi Mines (Biodiversity)	--	10,00,000.00
14.	Environmental monitoring in & around Noamundi	--	10,95,000.00
15.	CAAQMS maintenance & operation & display board	--	5,45,000.00
16.	Desilting of thickeners & check dam, Housekeeping of plant, spillage control measures at Processing plant	--	02,28,30,836.78
17.	Operation & assistance in waste collection & check dam de-siltation, disposal of slime at dump, housekeeping of plant etc	--	00,31,33,284.75
18.	Maintenance & upkeep of High rate Thickener, flocculent addition etc	--	02,72,20,000.00
19.	Water recycling & reusing system in plant	--	05,54,76,000.00
Total			17,97,95,364.53
Environmental Expenditure for the year 2019-20 at Noamundi Iron Mine =~17.97Cr			

Corporate Environmental Expenditure: 2019-20 Noamundi Iron Mine, TATA Steel Ltd

As per Office memorandum, F. No. 22-65/2017-IA.III, dated 1st May 2018 by MoEF&CC.

The Corporate Environmental Expenditure (CER) -cum- Corporate Social Responsibility (CSR) cost details for year 2019-20 for Noamundi Iron Mine are as follows:

Expenditure in Sectors	₹ in Lakhs
Healthcare (MANSI, RISHTA projects, medical camps, OPD, Mega Health camps etc)	62.21
Drinking Water (Solar drinking water projects, tube well repairing, deep bore wells, ring well constructions etc)	19.72
Education (JYOTI fellowship, Financial support to KEMS, Bus services to village students, AKANSHA project, Pre-metric coaching centers, RBC camp schools, School Infrastructures etc)	348.92
Skill Development (ITI jagnathpur, SABAL – Center for disability persons, SAI skill development center, short term vocational training programme, Nursing training etc)	162.34
Agriculture (System of Rice Intensification – to improve the local rice quality by advanced agriculture methods, millet cultivations, kitchen gardens, mushroom cultivations, lac & vegetable farming, ponds & irrigation canal development, exposure visit of farmers, Goatery & fish farming etc)	61.9
Entrepreneurship (Women empowerment etc)	1.41
Sports (Running of sport coaching center (under 10, Under 15, under 18), grassroot football festival etc)	12.49
Infrastructure (Community hall, auditorium, bathing steps in ponds, road (PCC & Moorum), new drains development, beautification of tourist spot etc),	56.62
Ethnicity (Tribal dance competition, tribal language classes, celebration of various tribal important Jayanties & programs etc)	13.86
Administration (New recruitments, & various expenses occurred such as meeting, admin & ITS expenses etc)	168.92
Grand Total	908.39

Corporate Environmental Expenditure for 2019-20 at Noamundi Iron Mine is ~9.08 Cr

