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Regd Post with A/D

Ref.No.: MGM/P&E/1380/18

Date: 27/11/2018

To,

**The Additional Director,
Ministry of Environment and Forest & Climate Change
Eastern Region Office,
A/3, Chandrasekharpur,
Bhubaneswar-751023**

Sub: Submission of Six-monthly EC compliance report on implementation of safeguards in respect of Joda West Iron and Manganese Mine, M/s TATA Steel Ltd. for the period April to September 2018.

Dear Sir,

We are submitting herewith six-monthly EC compliance report on implementation of safeguards in respect of Joda West Iron and Manganese Mine, M/s TATA Steel Ltd. for the period April to September 2018 as per EIA notification 2006.

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

This is for your kind perusal.

Thanking you,

Yours faithfully,

F: TATA STEEL LTD.

Agent, Joda West Iron and Manganese Mine &
Head, Manganese Gr. of Mines
Ferro Alloys & Minerals Division,
Joda.

Encl: as above.

Copy to : Zonal Office Kolkata, Central Pollution Control Board

TATA STEEL LTD.

Ferro Alloys & Minerals Division, Manganese Group of Mines, At/P.O.: Bichhakundi, Via: Joda,
Dist: Keonjhar Odisha – 758 034 Tel.: 9238101370, e-mail : mnminesadmin@tatasteel.com
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COMPLIANCE REPORT PERIOD: April' 18 to Sept' 18

**ENVIRONMENTAL CLEARANCE TO
JODA WEST IRON AND MANGANESE MINE OF TATA STEEL LIMITED
VIDE MoEF's LETTER NO. J-11015/86/2004-1A. II (M) DATED
13.09.2005
COMMENTS SUBMITTED TO THE
MINISTRY OF ENVIRONMENT & FORESTS,
GOVERNMENT OF INDIA**

Present Status of the Project: -

The Scheme of Mining & Progressive Mine Closure Plan from 2013-14 to 2017-18 over an area of 1437.719 ha. has been approved by Indian Bureau of Mines, Bhubaneswar vide letter no. MS/OTFM/47-ORI/BHU/2012-13, Dt.21.05.2013. The review of Mining plan under Rule no. 17(2) of MCR 2016 and submitted under Rule no. 23 of MCDR 2017 with proposal for the period of 2018-2023 is approved vide letter No. MS/OTFM/18-ORI/BHU/2017-18/2016.

Sl. no	A: Specific conditions	Compliance status
1	Mining shall not be undertaken in areas of forestland within the lease without the necessary approvals / forestry clearance.	<p>The mine has obtained the Forest Clearance vide MoEF's letter no. F.No.8-89/2004-FC, dt.10.08.2007 over an area of 436.678 ha of forest land.</p> <p>We have applied for forest diversion over an area of 730. 635 ha on 25.11.2015.</p> <p>Further, in accordance to the MoEF & CC Circular dated F.No.8-78/1996-FC, dated.10.03.2015, the forest area as on 25.10.1980 (i.e. Sabik Settlement) 79.239ha. within the mining lease of 1437.719 ha is now termed as forest land. Hence, fresh forest diversion proposal over an area of 79.239 ha has been applied on 20.06.2016</p> <p>The mining operation and allied activities are confined within the approved diverted area only.</p>
2	Topsoil should be stacked properly with proper slope at earmarked site(s) with adequate measures and should be used for reclamation and rehabilitation of mined out area.	There was no generation of top soil during the period Apr'18 to Sept'18. The top soil so generated previously has been used for plantation purposes.
3	<p>OB and other wastes should be stacked at earmarked sites only and should not be kept active for long periods of time.</p> <p>Plantation should be taken up for soil stabilization along the slopes of the dump and terraced after every 5-6 m of</p>	<p>OB and other wastes are being dumped as per approved Scheme of Mine of Joda West Iron and Manganese Mine.</p> <p>The dump is terraced at every 10m and overall slope is maintained well within 28° as per approved Scheme of Mining. The inactive portion of OB dumps</p>

	<p>height and overall slope angle shall be maintained not exceeding 28°. Sedimentation pits shall be constructed at the corners of the garland drains. Retention/toe walls shall be provided at the base of the dumps.</p>	<p>area being stabilized by plantation of local species.</p> <p>During the year 2018-19, 24345 nos. of saplings were planted. Beside this we also planted around 42536 nos. of vetiver slips.</p> <p>The retaining wall and garland drain with sedimentation pit at corners near toe at low lying area and uplift portion of OB dump has been constructed. Their dimensions are matching the requirements to arrest the run off effectively.</p>
4	<p>Minerals rejects shall be stacked separately at earmarked site/dump only.</p>	<p>The mineral rejects generated during manual processing of manganese ore (i.e. sorting, dressing and sizing) has been stacked separately at earmarked site.</p>
5	<p>Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The drains should be regularly desilted and maintained properly.</p> <p>Garland drains (size, gradient & length) and sump capacity should be designed keeping 50% safety margin over and above the peak sudden rainfall 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.</p> <p>Storm water return system should be provided. Storm water should not be allowed to go to the effluent treatment plant during high rainfall/super cyclone period. A separate storm water sump for this purpose should be created.</p>	<p>Existing catch drains and garland drains are covering the entire dump slope at bottom part. The run off from garland drains are collected in settling/sedimentation pits. The catch drains and sedimentation pits are periodically de-silted and maintained properly.</p> <p>Size, gradient and length of the drains are adequate to take care of the peak flow.</p> <p>A series of check dams and settling pits have been provided for proper settlement of suspended solid in surface runoff.</p>
6	<p>Dimension of retaining wall at the toe of OB dumps and benches within the mine to check run-off and siltation should be based on the rainfall data.</p>	<p>To prevent the siltation and check the run-off, retaining wall and garland drain are provided with the dimension as;</p> <p><u>Dimension of the Retaining Wall:</u> Height – 1 to 1.2 mtr. Width – 1 mtr.</p> <p><u>Dimension of the Garland Drain:</u> Depth – 1.20 to 1.5 mtr. Width – 1 to 1.2 mtr.</p> <p>A multi-stage sedimentation basin with check dam had been provided at H' Quarry to prevent direct flow of surface run off to Kundra Nallah, a perennial source of water flowing along the western lease boundary.</p>
7	<p>Trace Metals such as Ni, Co, As and Hg should be analyzed in dust fall and soil samples for at least one year during</p>	<p>Samples have been analyzed in dust fall & soil during summer season and monsoon season.</p>

	summer, monsoon and winter seasons. If concentrations of these metals are found below the standards then with prior approval of MOEF this specific monitoring could be discontinued.	The detail analysis result is enclosed as Annexure-IX (Dust Fall) & Annexure -X (Soil) .
8	<p>Mine Mineral and OB transportation shall be in trucks/dumpers covered with tarpaulins.</p> <p>Vehicular emissions should be kept under control and regularly monitored.</p> <p>Suitable measures should be taken to check fugitive emissions from haulage roads & transfer points, etc.</p>	<p>The trucks are being covered with tarpaulin during dispatch of manganese ore from mine to Ferro Alloys Plant and Railway Siding located at Joda. OB is being transported by shovel – dumper combination from mine face to dumps located near the quarry itself within 1.5 Km. So, it is not in practice to cover the OB transportation trucks with tarpaulin.</p> <p>All the trucks meant for transportation of mineral from mine to our captive plant & railway siding at Joda is bearing the “Pollution under Control” certificate. The emissions are under control.</p> <p>There is provision of water sprinkling by mobile water sprinklers to suppress fugitive emission from haul roads and other area having potential of producing air borne dust. We have also installed fixed-type water sprinklers along haul road in D-Quarry. The processed manganese ore is being transferred manually; hence there less fugitive emission during transfer of ore.</p> <p>The results of Ambient Air Quality done during the period Apr’18 to Sept’18 is enclosed as Annexure-IV and V.</p>
9	A green belt of adequate width should be raised by planting the native species around ML area. Plantation should also be carried out along roads, OB dump sites etc. in consultation with the local DFO / Agriculture Department. The density of the trees should be not less than 2500 plants per ha.	<p>Reclamation and plantation program have been drawn. We have planted around 11.54 lakh nos. of trees over an area around 224 ha till 2017-18 at safety zone, OB dump and as avenue plantation. The tree density is maintained at the rate of more than 2500 saplings per ha.</p> <ul style="list-style-type: none"> • During the year 2018-19, 24345 nos. of saplings were planted. Beside this we also planted around 42,536 nos. of vetiver slips.
10	Groundwater shall not be used for mine operations. Prior approval of CGWA shall be obtained for using groundwater.	<p>We have obtained NOC from CGWA vide No. CGWA/NOC/MIN/ORIG/2018/388, Dated.09.08.2018. for a quantity of 3130cum/year; against our application no. 21-4/1195/OR/MIN/2017.</p> <p>The ground water is not being used for mining and its allied activities. The mine seepage water is being used for nursery development and water sprinkling at mine. The total usage is well within the permissible limit.</p>
11	Mining will not intersect groundwater. Prior permission of the MOEF and	Mining is not intersecting the ground water as the Ground water being at lower level in comparison to

	CGWA shall be taken to mine below water table.	existing maximum quarry depth.
12	Regular monitoring of ground water level and quality should be carried out by establishing a network of existing wells and constructing new piezometers. The monitoring should be done for quantity four times a year in pre-monsoon (April / May), monsoon (August), post-monsoon (November) and winter (January) seasons and for quality in May. Data thus collected should be submitted to the MoEF & CGWA quarterly.	Ground water table is much below the existing mine workings because of mining operations are confined at hilly topography only. However, ground water level & quality at existing well at separate location is being monitored. The ground water quality monitoring results and level are enclosed as Annexure VII & VIII respectively.
13	Trace metals such as Fe, Cr ⁺⁶ , Cu, Se, As, Cd, Hg, Pb, Zn and Mn at specific locations for both surface water downstream and in ground water at lower elevations from mine area, shall be periodically monitored in consultation with the OSPCB and State Ground Water Board. Suitable treatment measures shall be undertaken in case levels are found to be higher than permissible limits.	Trace metals such as Fe, Cr ⁺⁶ , Cu, Se, As, Cd, Hg, Pb, Zn and Mn at specific locations for both surface water (downstream & upstream) and ground water at lower elevation is being periodically monitored by referring to the standards as per BIS: 10500. The details of analysis result for ground water and surface water with standards are enclosed as Annexure -VI & VII respectively.
14	"Consent to Operate" should be obtained from SPCB before expanding mining activities.	"Consent to operate" has been obtained from State Pollution Control Board, Orissa vide Order no. 3012/IND-I-CON-186 dated 18.02.16 valid 31.03.2021.
15	Conservation Plan for conservation of endangered fauna including the Indian Elephant found in and around the mine area shall be prepared and implemented in consultation with identified agencies/institutions and with the State Forest Department. The Plan should be dovetailed with that prepared/under implementation/proposed for the endangered fauna found in the Reserve Forest in the buffer zone of the project site. The costs for the specific activities/tasks should be earmarked in the Conservation Plan and shall not be diverted for any other purpose. Year-wise status of the implementation of the Plan and the expenditure thereon should be reported to the Ministry of Environment & forests, RO, Bhubaneswar.	We have deposited Rs.56,30,000/- on 05.07.2006 with DFO, Keonjhar, Orissa being the contribution towards implementation of Wild Life Management Plan prepared for Bonai & Keonjhar division. We have also paid additional amount of Rs. 2,31,24,380 and Rs 3,30,67,537 with DFO, Keonjhar, Orissa towards differential payment for implementation of regional Wildlife Management Plan prepared for Bonai & Keonjhar division. Further, Site Specific wildlife management plan has been approved by the memo no. 7726/1WL-SSP-93/2015 dated 31 Aug 2015.
16	A Final Mine Closure Plan along with details of Corpus Fund should be	A progressive mine closure plan for the period 2013-14 to 2017-18 has been approved by IBM along with

	submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.	<p>the Scheme of Mining.</p> <p>Further, Progressive mine closure plan for the period of 2018-19 to 2022-23 has been submitted under the Rule No. 23, MCDR 2017.</p> <p>The final mine closure plan along with details of Corpus fund will be submitted to the Ministry of Environment & Forests in advance of final mine closure for approval.</p>												
Sl. no	B: General Conditions	Compliance Status												
1	No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.	No change in mining technology and scope of working has been made at the mine. If any changes proposed in technology and scope of workings, prior approval shall be sought from Ministry of Environment & Forests.												
2	No change in the calendar plan including excavation, quantum of manganese ore and waste should be made.	<p>Excavation plan for total excavation, Manganese ore and waste has been prepared and is being strictly adhered. The actual figure for total excavation, manganese ore and waste for the year 2018-19 is given in table below.</p> <p style="text-align: center;">Table: Plan vs. Actual for year 2018-19</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Year- 2018-19</th> <th>Plan</th> <th>Actual</th> </tr> </thead> <tbody> <tr> <td>Total Excavation (cum)</td> <td>1286587</td> <td>359092</td> </tr> <tr> <td>Production (MT)/cum</td> <td>180000</td> <td>31991</td> </tr> <tr> <td>OB Removal (cum)</td> <td>1245720</td> <td>346295</td> </tr> </tbody> </table>	Year- 2018-19	Plan	Actual	Total Excavation (cum)	1286587	359092	Production (MT)/cum	180000	31991	OB Removal (cum)	1245720	346295
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Total Excavation (cum)	1286587	359092												
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3	<p>Four ambient air quality-monitoring stations should be established in the core zone as well as in the buffer zone for RPM, SPM, SO₂, NO_x. Monitoring. Location of the stations should be decided based on the meteorological data, topographical features, and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board.</p> <p>Data on ambient air quality (RPM, SPM, SO₂ & NO_x.) should be regularly submitted to the Ministry including its Regional office at Bhubaneswar and the State Pollution Control Board / Central Pollution Control Board once in six. months.</p>	<p>Five ambient air quality monitoring stations have been established out of which 2 nos. in core zone (Near Office close proximity to residential and mining area and near H-Quarry) and 3 nos. in buffer zone (at Khandbondh, Bonaikela, Banspani)</p> <p>Samples are drawn twice in a week in core zone and once in a quarter in buffer zone to ascertain the 24hour monitoring average for PM₁₀, PM_{2.5}, SO₂, NO_x, CO, Mn NH₃, BaP, benzene, As, Ni and Pb .and reports are being submitted to OSPCB every month.</p> <p>It was observed that the environmental parameters are within the prescribed limit.</p> <p>Abstract of the monthly monitoring data on ambient air quality and Water quality are enclosed as Annexure – IV & V.</p>												

4	Drills should be wet operated or with dust extractors and controlled blasting should be practiced.	Wet drilling concept is already in place. Controlled blasting technique with NONEL is in practice.
5	Fugitive dust emissions from all the sources should be controlled regularly monitored and data recorded properly. Water spraying arrangements on haul roads, wagon loading, dumpers/ trucks, loading & unloading points should be provided and properly maintained.	Effective water sprinkling by mobile water tanker is being done on haul roads and other area having potential of producing air borne dust. Additionally, we have also installed fixed-type water sprinklers along haul road at D-Quarry. The results of Ambient Air Quality done during the period Apr'18 to Sept' 18 is enclosed as Annexure-IV .
6	Adequate measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operations of HEMM, etc should be provided with ear plugs/ muffs.	Ear plugs & Ear muffs are provided to the workers working in mining operation & DG operations. Rests of operations are below the noise levels of 80 dBA. The details of noise monitoring for the period Apr'18 to Sept' 18 are enclosed as Annexure-XI .
7	Industrial waste water (workshop and waste water from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 191b May, 1993 and 31 st December, 1993 or as amended from time to time. Oil and grease trap should be installed before discharge of workshop effluents.	The oil separation system has been provided at workshop and working effectively. This is being centrally used for maintenance of all the Equipments running at Joda West & Service Equipments of Malda Mn.Mine.
8	Environmental laboratory should be established with adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board.	It is being done by M/s Visiontek Consultancy Service Pvt. Ltd (Recognized as "A" category consultant as by State Pollution Control Board, Odisha). The type of pollution monitoring and analysis equipment used by by M/s Visiontek Consultancy Service Pvt. Ltd is enclosed as Annexure - XII .
9.	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. 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.	Suitable dust masks are being provided to employees (departmental & contractual) engaged in dusty operations. It is also ensured that they use the same. Employees are undergoing Periodical Medical Examination which is inclusive of lungs function test and audiometry. All the personnel are trained on safety in work place and continuous awareness program are being conducted for all employees to avert manganese poisoning. Periodical Medical Examination of employees (departmental & contractual) are conducted as per prescribed norms of Mines Rule, 1955. The initial and periodical examination includes blood hematology, blood pressure, detailed cardiovascular assessment, neurological examination etc. All chest radiographs are being classified for detection of pneumoconiosis, diagnosis and documentation made in accordance to ILO classifications. Total 68 nos. of contractual

		employees have been trained during the period from Apr'18 to Sept'18. There are no findings of pneumoconiosis and manganese poisoning which is classified as occupational disease.
10	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.	The department is in place and the Head of the department is reporting to General Manager of the division. The organizational structure in place is enclosed as Annexure-XIII .
11	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.	Funds allocated for environmental management are spent only for environment related purposes and not diverted to any other purpose. During the year 2017-18, no fund was allocated for construction of toe wall & garland drain against which we have spent Rs 3,60,756. For plantation activity Rs. 2,18,750 was allocated against which we have spent Rs. 16,62,573. Similarly, for environment monitoring Rs12,00,000 was allocated against which we have spent Rs.9,25,625. Construction of toe wall, garland drain and settling pits are under process. The total cost incurrence for the year 2018-19 in respect of these measures including plantation shall be submitted in the next six-monthly EC compliance report.
12	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	We are providing full co-operation to the officers of the Regional Office by furnishing the requisite data / information / monitoring reports.
13	A copy of clearance letter will be marked to the concerned Panchayat/local NGO, if any, from whom suggestion/ representation has been received while processing the proposal.	Copy of the clearance letter marked to Chairman, Municipal Council, Joda on 12.01.2006.
14	The State Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industry Centre and Collector's Office/Tehsildar's Office for 30 days.	This is applicable to State Pollution Control Board, Orissa.

15	The project authorities should advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular of the locality concerned within seven 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 may also be seen at Web Site of the Ministry of Environment & 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.	A detail of Environmental Clearance with regard to Joda West Manganese Mine was published in Oriya News Papers Dharitri & Sambad 17.10.2005.
16	The Ministry or any other competent authority may stipulate any further condition for environmental protection.	Noted
17	Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance.	Noted
18	The above conditions will be enforced, inter alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1991 along with their amendments and rules.	Noted

Yours Faithfully
F: Tata Steel Limited


27-11-18

Agent, Joda West Iron and Manganese Mines
& Head (Manganese Group of Mines), Joda

Zinc as Zn	mg/l	5.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Vanadium as V	mg/l	0.2	<0.00 1	<0.00 1	<0.00 1	<0.00 1	<0.00 1	<0.00 1
Total Suspended Solids	mg/l	100	38	40	46	40	24	51.5
Temperature	°C	shall not exceed 50C above the receiving water temperature	25.0	25.0	25.0	25.0	21.0	27.0
Dissolved Oxygen	mg/l	-	5.3	5.6	5.2	4.2	5.4	4.5
BOD	mg/l	30	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8
COD	mg/l	250	14.0	19.0	18.0	12.0	6.0	18.0
Oil & Grease	mg/l	10	ND	ND	ND	ND	ND	ND
Ammonical Nitrogen as N	mg/l	50	ND	ND	ND	ND	ND	ND
Total Kjeldahl Nitrogen as N	mg/l	100	0.98	0.82	0.76	0.56	0.8	0.55
Sulphide as S	mg/l	2.0	ND	ND	ND	ND	ND	ND
Free Ammonia as NH ₃	mg/l	5.0	ND	ND	ND	ND	ND	ND
Particulate Size of Suspended Solids	mg/l	850 µm IS Sieve	<850	<850	<850	<850	<850	<850
Bio-assay	mg/l	90% survival in 100% effluent	100%	100%	96%	94%	100%	94%
Dissolved Phosphates as PO ₄	mg/l	5.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Parameter	Unit	General Standards for discharge of Environmental Pollutants Part A- Effluents	April-18	May-18	June-18	July-18	Aug-18	Sept-18
			1st Report	1st Report	1st Report	1st Report	1st Report	1st Report
Colour	Hazen	5	CL	CL	CL	CL	U/O	CL
Odour	--	Unobjectionable	U/O	U/O	U/O	U/O	6.78	U/O
pH at 25°C	--	5.5-9.0	6.92	7.08	7.12	7.51	64	7.31
Total Dissolved Solids	mg/l	-	86	96	92	88	<0.05	75
Copper as Cu	mg/l	3.0	<0.05	<0.05	<0.05	<0.05	0.019	<0.05
Fluoride as F	mg/l	2.0	0.022	0.025	0.016	0.01	ND	0.02
Total Residual Chlorine	mg/l	1.0	ND	ND	ND	ND	0.42	ND

Iron as Fe	mg/l	3.0	0.39	0.49	0.42	0.38	0.016	0.31
Manganese as Mn	mg/l	2.0	0.1	0.18	0.21	0.12	1.5	0.11
Nitrate as NO3	mg/l	10.0	1.28	1.36	1.41	1.22	<0.001	1.12
Phenolic Compounds as C ₆ H ₅ OH	mg/l	1.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium as Se	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd	mg/l	2.0	<0.001	<0.001	<0.001	<0.001	ND	<0.001
Cyanide as CN	mg/l	0.2	ND	ND	ND	ND	<0.01	ND
Lead as Pb	mg/l	0.1	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01
Mercury as Hg	mg/l	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel as Ni	mg/l	3.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic as As	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001
Total Chromium as Cr	mg/l	2.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc as Zn	mg/l	5.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	<0.05	<0.05	<0.05	<0.05	<0.001	<0.05
Vanadium as V	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	29	<0.001
Total Suspended Solids	mg/l	100	44	35	32	26	21	24
Temperature	°C	shall not exceed 50C above the receiving water temperature	25	25	25	25	5.5	27
Dissolved Oxygen	mg/l	-	5.2	5.8	5.1	4.8	<1.8	3.5
BOD	mg/l	30	<1.8	<1.8	<1.8	<1.8	10	<1.8
COD	mg/l	250	12	15	12.6	10.8	ND	9.8
Oil & Grease	mg/l	10	ND	ND	ND	ND	ND	ND
Ammonical Nitrogen as N	mg/l	50	ND	ND	ND	ND	1.5	ND
Total Kjeldahl Nitrogen as N	mg/l	100	0.86	0.96	0.84	0.51	ND	0.41
Sulphide as S	mg/l	2.0	ND	ND	ND	ND	ND	ND
Free Ammonia as NH ₃	mg/l	5.0	ND	ND	ND	ND	ND	ND
Particulate Size of Suspended Solids	mg/l	850 µm IS Sieve	<850	<850	<850.0	<850.0	<850.0	<850.0
Bio-assay	mg/l	90% survival in 100% effluent	100% Survival of Fish	1	96%	100%	100%	100%
Dissolved Phosphates as PO ₄	mg/l	5.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

ANNEXURE-IV
Ambient Air Quality (AAQ) Monitoring Report (CORE ZONE)
(Apr'18 to Sept'18)
Joda West Iron and Manganese Mine, M/S TATA STEEL LTD.

JW (Time office)

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	O ₃ (µg/m ³)	CO mg/m ³	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	C ₆ H ₆ (µg/m ³)	BaP (ng/m ³)	Mn µg/m ³
Apr-18	73.11	36.86	4.43	14.23	8.64	0.43	22.94	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.01
May-18	49.34	23.94	4.30	11.13	<4.0	0.35	< 20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jun-18	46.27	22.17	4.06	10.70	<4.0	0.33	21.20	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.01
Jul-18	46.7	21.4	4.0	10.28	<4.0	0.29	20.8	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.015
Aug-18	39.91	26.10	4.35	10.54	<4	0.28	21.13	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.01
Sep-18	43.48	21.14	4.07	9.75	<4.0	0.31	19.75	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.01

Near JW (H quarry)

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	O ₃ (µg/m ³)	CO mg/m ³	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	C ₆ H ₆ (µg/m ³)	BaP (ng/m ³)	Mn µg/m ³
Apr-18	78.84	40.75	5.11	15.64	10.00	0.47	25.51	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.01
May-18	53.60	26.01	4.59	11.90	<4.0	0.40	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Jun-18	51.50	25.43	4.18	12.30	<4.0	0.36	22.80	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.011
Jul-18	50.1	22.5	4.0	11.8	<4.0	0.29	21.9	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.012
Aug-18	50.56	22.74	4.40	11.56	<4.0	0.29	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.01
Sep-18	48.60	23.89	4.33	11.44	<4.0	0.33	21.15	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	0.01

ANNEXURE-V
Ambient Air Quality (AAQ) Monitoring Report (BUFFER ZONE)
(Apr'18 to Sept'18)
Joda West Iron and Manganese Mine, M/S TATA STEEL LTD.

BZ-1 : Khondbondh

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	CO mg/m ³	O ₃ (µg/m ³)	NH ₃ (µg/m ³)	BaP (ng/m ³)	C ₆ H ₆ (µg/m ³)	As (ng/m ³)	Ni (ng/m ³)	Pb (µg/m ³)
Aug-18	27.9	13.1	<4.0	<9.0	<0.1	<4.0	<20.0	<0.002	<0.001	<0.001	<0.01	<0.001

BZ-2 : Bounsapani

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	CO mg/m ³	O ₃ (µg/m ³)	NH ₃ (µg/m ³)	BaP (ng/m ³)	C ₆ H ₆ (µg/m ³)	As (ng/m ³)	Ni (ng/m ³)	Pb (µg/m ³)
Aug-18	26.4	12.6	<4.0	<9.0	<0.1	<4.0	<20.0	<0.002	<0.001	<0.001	<0.01	<0.001

BZ-3 : Baneikala

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	CO mg/m ³	O ₃ (µg/m ³)	NH ₃ (µg/m ³)	BaP (ng/m ³)	C ₆ H ₆ (µg/m ³)	As (ng/m ³)	Ni (ng/m ³)	Pb (µg/m ³)
Aug-18	25.8	12.4	<4.0	<9.0	<0.1	<4.0	<20.0	<0.002	<0.001	<0.001	<0.01	<0.001

18	Mineral Oil	mg/l	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Nitrate (as NO3) in	mg/l	45	100	0.52	0.76	0.54	0.51	1.5	0.45
20	Phenolic Compounds (as C6H5OH) in	mg/l	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
21	Selenium (as Se) in	mg/l	0.01	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Sulphate (as SO4) in	mg/l	200	400	1.44	1.72	1.81	1.72	3.6	1.52
23	Alkalinity (as CaCO3) in	mg/l	200	600	29	33	38	36	23	32
24	Total Hardness(as CaCO3) in	mg/l	300	600	32	36	40	40.6	28	39.8
25	Cadmium (as Cd) in	mg/l	0.01	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
26	Cyanide (as CN) in	mg/l	0.05	No Relaxation	ND	ND	ND	ND	ND	ND
27	Lead (as Pb) in	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Mercury (as Hg) in	mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
29	Arsenic (as As) in	mg/l	0.05	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
30	Zinc (as Zn) in	mg/l	5	15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
31	Chromium (as Cr+6) in	mg/l	0.05	No Relaxation	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
32	Poly Aromatic Hydrocarbon as PAH		--	--	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
33	Pesticide		Absent	0.001	Absent	Absent	Absent	Absent	Absent	Absent

ANNEXURE-VII
Ground Water Analysis Report as per IS:10500-1991
Sampling Location: GW1: Prembasti (Apr'18 to Sept'18)
Joda West Iron and Manganese Mine, M/S TATA STEEL LIMITED

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS - 10500:1991	Analysis Results	
					May-18	Aug-18
<i>Essential Characteristics</i>						
1	Colour	APHA 2120 B, C	Hazen	5	CL	CL
2	Odour	APHA 2150 B	--	U/O	U/O	U/O
3	Taste	APHA 2160 C	--	Agreeable	Agreeable	Agreeable
4	Turbidity	APHA 2130 B	NTU	5	<0.2	<0.2
5	pH Value	APHA 4500H+ B	--	6.5-8.5	7.44	7.12
6	Total Hardness (as CaCO ₃)	APHA 2340 C	mg/l	300	142	126.0
7	Iron (as Fe)	APHA 3500Fe, B	mg/l	0.3	0.29	0.21
8	Chloride (as Cl)	APHA 4500Cl- B	mg/l	250	38.0	28.0
9	Residual, free Chlorine	APHA 4500Cl, B	mg/l	0.2	ND	ND
<i>Desirable Characteristics</i>						
10	Dissolved Solids	APHA 2540 C	mg/l	500	220.0	186.0
11	Calcium (as Ca)	APHA 3500Ca B	mg/l	75	38.5	33.3
12	Magnesium (as Mg)	APHA 3500Mg B	mg/l	30	11.2	10.4
13	Copper (as Cu)	APHA 3111 B,C	mg/l	0.05	<0.05	<0.05
14	Manganese (as Mn)	APHA 3500Mn B	mg/l	0.1	0.013	0.012
15	Sulphate (as SO ₄)	APHA 4500 SO ₄ ²⁻ E	mg/l	200	4.9	4.6
16	Nitrate (as NO ₃)	APHA 4500 NO ₃ ⁻ E	mg/l	45	1.96	2.4
17	Fluoride (as F)	APHA 4500F- C	mg/l	1	0.017	0.018
18	Phenolic Compounds (as C ₆ H ₅ OH)	APHA 5530 B,D	mg/l	0.001	<0.001	<0.001
19	Mercury (as Hg)	APHA 3500 Hg	mg/l	0.001	<0.001	<0.001
20	Cadmium (as Cd)	APHA 3111 B,C	mg/l	0.01	<0.001	<0.001
21	Selenium (as Se)	APHA 3114 B	mg/l	0.01	<0.001	<0.001
22	Arsenic (as As)	APHA 3114 B	mg/l	0.05	<0.001	<0.001

23	Cyanide (as CN)	APHA 4500 CN- C,D	mg/l	0.05	ND	ND
24	Lead (as Pb)	APHA 3111 B,C	mg/l	0.05	<0.001	<0.001
25	Zinc (as Zn)	APHA 3111 B,C	mg/l	5	<0.05	<0.05
26	Anionic Detergents (as MBAS)	APHA 5540 C	mg/l	0.2	<0.2	<0.2
27	Chromium (as Cr ⁺⁶)	APHA 3500Cr B	mg/l	0.05	<0.05	<0.05
28	Mineral Oil	APHA 5220 B	mg/l	0.01	<0.01	<0.01
29	Alkalinity	APHA 2320 B	mg/l	200	130.0	111.0
30	Aluminium as(Al)	APHA 3500Al B	mg/l	0.03	<0.001	<0.001
31	Boron (as B)	APHA 4500B, B	mg/l	1	<0.01	<0.01
32	Poly Aromatic Hydrocarbon as PAH	APHA 6440 B	µg/l	--	<0.001	<0.001
33	Pesticide	APHA 6630 B,C	mg/l	Absent	Absent	Absent

Ground Water Analysis Report as per IS:10500-1991
 Sampling Location: GW2: Kamarjoda (Apr'18 to Sept'18)
 Joda West Iron and Manganese Mine, M/S TATA STEEL LIMITED

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS - 10500:1991	Analysis Results	
					May-18	Aug-18
1	Colour	APHA 2120 B, C	Hazen	5	CL	CL
2	Odour	APHA 2150 B	--	U/O	U/O	U/O
3	Taste	APHA 2160 C	--	Agreeable	Agreeable	Agreeable
4	Turbidity	APHA 2130 B	NTU	5	<0.2	<0.2
5	pH Value	APHA 4500H+ B	--	6.5-8.5	7.36	7.18
6	Total Hardness (as CaCO ₃)	APHA 2340 C	mg/l	300	146	135.0
7	Iron (as Fe)	APHA 3500Fe, B	mg/l	0.3	0.25	0.18
8	Chloride (as Cl)	APHA 4500Cl- B	mg/l	250	39.0	34.0
9	Residual, free Chlorine	APHA 4500Cl, B	mg/l	0.2	ND	ND
<i>Desirable Characteristics</i>						
10	Dissolved Solids	APHA 2540 C	mg/l	500	227.0	205.0
11	Calcium (as Ca)	APHA 3500Ca B	mg/l	75	40.1	36.1
12	Magnesium (as Mg)	APHA 3500Mg B	mg/l	30	11.2	10.9
13	Copper (as Cu)	APHA 3111 B,C	mg/l	0.05	<0.05	<0.05
14	Manganese (as Mn)	APHA 3500Mn B	mg/l	0.1	0.015	0.014
15	Sulphate (as SO ₄)	APHA 4500 SO ₄ ²⁻ E	mg/l	200	5.2	5.2
16	Nitrate (as NO ₃)	APHA 4500 NO ₃ ⁻ E	mg/l	45	2.16	2.6
17	Fluoride (as F)	APHA 4500F- C	mg/l	1	0.019	0.016
18	Phenolic Compounds (as C ₆ H ₅ OH)	APHA 5530 B,D	mg/l	0.001	<0.001	<0.001

19	Mercury (as Hg)	APHA 3500 Hg	mg/l	0.001	<0.001	<0.001
20	Cadmium (as Cd)	APHA 3111 B,C	mg/l	0.01	<0.001	<0.001
21	Selenium (as Se)	APHA 3114 B	mg/l	0.01	<0.001	<0.001
22	Arsenic (as As)	APHA 3114 B	mg/l	0.05	<0.001	<0.001
23	Cyanide (as CN)	APHA 4500 CN- C,D	mg/l	0.05	ND	ND
24	Lead (as Pb)	APHA 3111 B,C	mg/l	0.05	<0.001	<0.001
25	Zinc (as Zn)	APHA 3111 B,C	mg/l	5	<0.05	<0.05
26	Anionic Detergents (as MBAS)	APHA 5540 C	mg/l	0.2	<0.2	<0.2
27	Chromium (as Cr ⁺⁶)	APHA 3500Cr B	mg/l	0.05	<0.05	<0.05
28	Mineral Oil	APHA 5220 B	mg/l	0.01	<0.01	<0.01
29	Alkalinity	APHA 2320 B	mg/l	200	134.0	120.0
30	Aluminium as(Al)	APHA 3500Al B	mg/l	0.03	<0.001	<0.001
31	Boron (as B)	APHA 4500B, B	mg/l	1	<0.01	<0.01
32	Poly Aromatic Hydrocarbon as PAH	APHA 6440 B	µg/l	--	<0.001	<0.001
33	Pesticide	APHA 6630 B,C	mg/l	Absent	Absent	Absent

ANNEXURE-VIII
GROUND WATER LEVEL (Apr'18 to Sept'18)
Joda West Iron and Manganese Mine, M/S TATA STEEL LIMITED

GROUND WATER LEVEL ANALYSIS REPORT			
SL.NO	Monitoring Date	Location	Analysis Result (MT/BGL)
1	May-18	Kamar Joda	10.7
2	May-18	Prembasti	10.6
3	Aug-18	kamar joda OW	2.8
4	Aug-18	Banaikala OW	2.6

ANNEXURE-IX
DUST FALL MONITORING (Apr'18 to Sept'18)
Joda West Iron and Manganese Mine, M/S TATA STEEL LIMITED

Month	Total Dust Fall (t/km ² /month)	Analysis Result			
		Co (%)	Ni(%)	Hg(%)	As (%)
May-18	0.488	<0.001	<0.001	<0.001	<0.001
Aug-18	0.412	<0.001	<0.001	<0.001	<0.001

ANNEXURE-X
Soil Quality Analysis Report (Apr'18 to Sept'18)
Joda West Iron and Manganese Mine, M/S TATA STEEL LIMITED

Month	Co (%)	Ni(%)	Hg(%)	As (%)
May-18	0.022	0.053	<0.000002	<0.000002
Aug-18	0.018	0.042	<0.000002	<0.000002

ANNEXURE-XI
Ambient Noise Monitoring Report (Apr'18 to Sept'18)
Joda West Iron and Manganese Mine, M/S TATA STEEL LIMITED

May-18				
AAQ				
Sl. No	Date	Name of Location	Unit	Day Time Result
1	May-18	Township	dB	60.6
2		Hospital		41.8
3		Mines Area		61.2
4		Railway Siding		59.2
CPCB Standard				75
EQUIPMENT				
Sl. No	Date	Name of Location	Unit	Result
1	May-18	OD-09A-4623(Truck)	dB	55.8
2		D-80A (Loader)		78.2
3		OD-09A-4691(Truck)		60.2
4		SD-13(Drojer)		71.8
5		OD-09N-9454(Truck)		80.6
6		Volvo-EC300 DL(Sovel-1)		81.8
7		Volvo-EC300BLC(Sovel-2)		81.2
8		OR-14N-5243(Water Tank)		81.2
9		OR-09L-9552(Truck)		84.8
10		OD-09A-4125(Truck)		85.2
11		OD-09A-4128(Truck)		86.4
12		OD-09A-4692(Truck)		86
CPCB Standard				75

ANNEXURE-XII
LIST OF ENVIRONMENTAL MONITORING EQUIPMENT
Joda West Iron and Manganese Mine, M/S TATA STEEL LIMITED

LIST OF ENVIRONMENTAL MONITORING EQUIPMENT		
Ambient Air Quality		
Sl.No.	Name of the Instrument	Parameter
1	Respirable Dust sampler	PM ₁₀
2	Fine Particulate Sampler	PM _{2.5}
3	Spectrophotometer UV-Visible range	SO ₂ , NO _x
4	NDIR	CO
5	AAS	Manganese
Other Paraphernalia for analysis of air quality are also available in the laboratory.		
Water Quality		
Sl.No.	Name of the Instrument	Parameter
1	Analytical weighing Balance	Used for weighing the chemicals
2	Micro Balance	Used for weighing CRMs
3	AAS with VGA and Hallow cathode lamps	All Heavy metals (Arsenic, Mercury, Selenium, Cadmium, Chromium, Cobalt, Iron, Lead, Manganese, Zinc, Aluminium, etc..)
4	Spectrophotometer UV-Visible range	Nitrate, Nitrite, Sulphate, Chromium(VI), Fluoride, Cyanide, Phenolic compounds
5	Flame Photometer	Sodium, Potassium
6	Ion Analyzer	Fluoride
7	BOD Incubator	BOD
8	COD Digester	COD
9	Furnace	Total volatile solids, Fixed solids

10	Hot Air Oven	Total Suspended Solids, Total Dissolved Solids
11	pH meter	pH
12	Conductivity meter	Conductivity
13	Turbidity Meter	Turbidity
14	Bacteriological Incubator	Total coli form and fecal coli form
15	Autoclave	sterilization
16	Microscope	Bacteriological colony count
17	Magnetic stirrer	Stirring purpose
18	Vacuum filtration unit	Rapid filtration
19	Water Bath	Boiling and evaporation purpose
20	Cadmium reduction column	Nitrate
21	Fluoride distillation unit	Fluoride
22	Kjeldal flask	Ammonia and Organic Nitrogen
23	Hot Plate	Digestion
24	Pizometer	Water level monitoring
25	Aquarium	Bio assay test

ANNEXURE-XIII
 ORGANIZATION STRUCTURE
 Joda West Iron and Manganese Mine, M/S TATA STEEL LIMITED

