COMPLIANCE REPORT PERIOD : OCT'14 TO MAR'15

ENVIRONMENTAL CLEARANCE TO BAMEBARI MANGANESE MINE OF TATA STEEL LIMITED VIDE MoEF's LETTER NO. J-11015/85/2003-1A.II(M) DATED 17.11.2005 COMMENTS SUBMITTED TO THE MINISTRY OF ENVIRONMENT & FORESTS, GOVERNMENT OF INDIA

Present Status of the Project:-

The Scheme of Mining and Progressive Mine Closure Plan for Bamebari Manganese Mine over an area 1150.55 ha. (RML ï 464 ha & ML ï 686.550 ha.) was submitted under Rule No.12, MCDR 1988 for the period 2010-11 to 2014-15 and has been approved by IBM vide letter no. MS/OTF-MECH/06-ORI/BHU/2010-11, dated 09.06.2010.

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.	The mine has obtained the Forest Clearance vide MoEFôs letter No 8-72/2004-FC dt 15.01.2007 over an area of 145.329 ha of forest land. The mining operation and allied activities are confined within the approved diverted area only.
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.	No Topsoil has been generated during Octô14 to Marô15 as all the workings were concentrated within the existing pit limit. The top soil generated prior to this period has already been utilized for plantation in the inactive dump slopes.
3	OB and other wastes should be stacked at earmarked sites only and should not be kept active for long periods of time. Plantation should be taken up for soil stabilisation along the slopes of the dump and terraced after every 5-6 m of 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.	OB and other wastes are being dumped as per plan and within an area of 46.823 ha. The inactive portion of OB dumps area being stabilized by plantation of fast growing species. 28145 nos. of sapling of local species (Gambhari, Chakunda, Mahanimba, Kala Sirs, Sisu etc) were planted during 2014-15 and the survival rate found to be 61.68% Apart from this we have distributed 5000 no saplings (fruit and timber) free of cost to our surrounding communities including, school children, villagers, clubs and SHGs under guidance of State Pollution Control Board, Odisha. We have also planted 1,00,000 of Vetiver slips in inactive dump slopes of Bamebari quarry under guidance of IIT, Kharagpur for stabilization of dump slopes during the

		year 2013-14. The overall slope angles of OB dumps are maintained within the natural angle of repose of the waste. The overall slope angles of OB dumps are maintained within the natural angle of repose of the waste. The retaining wall and garland drain with sedimentation pit at corners near toe of OB dump at maximum places has been constructed & in remaining area it is under construction. Their dimensions are matching the requirements to arrest effectively the run off.
4	Minerals rejects shall be stacked separately at earmarked site/dump only.	The mineral rejects generated during manual processing of manganese ore (i.e. sorting, dressing and sizing) has been stacked separately at earmarked site.
5	Catch Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from soil, 0B and mineral dumps. The drains should be regularly desilted and maintained properly. 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. 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.	Existing catch drains and garland drains are covering the entire dump slope at low lying part. The catch drains and sedimentation pits are periodically de-silted and maintained properly. Size, gradient and length of the drains will be adequate to take care of the peak flow. No Provision of Effluent treatment plant , so no chance of inrush of storm water in to the ETP during high rainfall/super cyclone period
6	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.	In order to prevent the siltation and check the run-off, retaining wall and garland drain are provided with the dimension as; <u>Dimension of the Retaining Wall</u> : Height ï 1 to 1.2 mtr. Width ï 1 mtr. <u>Dimension of the Garland Drain</u> : Depth ï 1.20 to 1.5 mtr. Width ï 1 to 1.2 mtr.
7	Trace Metals such as Ni, Co, As and Hg should be analyzed in dust fall and soil samples for at least one year during	Samples have been analyzed in dust fall & soil during pre monsoon season. It was observed that,

	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.	a) Presence of Co and Hg was nil. Only Ni & As presence varies from 0.033 to 0.021 & 0.029 to 0.017 % near Bamebari Pit & Joribar Pit respectively in dust fall samples during post-monsoon season. b) Presence of Co and Hg was nil. Only Ni & As presence varies from 0.044 to 0.036 & 0.032 to 0.028 % near Bamebari Pit & Joribar Pit respectively in soil samples during winter season. The detail analysis result is enclosed as **Annexure-I (Dust Fall) & II (Soil)**
8	Mine Mineral and OB transportation shall be in trucks/dumpers covered with tarpaulins. Vehicular emissions should be kept under control and regularly monitored. Suitable measures should be taken to check fugitive emissions from haulage roads & transfer points, etc.	The trucks are being covered with tarpaulin during dispatch of manganese ore from mine to Ferro Alloys Plant and Railway Siding at Joda. OB is being transported by shovel ï 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. All the trucks meant for transportation of mineral from mine to our captive plant & Railway Siding at Joda is bearing the ñPollution under Controlô certificate. The emissions are under control. Provision of water sprinkling by mobile water sprinklers to suppress fugitive emission from haul roads. The processed manganese ore is being transferred manually; hence there is less fugitive emission during transfer of ore. The fugitive dust monitoring done during the period Octô14 to Marô15 is being enclosed as **Annexure-III**.
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 *I* Agriculture Department. The density of the trees should be not less than 2500 plants per ha.	• Reclamation and plantation programs have been drawn. We have planted 389085 nos. of sapling over an area of 66.27 ha with 78 % survival rate. • Tree density is maintained at the rate of 4572 saplings per ha. • The plantation includes the local species (Gambhari, Chakunda, Mahanimba, Kala Sirs, Sisu etc)
10	Groundwater shall not be used for mine operations. Prior approval of CGWA shall be obtained for using groundwater.	Ground water use permission has been obtained from CGWA vide letter no. 21-4(297)/CGWA/SER/2010-168, Dt.15.02.2011 for 500 m^3 per day. The ground water is not being used for mining and its allied activities.

11	Mining will not intersect groundwater. Prior permission of the MOEF and CGWA shall be taken to mine below water table.	Mining is not intersecting the ground water as the Ground water being at lower level in comparison to 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 *I* 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 nearby villages are being monitored. It was observed that , the level of ground water , a) During post-monsoon was 0.65 mtr (at 513.35 mRL). b) During winter season was 1.83 mtr (at 512.17 mRL c) During winter was 29.11 mtr (at 523.89 mRL) for the Piezometric test point at Bamebari and was 27.75 mtr (at 525.25 mRL) during post-monsoon. d) The quality of ground water monitored with reference to standard of BIS: 10500 and the qualities are well within the standard. The ground water level and quality monitoring results are enclosed as **Annexure IV & V** 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 pennissible 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. It was observed in ground water samples that, only Fe, Zn and Mn 0.16, 0.33 and 0.017 mg/l during post-monsoon and 0.15, 0.24 and 0.030 mg/l during winter respectively. The analysis results are well within the permissible standards while other parameters are below detection level. The details of analysis result for ground water and surface water with standards are enclosed as **Annexure – VI & VIII respectively.**
14	"Consent to Operate" should be obtained from SPCB before expanding mining activities.	ñConsent to operateò order no.117 No.7249/ IND-I-CON-189 dated 12.04.2012 & valid up to 31.03.2016.

15	A 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/taslcs 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, Bhubaneshwar.	We have deposited Rs.45,05,554/- on 15.12.2005 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. 47,74,446 and Rs 1,06,72,000 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 prepared and submitted for approval as per the new guidelines.
16	A Final Mine Closure Plan along with details of Corpus Fund should be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.	Progressive Mine Closure Plan for the period 2010-11 to 2014-15 has been approved by IBM. 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.
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.	Plan for production of Manganese Ore and excavation of waste has been prepared and is being strictly adhered to; Plan 2014-15 Production: 83,200 MT OB Removal: 5,65,847 CuM Planned (Octô14 to Marô15) Production:- 41,600 MT OB Removal:- 2,82,923 CuM Actual (Octô14 to Marô15)- Production (Octô14 to Marô15) : 20,427 MT OB Removal (Octô14 to Marô15) : 1,35,616 CuM
3	Four ambient air quality-monitoring stations should be established in the core zone as well as in the buffer zone for RPM. SPM, SO2, NOx. monitoring. Location of the stations should be decided based on the meteorological data, topographical	Six ambient air quality monitoring stations have been established out of which 2 nos. in core zone (Near Managerôs Office close proximity to residential and near old magazine close proximity to mining area) and 4 nos. in buffer zone (at Jagannathpur,

	features, and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Data on ambient air quality (RPM, SPM, SO2 & NOx.) should be regularly submitted to the Ministry including its Regional office at Bhubaneshwar and the State Pollution Control Board *I* Central Pollution Control Board once in six. Months.	Bandhuabeda, Raikera & Balita). Samples are drawn twice in a week in core zone and once in a quarter in buffer zone to ascertain the 24 hour monitoring average for $PM_{10,}$ $PM_{2.5}$, So2 & NOx, CO & Mn. It was observed that, a) PM_{10} varies from 46.11 µg/m^3 (Marô15) to 57.44 µg/m^3 (Decô14) near Mgr. Office (close proximity residential colony) against the standard 100 µg/m^3. b) PM_{10} varies from 53.44 µg/m^3 (Marô15) to 65.89 µg/m^3 (Decô14) near old magazine (quarry area) against the standard 100 µg/m^3. c) $PM_{2.5}$ varies from 27.02 µg/m^3 (Marô15) to 32.38 µg/m^3 (Decô14) near Mgr. Office (close proximity residential colony) against the standard 60 µg/m^3. d) $PM_{2.5}$ varies from 30.89 µg/m^3 (Febô15) to 37.07 µg/m^3 (Decô14) near old magazine (quarry area) against the standard 60 µg/m^3. e) SO_2 varies from 4.14 µg/m^3 (Marô15) to 4.57 µg/m^3 (Octô14) is under below detection level near Mgr. Office (close proximity residential colony) against the standard 80 µg/m^3. f) SO_2 varies from 4.66 µg/m^3 (Marô15) to 5.21 µg/m^3 (Janô15) near old magazine (quarry area) against the standard 80 µg/m^3. g) NoX varies from 10.43 µg/m^3 (Febô15) to 12.57 µg/m^3 (Decô14) near Mgr. Office (close proximity residential colony) against the standard 80 µg/m^3. h) NoX varies from 11.24 µg/m^3 (Febô15) to 13.41 µg/m^3 (Decô14) near old magazine (quarry area) against the standard 80 µg/m^3. i) CO varies from 0.14 mg/m^3 (Febô15) to 0.19 mg/m^3 (Decô14) near Mgr. Office (close proximity residential colony) against the standard 2 mg/m^3. j) CO varies from 0.18 mg/m^3 (Febô15) to 0.25 mg/m^3 (Decô14) near old magazine (quarry area) against the standard 80 mg/m^3. k) Mn varies from 0.53 µg/m^3 (Marô15) to

		0.77 µg/m^3 (Janô15) near Mgr. Office (close proximity residential colony) against the standard 0.25 mg/m^3. l) Mn varies from 0.62 µg/m^3 (Marô15) to 0.88 mg/m^3 (Janô15) near old magazine (quarry area) against the standard 0.25 mg/m^3. Data on ambient air quality monitoring for every month is being submitted to State Pollution Control Board. Abstract of the monthly monitoring data on ambient air quality is enclosed as **Annexure – VIII**.
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. The fugitive dust monitoring done during the period Octô14 to Marô15 is being enclosed as **Annexure-III.**
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 drilling operations & DG operations. Rest of operations are below the noise levels of 80 dBA. The details of noise monitoring for the period Octô14 to Marô15 are enclosed as **Annexure-IX.**
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 II 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 Bamebari & Tiringpahar 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 SS Environics India Pvt.Ltd at Bhubaneswar. (Recognized as ñAò category consultant as by State Pollution Control Board, Orissa). The type of pollution monitoring and analysis equipment used by M/s SS Environics India Pvt.Ltd. is enclosed as **Annexure – X.**
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.	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

	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.	Examination which is inclusive of lungs function test and audiometry. All the personnel are trained on safety in work place and continuous awareness programmes 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. During 2011-12, 219 nos. of employees were examined while during 2012-13, a total no. of 240 employees (both Departmental and Contractual) were examined. During 2013-14 a total no. of 72 employees (Departmental-9 and contractor employees-63) & during 2014-15 a total of 78 no(Departmental-4 and Contractor-74) were examined. The employees of Bamebari Manganese Mines and Tiringpahar Manganese Mines are shown together. 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-XI**.
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 Bhubaneshwar.	Funds allocated for environmental management are spent only for environment related purposes and not diverted to any other purpose. The utilization of environment management for FYô15 was Rs. 30,23,058 (Monitoring ï Rs 15,73,827/- & Plantation- Rs. 14,49,231/-) against the budget of Rs 6,87,000/- (Monitoring - Rs, 4,70,000/- & Plantation - Rs. 2,17,000/-) for Bamebari Manganese Mines.
12	The Regional Office of this Ministry located at Bhubaneshwar shall monitor compliance of the stipulated conditions. The project authorities should extend full	We are extending full co-operation to the officers of the Regional Office by furnishing the requisite data / information / monitoring

	cooperation to the officer (s) of the Regional Office by furnishing the requisite data *I* information *I* monitoring reports	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 Sarpanch, Gram Panchayat, Palasa 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 Bamebari Manganese Mine was published in Oriya News Papers Anupam Bharat & Aam Khabar dated 10.01.2006.
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

As per letter no. 106-9/11/EPE: To discuss the impact of mining activities on habitation and develop a code of practice on these issues, a meeting was held under the Chairmanship of Shri M.S. Nagar, Chairman EAC (Non coal Mining Sector) on 23.06.2014. After detailed deliberations by the Exports, the following suggestions were made as part of mitigation measures to avoid adverse impact of mining operation in the case of habitations/villages:-

Sl. no	2 : Additional Conditions	Compliance status
a	The project Authority shall adopt Best Mining Practice for the 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.	OB and other wastes are being dumped as per plan and within an area of 46.823 ha. The inactive portion of OB dumps area being stabilized by plantation of fast growing species. The overall slope angles of OB dumps are maintained within the natural angle of repose of the waste. The retaining wall and garland drain with sedimentation pit at corners near toe of OB dump at maximum places has been constructed & in remaining area it is under construction with the dimension as; Dimension of the Retaining Wall : Height ï 1 to 1.2 mtr. Width ï 1 mtr. Dimension of the Garland Drain : Depth ï 1.20 to 1.5 mtr. Width ï 1 to 1.2 mtr. Existing catch drains and garland drains are covering the entire dump slope at low lying part. The catch drains and sedimentation pits are periodically de-silted and maintained properly. Size, gradient and length of the drains will be adequate to take care of the peak flow.
b	The natural water bodies and or streams which are flowing in and around the village should not be disturbed. The Water Table should be natured 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.	The natural water bodies and or streams which are flowing in and around the village is not disturbed, although Surface water is drawn within the limit of the Surface Water drawl permission. Ground water use permission has been obtained from CGWA vide letter no. 21-4(297)/CGWA/SER/2010-168, Dt.15.02.2011 for 500 m3 per day. The ground water is not being used for mining and its allied activities. The water table is recharged by the water bodies/streams flowing around the villages and also by the direct seepage of the rainfall occuring in the area. Regular monitoring of water table is being carried out in the open dug well located in the village and the monitoring report is attached as Annexure-IV for your kind reference.

c	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 villages and keeping the noise levels well within the prescribed limits for day/night hours.	There is no night shift operation in the Mines hence, the sound at night at project site is not applicable. Moreover, the illumination at night level is also low, as it not used for supporting the night shift operation. It is ensured that the biological clock of the villagers is not disturbed by orienting the floodlights/masks away from the villages and keeping the noise levels well within the prescribed limits for day/night hours.
d	The project Authority shall make necessary alternatives, 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 spares trees on such grazing ground, which provide midday shelter from the scorching sun should be scrupulously guarded against felling, last the cattle abandon the grazing ground or return home by noon.	The grazing land in the leasehold area is not disturbed till now and the directions of the Honble Supreme Court will be followed while acquiring grazing land in future. The mine has obtained the Forest Clearance vide MoEF's letter No 8-72/2004-FC dt 15.01.2007 over an area of 145.329 ha of forest land. The mining operation and allied activities are confined within the approved diverted area only.
e	Where ever blasting is undertaken as part 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. A provision for monitoring of each blast should be made so that the impact of blasting on nearby habitation and dwelling units could be ascertained. The covenant of lease deed under Rule 31 of MCR 1960	Vibration Study due to blasting is being carried out by CIMFR on regular basis and the recommendations of the study is strictly being adhered. Controlled blasting is practised with the use of Nonel. Every critical blast is being monitored and the covenant of lease deed under Rule 31 of MCR 1960 is being followed.

	provides that no mining operations shall be carried out within 50 meters of public works such as public roads and buildings or inhabited sites except with the prior permission from the Competent Authority.	
f	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 fogging system. Belt conveyors should be fully covered to avoid air borne dust.	Water sprinkling is also been carried out by the tankers fitted with sprinklers on regular interval with incresed frequency during the dry seasons and is sufficient for dust suppression. There is no crusher unit as well as belt conveyor system installed in the mine. Regular dust monitoring of the Mine area is being carried out and the monitoring report is attached as Annexure-VIII
g	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.	It is being ensured that the productivity of agricultural crops is not affected by adopting the best mining practices in terms of maintaining zero effluent discharge and restricting the run-off from mines to a minimum by constucting retaining wall around the critical areas of the dump complemanting it with garland drain and making settling pits, check dams at regular intervals. In this region several mines are located in a cluster hence the Associations of owners of the cluster mines, shall be formed inter-alia, to sub-serve such an objective, and shall take responsibility for securing such Crop Liability Policy.
h	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) 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.	All the area within the Mining Lease area will be affected due to Mining activities during the life of mine except the area considered for Safety Zone, the private lands, the ST land area, which will be utilised as per the prevailing norms.
i	Transportation of the minerals by road passing through the village shall not be allowed. A ðbypassô 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	Tranportation of the minerals is not done by the road passing through the village. The current road used for transport is being maintained by us. The village road network will be used only when the carrying capacity of such roads is increased.

	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 road.	
j	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.	Noted.
k	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 neighbourhood Habitats could also be planned and executed by the PPs more systematically based on the óNeed based door to door survey ô by established Social Institutes / Workers on the lines as required under TOR. ñR&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 SCs / STs 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 sectorial 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.	Socio Economic Development of the neighbourhood Habitats is planned and executed by us through a separate wing formed for the said pupose, TSRDS (Tata Steel Rural Development Society) in which Need based door to door survey is done and accordingly the CSR activities are planned. No displacement is there, hence R&R Plan is not applicable to us.

	The issues relating to shifting of village including their R&R and socio-economic aspects should be discussed in the EIA report.ò	

Yours faithfully
F: TATA STEEL LTD.

Sd/-
Agent, Bamebari Mn.Mine &
Head (Manganese Group of Mines), Joda

Annexure – I

S.S.Environics (India) Pvt. Ltd.

(An ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 Certified Company)

Plot No-361/2314 "Sustenance Tower"
At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha
Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-2702 *Date:* 04.12.2014

DUST FALL ANALYSIS RESULTS FOR TRACE METALS

Name of the Mines : **Bamebari Manganese Mines (Tata Steel Ltd)**
Location of Sampling : DF1: Near Bamebari Mine Pit
DF2: Near Joribahar Pit
Period of monitoring : November-2014

Sl. No.	Parameters	DF1	DF2
1.	Nickel as (Ni) in %	0.033	0.021
2.	Cobalt as (Co) in %	Nil	Nil
3.	Arsenic as (As) in %	0.029	0.017
4.	Mercury as (Hg) in %	Nil	Nil

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Ref No: SSE/14/R-3360 *Date:* 04.02.2015

DUST FALL ANALYSIS RESULTS FOR TRACE METALS

Name of the Mines	:	**Bamebari Manganese Mines (Tata Steel Ltd)**
Location of Sampling	:	DF1: Near Bamebari Mine Pit
		DF2: Near Joribahar Pit
Period of monitoring	:	January-2015

Sl. No.	Parameters	DF1	DF2
1.	Nickel as (Ni) in %	0.047	0.035
2.	Cobalt as (Co) in %	Nil	Nil
3.	Arsenic as (As) in %	0.039	0.024
4.	Mercury as (Hg) in %	Nil	Nil

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Annexure –II

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Plot No-361/2314 "Sustenance Tower"

At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha

Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-2698 Date: 04.12.2014

SOIL QUALITY ANALYSIS RESULTS FOR TRACE METALS

Name of the Mines : **Bamebari Manganese Mines (Tata Steel Ltd)**

Location of Sampling : S1: Near Bamebari Mine pit

S2: Joribahar pit

Date of Sampling : 07.11.2014

Date of Analysis : 11.11.2014

Sl. No.	Parameters	S1	S2
1.	Nickel as (Ni) in %	0.037	0.029
2.	Cobalt as (Co) in %	Nil	Nil
3.	Arsenic as (As) in %	0.026	0.020
4.	Mercury as (Hg) in %	Nil	Nil

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S.S.Environics (India) Pvt. Ltd.

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Plot No-361/2314 "Sustenance Tower"

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Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-3372 Date: 04.02.2015

SOIL QUALITY ANALYSIS RESULTS FOR TRACE METALS

Name of the Mines : **Bamebari Manganese Mines (Tata Steel Ltd)**

Location of Sampling : S1: Near Bamebari Mine pit

S2: Joribahar pit

Date of Sampling : 24.01.2015

Date of Analysis : 27.01.2015

Sl. No.	Parameters	S1	S2
1.	Nickel as (Ni) in %	0.044	0.036
2.	Cobalt as (Co) in %	Nil	Nil
3.	Arsenic as (As) in %	0.032	0.028
4.	Mercury as (Hg) in %	Nil	Nil

For S.S Environics (India) Pvt. Ltd.

Annexure – III(Fugitive Emission Report)

Mine	Location	Place of Monitoring	Standard	13.10.2014 to 18.10.2014	20.10.2014 to 25.10.2014	10.11.2014 to 15.11.2014	22.12.2014 to 27.12.2014	12.01.2015 to 17.01.2015	26.01.2015 to 31.01.2015	09.02.2015 to 14.02.2015	16.02.2015 to 21.02.2015	09.03.2015 to 14.03.2015	16.03.2015 to 21.03.2015	Average-H1
Bamebari Mn Mines	Bamebari Pit	Mine Haul Road	Total SPM-1200 µg/m3	291	301	298	290	278	295	311	297	288	283	293
		20 m away from Shovel operation	Total SPM-1200 µg/m4	260	248	256	262	268	252	248	242	250	246	253
		10 m away from Wagon Drill in Operation	Total SPM-1200 µg/m5	190	195	210	202	190	189	212	194	188	176	195
		10 m away from ore unloading point at Stack Yard	Total SPM-1200 µg/m6	200	210	201	190	198	202	215	220	198	191	203
	Joribar Pit	Mine Haul Road	Total SPM-1200 µg/m7	289	305	289	295	270	279	288	303	276	284	288
		20 m away from Shovel operation	Total SPM-1200 µg/m8	257	254	288	266	268	254	262	247	233	231	256
		10 m away from Wagon Drill in Operation	Total SPM-1200 µg/m9	194	198	201	208	190	196	189	214	199	193	198
		10 m away from ore unloading point at Stack Yard	Total SPM-1200 µg/m10	192	178	189	180	203	197	213	204	196	206	196

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Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-2865 *Date:* 04.12.2014

GROUND WATER LEVEL MONITORING REPORT

Name of the Mines : **Bamebari Manganese Mines, Tata Steel Ltd.**

Monitoring Area & Date	Name of the Location	Top mRL	Water Encountered at mRL	Water Level in mtrs
25.11.2015	Well at Nimira	514	513.35	0.65
25.11.2015	Peizometric test Point at Bamebari	553	525.25	27.75

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Ref No: SSE/14/R-3363 *Date:* 04.02.2014

GROUND WATER LEVEL MONITORING REPORT

Name of the Mines : **Bamebari Manganese Mines, Tata Steel Ltd.**

Monitoring Area & Date	Name of the Location	Top mRL	Water Encountered at mRL	Water Level in mtrs
24.01.2015	Well at Nimira	514	512.17	1.83
24.01.2015	Peizometric test Point at Bamebari	553	523.89	29.11

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Annexure – V

S.S.Environics (India) Pvt. Ltd.

(An ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 Certified Company)

Plot No-361/2314 "Sustenance Tower"
At: Patrapada, P.O: Dumuduma, Dist: Khurda, Bhubaneswar-751 019, Odisha
Tele Fax: 0674- 2471574; E-mail: emails@ssenvironics.com

Ref No: SSE/14/R-2855 *Date:* 04.12.2014

GROUND WATER QUALITY ANALYSIS REPORT

Name of the Mines : **Bamebari Manganese Mines (Tata Steel Ltd)**
Location of Sampling : GW1: Well near Bamebari Petrol Pump
GW2: Well at Namira
Date of Sampling : 05.11.2014
Date of Analysis : 08.11.2014

Sl. No	Parameter	Standard as per BIS: 10500	Sampling Locations	
			GW1	GW2
Essential Characteristics				
1	Colour	5	CL	CL
2	Odour	U/O	U/O	U/O
3	Taste	Agreeable	AL	AL
4	Turbidity (NTU), max	1	<1	<1
5	pH Value	6.5-8.5	7.3	7.2
6	Total Hardness (as $CaCO_3$), mg/l, max	300	52	45
7	Iron (as Fe), mg/l, max	0.3	0.11	0.14
8	Chloride (as Cl), mg/l, max	250	9.1	9.6
9	Residual, free Chlorine, mg/l, min	0.2	ND	ND
Desirable Characteristics				
10	Dissolved Solids, mg/l, max	500	114	126
11	Calcium (as Ca), mg/l, max	75	9.4	9.9
12	Copper (as Cu), mg/l, max	0.05	BDL	BDL
13	Manganese (as Mn), mg/l, max	0.1	0.011	0.013
14	Sulphate (as SO_4), mg/l, max	200	21.8	24.2
15	Nitrate (as NO_3), mg/l, max	45	0.20	0.26
16	Fluoride (as F), mg/l, max	1.0	BDL	BDL
17	Phenolic Compounds (as C_6H_5OH), mg/l, max	0.001	ND	ND
18	Mercury (as Hg), mg/l, max	0.001	BDL	BDL
19	Cadmium (as Cd), mg/l, max	0.01	BDL	BDL
20	Selenium (as Se), mg/l, max	0.01	BDL	BDL
21	Arsenic (as As), mg/l, max	0.05	BDL	BDL
22	Cyanide (as CN), mg/l, max	0.05	BDL	BDL
23	Lead (as Pb), mg/l, max	0.05	BDL	BDL
24	Zinc (as Zn), mg/l, max	5	0.22	0.29
25	Anionic Detergents (as MBAS), mg/l, max	0.2	Absent	Absent
26	Chromium (as Cr+6), mg/l, max	0.05	BDL	BDL
27	Polynuclear aromatic hydrocarbons (as PAH), g/l, max	-	ND	ND
28	Mineral Oil, mg/l, max	0.01	ND	ND
29	Pesticides, mg/l, max	Absent	Absent	Absent
30	Alkalinity , mg/l, max	200	33	28
31	Aluminium as Al, mg/l, max	0.03	BDL	BDL
32	Boron mg/l , max	1.0	BDL	BDL

CL – Colourless, U/O – Unobjectionable, ND – Not detectable.
BDL Values: Copper- 0.001mg/l,Flouride-0.001 mg/l, Cadmium- 0.001 mg/l, Mercury- 0.0001 mg/l, Lead- 0.001 mg/l, Arsenic- 0.001 mg/l, Zinc- 0.005 mg/l, Cyanide- 0.001 mg/l, Cr+6- 0.001 mg/l, , Selenium- 0.001 mg/l, Al-0.001 mg/l.

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Ref No: SSE/14/R-3367 *Date:* 04.02.2015

GROUND WATER QUALITY ANALYSIS REPORT

Name of the Mines : **Bamebari Manganese Mines (Tata Steel Ltd)**
Location of Sampling : GW1: Well near Bamebari Petrol Pump
GW2: Well at Namira
Date of Sampling : 24.01.2015
Date of Analysis : 27.01.2015

Sl. No	Parameter	Standard as per BIS: 10500	Sampling Locations	
			GW1	GW2
Essential Characteristics				
1	Colour	5	CL	CL
2	Odour	U/O	U/O	U/O
3	Taste	Agreeable	AL	AL
4	Turbidity (NTU), max	1	<1	<1
5	pH Value	6.5-8.5	6.9	7.1
6	Total Hardness (as $CaCO_3$), mg/l, max	300	58	51
7	Iron (as Fe), mg/l, max	0.3	0.13	0.13
8	Chloride (as Cl), mg/l, max	250	10.4	9.9
9	Residual, free Chlorine, mg/l, min	0.2	ND	ND
Desirable Characteristics				
10	Dissolved Solids, mg/l, max	500	122	103
11	Calcium (as Ca), mg/l, max	75	9.1	8.7
12	Copper (as Cu), mg/l, max	0.05	BDL	BDL
13	Manganese (as Mn), mg/l, max	0.1	0.025	0.019
14	Sulphate (as SO_4), mg/l, max	200	25.7	23.1
15	Nitrate (as NO_3), mg/l, max	45	0.29	0.25
16	Fluoride (as F), mg/l, max	1.0	BDL	BDL
17	Phenolic Compounds (as C_6H_5OH), mg/l, max	0.001	ND	ND
18	Mercury (as Hg), mg/l, max	0.001	BDL	BDL
19	Cadmium (as Cd), mg/l, max	0.01	BDL	BDL
20	Selenium (as Se), mg/l, max	0.01	BDL	BDL
21	Arsenic (as As), mg/l, max	0.05	BDL	BDL
22	Cyanide (as CN), mg/l, max	0.05	BDL	BDL
23	Lead (as Pb), mg/l, max	0.05	BDL	BDL
24	Zinc (as Zn), mg/l, max	5	0.19	0.17
25	Anionic Detergents (as MBAS), mg/l, max	0.2	Absent	Absent
26	Chromium (as Cr+6), mg/l, max	0.05	BDL	BDL
27	Polynuclear aromatic hydrocarbons (as PAH), g/l, max	-	ND	ND
28	Mineral Oil, mg/l, max	0.01	ND	ND
29	Pesticides, mg/l, max	Absent	Absent	Absent
30	Alkalinity , mg/l, max	200	26	34
31	Aluminium as Al, mg/l, max	0.03	BDL	BDL
32	Boron mg/l , max	1.0	BDL	BDL

CL – Colourless, U/O – Unobjectionable, ND – Not detectable.
BDL Values: Copper- 0.001mg/l,Flouride-0.001 mg/l, Cadmium- 0.001 mg/l, Mercury- 0.0001 mg/l, Lead- 0.001 mg/l, Arsenic- 0.001 mg/l, Zinc- 0.005 mg/l, Cyanide- 0.001 mg/l, Cr+6- 0.001 mg/l, , Selenium- 0.001 mg/l, Al-0.001 mg/l.

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Annexure - VI

S.S.Environics (India) Pvt. Ltd.

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Ref No: SSE/14/R-2860 *Date:* 04.12.2014

ANALYSIS OF TRACE METALS IN GROUND WATER AT LOWER ELEVATION

Name of the Mines : **Bamebari Manganese Mines (Tata Steel Ltd)**

Location of Sampling : Borewell near Bamebari Main gate

Date of Sampling : 05.11.2014

Date of Analysis : 08.11.2014

Sl. No	Parameter	Standard as per BIS: 10500	Analysis Results
1	Iron (as Fe), mg/l, max	0.3	0.16
2	Chromium (as Cr+6), mg/l, max	0.05	BDL
3	Copper (as Cu), mg/l, max	0.05	BDL
4	Selenium (as Se), mg/l, max	0.01	BDL
5	Arsenic (as As), mg/l, max	0.05	BDL
6	Cadmium (as Cd), mg/l, max	0.01	BDL
7	Mercury (as Hg), mg/l, max	0.001	BDL
8	Lead (as Pb), mg/l, max	0.05	BDL
9	Zinc (as Zn), mg/l, max	5	0.33
10	Manganese (as Mn), mg/l, max	0.1	0.017

BDL Values: Copper- 0.001mg/l, Cadmium- 0.001 mg/l, Mercury- 0.0001 mg/l, , Arsenic- 0.001 mg/l,Selenium-0.001 mg/l, Cr+6- 0.001 mg/l.

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Ref No: SSE/14/R-3376 *Date:* 04.02.2015

ANALYSIS OF TRACE METALS IN GROUND WATER AT LOWER ELEVATION

Name of the Mines : **Bamebari Manganese Mines (Tata Steel Ltd)**

Location of Sampling : Borewell near Bamebari Main gate

Date of Sampling : 24.01.2015

Date of Analysis : 27.01.2015

Sl. No	Parameter	Standard as per BIS: 10500	Analysis Results
1	Iron (as Fe), mg/l, max	0.3	0.15
2	Chromium (as Cr+6), mg/l, max	0.05	BDL
3	Copper (as Cu), mg/l, max	0.05	BDL
4	Selenium (as Se), mg/l, max	0.01	BDL
5	Arsenic (as As), mg/l, max	0.05	BDL
6	Cadmium (as Cd), mg/l, max	0.01	BDL
7	Mercury (as Hg), mg/l, max	0.001	BDL
8	Lead (as Pb), mg/l, max	0.05	BDL
9	Zinc (as Zn), mg/l, max	5	0.24
10	Manganese (as Mn), mg/l, max	0.1	0.030

BDL Values: Copper- 0.001mg/l, Cadmium- 0.001 mg/l, Mercury- 0.0001 mg/l, , Arsenic- 0.001 mg/l,Selenium-0.001 mg/l, Cr+6- 0.001 mg/l.

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Annexure – VII(Surface Water Quality Analysis Report)

BAMEBARI (UPSTREAM) W1				Oct'14		Nov'14		Dec'14		Jan'15		Feb'15		March'15		Avg 6 months
Sl.	Parameters	Unit	Standards as per	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	W-1
1	Colour & Odour	--	300 & $	12 & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	**3.9 & U/O**
2	Suspended Solids	Mg/l	$	34	26	31	38	26	31	21	16	28	29	22	26	**27.33**
3	Particular Size of S.S.	µ(micron)	$	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	**<850**
4	Dissolved Solids	Mg/l	1500	123	109	129	131	117	122	106	97	124	134	110	122	**118.67**
5	PH	--	6.5-8.5	7.2	7.1	7.2	7.2	7.1	7.2	7.1	7.1	7.2	7.2	7.2	7.2	**7.17**
6	Temperature	^{0}C	$	25	25	24	24	23	23	22	22	24	24	25	25	**23.83**
7	Oil & Grease	Mg/l	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**ND**
8	Total Residual Chlorine	Mg/l	$	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**ND**
9	Amm. Nitrogen as N	Mg/l	$	0.38	0.3	0.38	0.39	0.31	0.33	0.19	0.18	0.27	0.27	0.2	0.21	**ND**
10	Total Kjeldal Nitrogen as N	Mg/l	$	0.97	0.89	1.05	1.12	0.96	1.04	0.98	0.78	1.19	0.84	1.04	0.77	**0.97**
11	Free Ammonia as NH_3	Mg/l	$	0.005	0.003	0.003	0.004	0.004	0.004	0.002	0.003	0.002	0.003	0.002	0.002	**ND**
12	Dissolved Oxygen	Mg/l	4	7.3	7.3	7.2	7.2	7.3	7.4	7.3	7.3	7.4	7.2	7.4	7.2	**7.29**
13	BOD(3) days at 27^{0}C	Mg/l	3	1.15	1.06	1.16	1.18	1.11	1.1	0.86	0.96	0.97	1.12	0.89	1.04	**1.05**
14	COD	Mg/l	$	3.37	3.17	3.38	3.55	3.29	3.47	2.44	2.58	2.87	3.65	2.58	3.11	**3.12**
15	Arsenic as As	Mg/l	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
16	Mercury as Hg	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
17	Lead as Pb	Mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
18	Cadmium as Cd	Mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
19	Hexa Chromium as Cr^{+6}	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
20	Total Chromium as Cr	Mg/l	$	0.14	0.11	0.19	0.21	0.16	0.17	0.11	0.07	0.15	0.11	0.13	0.09	**0.14**
21	Copper as Cu	Mg/l	1.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
22	Zinc as Zn	Mg/l	15	0.16	0.13	0.17	0.18	0.14	0.14	0.19	0.13	0.19	0.24	0.15	0.19	**0.17**
23	Selenium as Se	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
24	Nickel as Ni	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
25	Cyanide as CN	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
26	Fluoride as F	Mg/l	1.5	0.053	0.039	0.06	0.06	0.05	0.07	0.04	0.06	0.04	0.05	0.04	0.05	**0.05**
27	Diss. Phosphate as P	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
28	Sulphide as S	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
29	Phenolic Compounds as C_6H_5OH	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
30	Bio-assay Test	--	$	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	**98% .**
31	Manganese as Mn	Mg/l	$	0.063	0.051	0.052	0.054	0.048	0.048	0.026	0.028	0.021	0.037	0.017	0.03	**0.04**
32	Iron as Fe	Mg/l	50	0.27	0.17	0.33	0.42	0.29	0.39	0.18	0.19	0.26	0.31	0.21	0.25	**0.27**
33	Vanadium as V	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
34	Nitrate as NO_3	Mg/l	50	0.18	0.13	0.18	0.26	0.15	0.22	0.12	0.12	0.22	0.18	0.17	0.14	**0.17**

BAMEBARI (DOWNSTREAM) W2				Oct'14		Nov'14		Dec'14		Jan'15		Feb'15		March'15		Avg 6 months
Sl.	Parameters	Unit	Standards as per	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	1st Report	2nd Report	W-2
1	Colour & Odour	--	300 & $	14 & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	**3.8& U/O**
2	Suspended Solids	Mg/l	$	39	28	37	42	28	35	27	23	33	36	26	31	**32.08**
3	Particular Size of S.S.	µ(micron)	$	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	**<850**
4	Dissolved Solids	Mg/l	1500	129	114	132	136	123	128	114	108	138	141	117	128	**125.67**
5	PH	--	6.5-8.5	7.2	7.1	7.3	7.1	7.2	7.2	7.2	7.1	7.2	7.2	7.2	7.3	**7.19**
6	Temperature	^{0}C	$	25	25	24	24	23	23	22	22	24	24	25	25	**23.83**
7	Oil & Grease	Mg/l	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**ND**
8	Total Residual Chlorine	Mg/l	$	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**ND**
9	Amm. Nitrogen as N	Mg/l	$	0.44	0.35	0.41	0.41	0.37	0.37	0.24	0.21	0.31	0.35	0.23	0.29	**ND**
10	Total Kjeldal Nitrogen as N	Mg/l	$	1.11	0.91	1.09	1.15	1.1	1.09	1.1	0.83	1.26	0.92	1.15	0.85	**1.05**
11	Free Ammonia as NH_3	Mg/l	$	0.006	0.003	0.003	0.003	0.004	0.004	0.002	0.003	0.002	0.002	0.002	0.002	**ND**
12	Dissolved Oxygen	Mg/l	4	7.2	7.2	7.2	7.2	7.3	7.4	7.3	7.3	7.4	7.3	7.3	7.2	**7.28**
13	BOD(3) days at 27^{0}C	Mg/l	3	1.19	1.11	1.19	1.21	1.15	1.14	0.92	1	1.1	1.18	0.95	1.1	**1.10**
14	COD	Mg/l	$	3.45	3.28	3.42	3.58	3.36	3.51	2.53	2.66	3.19	3.79	2.62	3.35	**3.23**
15	Arsenic as As	Mg/l	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
16	Mercury as Hg	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
17	Lead as Pb	Mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
18	Cadmium as Cd	Mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
19	Hexa Chromium as Cr^{+6}	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
20	Total Chromium as Cr	Mg/l	$	0.17	0.12	0.22	0.25	0.2	0.19	0.13	0.1	0.19	0.14	0.16	0.1	**0.16**
21	Copper as Cu	Mg/l	1.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
22	Zinc as Zn	Mg/l	15	0.19	0.14	0.2	0.21	0.17	0.16	0.21	0.17	0.22	0.29	0.18	0.22	**0.20**
23	Selenium as Se	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
24	Nickel as Ni	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
25	Cyanide as CN	Mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
26	Fluoride as F	Mg/l	1.5	0.061	0.045	0.06	0.07	0.06	0.07	0.05	0.06	0.04	0.06	0.05	0.05	**0.06**
27	Diss. Phosphate as P	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
28	Sulphide as S	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
29	Phenolic Compounds as C_6H_5OH	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
30	Bio-assay Test	--	$	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	**98.0%**
31	Manganese as Mn	Mg/l	$	0.069	0.056	0.057	0.058	0.051	0.051	0.033	0.033	0.029	0.045	0.022	0.038	**0.045**
32	Iron as Fe	Mg/l	50	0.31	0.21	0.38	0.48	0.32	0.42	0.21	0.22	0.33	0.38	0.26	0.29	**0.32**
33	Vanadium as V	Mg/l	$	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**BDL**
34	Nitrate as NO_3	Mg/l	50	0.21	0.15	0.21	0.3	0.18	0.25	0.15	0.14	0.28	0.22	0.2	0.17	**0.21**

Annexure – VIII (Ambient Air Quality)

BAMEBARI Monthly Avgs	Location	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	Mn µg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a) Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
Oct'14	Bamebari Camp	52.89	30.21	4.57	12.03	0.18	0.70	6.60	BDL	BDL	0.69	BDL	BDL	BDL
Nov'14	Bamebari Camp	53.25	30.46	4.21	12.46	0.15	0.73	6.43	BDL	BDL	0.67	BDL	BDL	BDL
Dec'14	Bamebari Camp	57.44	32.38	4.33	12.57	0.19	0.74	6.51	BDL	BDL	0.69	BDL	BDL	BDL
January'15	Bamebari Camp	56.33	31.96	4.50	11.94	0.17	0.77	6.21	0.00012	BDL	0.73	BDL	BDL	BDL
Feb'15	Bamebari Camp	47.38	27.84	4.24	10.43	0.14	0.66	5.46	BDL	BDL	0.57	BDL	BDL	BDL
March'15	Bamebari Camp	46.11	27.02	4.14	10.94	0.14	0.53	5.38	BDL	BDL	0.66	BDL	BDL	BDL
6 Months Avgs	Bamebari Camp	**52.23**	**29.98**	**4.33**	**11.73**	**0.16**	**0.69**	**6.10**	**BDL**	**BDL**	**0.67**	**BDL**	**BDL**	**BDL**

BAMEBARI Monthly Avgs	Location	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	Mn µg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a) Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
Oct'14	Bamebari Pit	60.11	34.43	5.11	12.77	0.23	0.77	7.20	BDL	BDL	0.77	BDL	BDL	BDL
Nov'14	Bamebari Pit	62.00	34.90	4.85	13.38	0.21	0.83	7.26	BDL	BDL	0.77	BDL	BDL	BDL
Dec'14	Bamebari Pit	65.89	37.07	5.04	13.41	0.25	0.84	7.40	BDL	BDL	0.80	BDL	BDL	BDL
January'15	Bamebari Pit	64.33	36.29	5.21	12.91	0.23	0.88	7.17	0.00028	BDL	0.86	BDL	BDL	BDL
Feb'15	Bamebari Pit	54.13	30.89	4.76	11.24	0.18	0.75	6.10	0.00007	BDL	0.67	BDL	BDL	BDL
March'15	Bamebari Pit	53.44	31.50	4.66	11.86	0.19	0.62	6.07	0.00006	BDL	0.76	BDL	BDL	BDL
6 Months Avgs	Bamebari Pit	**59.98**	**34.18**	**4.94**	**12.59**	**0.21**	**0.78**	**6.87**	**BDL**	**BDL**	**0.77**	**BDL**	**BDL**	**BDL**

Annexure - IX

TATA STEEL

MANGANESE GR.OF MINES, JODA

RESULT OF NOISE LEVEL MONITORING AT DIFFERENT LOCATION

Mine	Location	Physical Condition	Period **03.11.2015 to 08.11.2015** Noise Level dB(A)	Period **23.02.2015 to 28.02.2015** Noise Level dB(A)
Bamebari Mn Mines	a) Bamebari Pit	i) 2 mtr.away from Shovel Operation	76	79
		ii) Inside the Shvel Operator Cabin	57	53
		iii) 1 mtr.away from wagon drill operation	83 *	85*
	b) Joribar Pit.	i) 2 mtr.away from Shovel Operation	75	78
		ii) Inside the Shvel Operator Cabin	52	49
		iii) 1 mtr.away from wagon drill operation	88 *	81 *

NB : - Prescribed noise level for 8 hr. exposure is 90 dB(A)
*** Ear Muff / Ear Plug has been provided to all the crew members of operation**

Annexure - X

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
Adequate Titration , Distillation and Filtration unit with sufficient glassware required for laboratory analysis are available with us.		

Annexure – XI
Organizational Structure