

COMPLIANCE REPORT PERIOD: OCT'14 TO MAR'15

ENVIRONMENTAL CLEARANCE TO TIRINGPAHAR MANGANESE MINE OF TATA STEEL LIMITED VIDE MoEF's LETTER NO. J-11015/87/2004-1A.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 Tiringpahar Manganese Mine over an area of 643.710 ha. (RML ó 169 ha & ML ó 474.710 ha) was submitted under Rule No.12, MCDR 1988 for the period 2010-11 to 2014-15 and was approved by IBM vide letter no. MS/OTF.MECH/21-ORI/BHU/2010-11, Dt. 09.07.2010.

| Sl. no | A : Specific conditions | Compliance status |
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| 1 | Mining shall not be undertaken in areas of forestland within the lease without the necessary approvals / forestry clearance. | The mine has obtained forest clearance over 52.348 ha vide MoEF's letter No 8-80/2004-FC dt 28.03.2007. 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. | There was no generation of top soil during Oct'14 to Mar'15 due to workings were within the broken up area. 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 stabilization 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 17.093 ha. The inactive portion of OB dumps area being stabilized by plantation of fast growing species. 20890 nos. of saplings of local species (Gambhari, Chakunda, Mahanimba, Kala Sirs, Sisu, etc) were planted during 2014-15 and the survival rate was found to be 73.47%. 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. 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. |

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| 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. 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 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.</p> <p>No Provision of Effluent treatment plant , so no chance of inrush of storm water in to the ETP during high rainfall/super cyclone period</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>In order 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 ó 1 to 1.2 mtr. Width ó 1 mtr.</p> <p><u>Dimension of the Garland Drain :</u> Depth ó 1.20 to 1.5 mtr. Width ó 1 to 1.2 mtr.</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 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.</p> | <p>Samples have been analyzed in dust fall & soil during post monsoon and winter season.</p> <p>It was observed that,</p> <p>a) Presence of Co and Hg was nil. Only Ni & As presence varies from 0.027 to 0.016 & 0.021 to 0.015 near Guruda Pit & Purunapani Pit respectively in dust fall during post monsoon season.</p> <p>b) Presence of Co and Hg was nil. Only Ni & As presence varies from 0.045 to 0.032 & 0.035 to 0.026 near Guruda Pit & Purunapani Pit respectively in soil samples during winter season.</p> <p>The detail analysis result is enclosed as Annexure-I (Dust Fall) & II (Soil).</p> |
| 8 | <p>Mine Mineral and OB transportation shall be in trucks/dumpers covered with tarpaulins.</p> | <p>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 ó 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</p> |

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| | <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>at Joda is bearing the 'Pollution under Control' certificate. The emissions are under control.</p> <p>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 no fugitive emission during transfer of ore.</p> <p>During Oct 14-Mar 15 there were no operations at Tiringpahar Manganese Mines</p> |
| 9 | <p>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> | <ul style="list-style-type: none"> • Reclamation and plantation programmes have been drawn. We have planted 1,47,399 nos. of saplings over an area of 38.20 ha with 79% survival rate. • Tree density is maintained at the rate of 3061 saplings per ha. • The plantation includes the local species. |
| 10 | <p>Groundwater shall not be used for mine operations. Prior approval of CGWA shall be obtained for using groundwater.</p> | <p>Ground water use permission has been obtained from CGWA vide letter no. 21-4498)/CGWA/SER/2010-171, Dt.15.02.2011 for 208 m³ per day.</p> <p>The ground water is not being used for mining and its allied activities.</p> |
| 11 | <p>Mining will not intersect groundwater. Prior permission of the MOEF and CGWA shall be taken to mine below water table.</p> | <p>Mining is not intersecting the ground water as the Ground water being at lower level in comparison to existing maximum quarry depth.</p> |
| 12 | <p>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 Ministry of Environment & Forests and the Central Ground Water Authority quarterly.</p> | <p>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 is being monitored.</p> <p>It was observed that , the level of ground water ,</p> <ol style="list-style-type: none"> a) During post monsoon was 2.97 mtr (at 576.03 mRL) to 5.62 mtr.(at 509.38 mRL) & b) During winter was 3.80 mtr (at 575.20 mRL) to 7.15 mtr (at 507.85 mRL). c) Ground water not encountered upto 80 metres (at 633 mRL) at Piezometric test point at Guruda Pit during summer as well as during monsoon. d) The quality of ground water monitored with reference to standard of BIS : 10500 and the qualities are well within the standard. <p>The ground water level and quality monitoring results are enclosed as Annexure III & IV respectively</p> |
| 13 | <p>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</p> | <p>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</p> |

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| | 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. | 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 0.15, 0.28 and 0.013 mg/l during post monsoon and 0.13, 0.21 and 0.020 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 V & VI 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.115 No.7251 / IND-I-CON-190 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/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, Bhubaneshwar. | We have deposited Rs.25,20,385/- 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. 8,59,615 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. | A progressive mine closure plan for the period from 2010-11 to 2014-15 has been submitted to IBM and is under approval process. 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: |

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| | | <p>Plan 2014-15: Production: 85000 MT OB: 5,74,000 Cu M Planned (Octø14 to Marø15) Production:- 42,500 MT OB:- 2,87,000 CuM Actual (Octø14 to Marø15)- Production (Octø14 to Marø15) : NIL OB Removal (Octø14 to Marø15): NIL</p> |
| 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 Bhubaneshwar and the State Pollution Control Board / Central Pollution Control Board once in six. months.</p> | <p>Six ambient air quality monitoring stations have been established out of which 2 nos. in core zone (Near Pump House) and Guruda mining area & 4 nos. in buffer zone (at Jaribahal, Langalota, Palasa & Balda).</p> <p>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 PM₁₀, PM_{2.5}, So₂ & NO_x, CO & Mn.</p> <p>It was observed that,</p> <ol style="list-style-type: none"> PM₁₀ varies from 35.56 µg/m³ (Marø15) to 45.67 µg/m³ (Decø14) near Purunapani Quarry against the standard 100 µg/m³. PM₁₀ varies from 40.00 µg/m³ (Marø15) to 50.33 µg/m³ (Decø14) near Guruda quarry against the standard 100 µg/m³. PM_{2.5} varies from 21.08 µg/m³ (Marø15) to 26.90 µg/m³ (Decø14) near Purunapani Quarry against the standard 60 µg/m³. PM_{2.5} varies from 23.66 µg/m³ (Marø15) to 29.53 µg/m³ (Decø14) near Guruda quarry against the standard 60 µg/m³. SO₂ varies from 4.00 µg/m³ (Marø15) to 4.11 µg/m³ (Octø14) near Purunapani Quarry against the standard 80 µg/m³. SO₂ varies from 4.00 µg/m³ (Marø15) to 4.23 µg/m³ (Octø14) near Guruda quarry against the standard 80 µg/m³. NoX varies from 9.40 µg/m³ (Febø15) to 11.33 µg/m³ (Decø14) near Purunapani quarry against the standard 80 µg/m³. NoX varies from 9.70 µg/m³ (Febø15) to 11.78 µg/m³ (Decø14) near Guruda quarry against the standard 80 µg/m³. CO varies from 0.11 µg/m³ (Novø14) to 0.13 µg/m³ (Octø14) near Purunapani quarry against the standard 2 µg/m³. CO varies from 0.11 µg/m³ (Febø15) to 0.14 µg/m³ (Octø14) near Guruda quarry against the |

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| | | <p>standard $2 \mu\text{g}/\text{m}^3$.</p> <p>k) Mn varies from $0.43 \mu\text{g}/\text{m}^3$ (Marø15) to $0.64 \mu\text{g}/\text{m}^3$ (Janø15) near Purunapani quarry against the standard $0.25 \text{mg}/\text{m}^3$.</p> <p>l) Mn varies from $0.46 \mu\text{g}/\text{m}^3$ (Marø15) to $0.68 \mu\text{g}/\text{m}^3$ (Janø15) near Guruda quarry against the standard $0.25 \text{mg}/\text{m}^3$.</p> <p>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 ó VII.</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 being practiced where ever required. |
| 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. During Octø14-Marø15 there were no operations at Tiringpahar Manganese Mines. |
| 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. During Octø14- Marø15 there were no operations at Tiringpahar Manganese Mines |
| 7 | In 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. | There is no infrastructural facility has been installed for equipment/ vehicle within the lease hold area. The equipment and vehicles deployed in the mine are maintained at Bamebari Mn.Mines which is under same management control. The oil separation system has been provided at workshop at Bamebari and working effectively. |
| 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 òAö 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 ó VIII. |
| 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 Examination which is inclusive of lungs function test and audiometry. All the personnel are |

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| | 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. | <p>trained on safety in work place and continuous awareness programmes are being conducted for all employees to avert manganese poisoning.</p> <p>Periodical Medical Examination of employees (departmental & contractual) are conducted as per prescribed norms of Mines Rule, 1955. The initial and periodical examination includes blood haematology, 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, 60 nos. of employees were examined. During 2012-13, a total no. of 240 employees were examined. During 2013-14 a total no. of 72 employees (Departmental-9 and contractor employees-63) 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.</p> |
| 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. | <p>The department is in place and the Head of the department is reporting to General Manager of the division.</p> <p>The organizational structure in place is enclosed as Annexure-IX.</p> |
| 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. | <p>Funds allocated for environmental management are spent only for environment related purposes and not diverted to any other purpose.</p> <p>The utilization of environment management for FY05 was Rs. 16,68,407/- (Monitoring ó Rs 12,65,117/- & Plantation - Rs. 4,03,290/-) against the budget of Rs 6,86,000/- (Monitoring - Rs, 5,70,000/- & Plantation - Rs. 1,16,000/-) for Tiringpahar Manganese Mines.</p> |
| 12 | The Regional Office of this Ministry located at Bhubaneshwar 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 shall extend to 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 Sarpanch, Gram Panchayat, Jajang on 12.01.2006. |

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| 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 Tiringpahar 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 : <u>Additional Conditions</u> | Compliance status |
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| 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 17.093 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. In order to prevent the siltation and check the run-off, retaining wall and garland drain are provided with the dimension as; Dimension of the Retaining Wall : Height ó 1 to 1.2 mtr. Width ó 1 mtr., Length: 413.25 mtr. |

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| | | <p>Dimension of the Garland Drain :</p> <p>Depth ó 1.20 to 1.5 mtr. Width ó 1 to 1.2 mtr., Length: 413.25 mtr.</p> <p>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.</p> |
| b | <p>The natural water bodies and or streams which are flowing in and around the village should not be disturbed. The Water Table should be 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.</p> | <p>The natural water bodies and or streams which are flowing in and around the village is not disturbed. Ground water use permission has been obtained from CGWA vide letter no. 21-4498)/CGWA/SER/2010-171, Dt.15.02.2011 for 208 m3 per day.</p> <p>The ground water is not being used for mining and its allied activities.</p> <p>The water table is recharged by the water bodies/streams flowing around the villages and also by the direct seepage of the rainfall occurring 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-III for your kind reference.</p> |
| c | <p>The illumination and sound at night at project sites disturb the villages in respect of both human and animal population. Consequent sleeping disorders and stress may affect the health in the villages located close to mining operations. Habitations have a right to darkness and minimal noise levels at night. The Project Proponents (PPs) must ensure that the biological clock of the villagers is not disturbed by orienting the floodlights/masks away from the villages and keeping the noise levels well within the prescribed limits for day/night hours.</p> | <p>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.</p> |
| d | <p>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 Honøble Supreme Court with regard to acquiring grazing land. The spares trees on such grazing ground, which provide</p> | <p>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.</p> <p>The mine has obtained forest clearance over 52.348 ha vide MoEFø letter No 8-80/2004-FC dt 28.03.2007.</p> <p>The mining operation and allied activities are confined within the approved diverted area only.</p> |

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| | <p>midday shelter from the scorching sun should be scrupulously guarded against felling, last the cattle abandon the grazing ground or return home by noon.</p> | |
| e | <p>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 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.</p> | <p>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.</p> |
| f | <p>Main haulage road in the mine should be provided with permanent water sprinklers and other roads should be regularly wetted with water tankers fitted with sprinklers. Crusher and material transfer points should invariably be provided with Bag filters and or dry fogging system. Belt conveyors should be fully covered to avoid air borne dust.</p> | <p>Water sprinkling is also been carried out by the tankers fitted with sprinklers on regular interval with increased 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-VII</p> |
| g | <p>The Project Authority shall ensure that the productivity of agricultural crops is not affected due to mining operations. Crop liability insurance policy has to be taken by the PP as a precaution to compensate for any crop loss. The impact zone shall be 5km from the boundary of mine lease area for such insurance policy. In case, several mines are located in a cluster, the Associations of owners of the cluster mines, formed inter-alia, to sub-serve such an objective, shall take responsibility for</p> | <p>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 constructing retaining wall around the critical areas of the dump complementing 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</p> |

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| | securing such Crop Liability Policy. | 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 bypass road should be constructed (say, leaving a gap of at least 200 meters) for the purpose of transportation of the minerals so that the impact of sound, dust and accidents could be mitigated. The PP shall bear the cost towards the widening and strengthening of existing public road network in case the same is proposed to be used for the Project. No road movement should be allowed on existing village road network without appropriately increasing the carrying capacity of such road. | Transportation 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. |
| 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 turnover, Socio Economic Development of the neighbourhood Habitats could also be planned and executed by the PPs more systematically based on the Need based door to door survey by established Social Institutes / Workers on the lines as required under TOR. R&R Plan/compensation details for the Project | Socio Economic Development of the neighbourhood Habitats is planned and executed by us through a separate wing formed for the said purpose, 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. |

| | |
|---|--|
| <p>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. The issues relating to shifting of village including their R&R and socio-economic aspects should be discussed in the EIA report.ö</p> | |
|---|--|

Yours faithfully
F: TATA STEEL LTD.

Sd/-
Agent, Tiringpahar 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-2703

Date: 04.12.2014

DUST FALL ANALYSIS RESULTS FOR TRACE METALS

Name of the Mines : T. Pahar Manganese Mines (Tata Steel Ltd.)
Location of Sampling : DF1: Guruda Pit
DF2: Purunapani
Period of monitoring : November-2014

| Sl. No. | Parameters | DF1 | DF2 |
|---------|----------------------|-------|-------|
| 1. | Nickel as (Ni) in % | 0.030 | 0.021 |
| 2. | Cobalt as (Co) in % | Nil | Nil |
| 3. | Arsenic as (As) in % | 0.016 | 0.01 |
| 4. | Mercury as (Hg) in % | Nil | Nil |





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-3361

Date: 04.02.2015

DUST FALL ANALYSIS RESULTS FOR TRACE METALS

Name of the Mines : T. Pahar Manganese Mines (Tata Steel Ltd.)
Location of Sampling : DF1: Guruda Pit
DF2: Purunapani
Period of monitoring : January-2015

| Sl. No. | Parameters | DF1 | DF2 |
|---------|----------------------|-------|-------|
| 1. | Nickel as (Ni) in % | 0.027 | 0.016 |
| 2. | Cobalt as (Co) in % | Nil | Nil |
| 3. | Arsenic as (As) in % | 0.021 | 0.015 |
| 4. | Mercury as (Hg) in % | Nil | Nil |



For S.S ENVIRONICS (INDIA) PVT. LTD

Annexure – II



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-2699

Date: 04.12.2014

SOIL QUALITY ANALYSIS RESULTS FOR TRACE METALS

Name of the Mines : Tiringpahar Manganese Mine
(Tata Steel Ltd)

Location of Sampling : S1: Guruda pit
S2: Purunapani

Date of Sampling : 25.11.2014

Date of Analysis : 27.11.2014

| Sl. No. | Parameters | S1 | S2 |
|---------|----------------------|-------|-------|
| 1. | Nickel as (Ni) in % | 0.036 | 0.028 |
| 2. | Cobalt as (Co) in % | Nil | Nil |
| 3. | Arsenic as (As) in % | 0.028 | 0.019 |
| 4. | Mercury as (Hg) in % | Nil | Nil |



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



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@ssevironics.com

Ref No: SSE/14/R-3373

Date: 04.02.2015

SOIL QUALITY ANALYSIS RESULTS FOR TRACE METALS

Name of the Mines : Tiringpahar Manganese Mine
(Tata Steel Ltd)

Location of Sampling : S1: Guruda pit
S2: Purunapani

Date of Sampling : 24.01.2015

Date of Analysis : 27.01.2015

| Sl. No. | Parameters | S1 | S2 |
|---------|----------------------|-------|-------|
| 1. | Nickel as (Ni) in % | 0.045 | 0.032 |
| 2. | Cobalt as (Co) in % | Nil | Nil |
| 3. | Arsenic as (As) in % | 0.035 | 0.026 |
| 4. | Mercury as (Hg) in % | Nil | Nil |



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

Annexure – III



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-2866

Date: 04.12.2015

GROUND WATER LEVEL MONITORING REPORT

Name of the Mines : Tiringpahar Manganese Mines, Tata Steel Ltd.

| Monitoring Area & Date | Name of the Location | Top mRL | Water Encountered at mRL | Water Level in mtrs |
|------------------------|----------------------|---------|--------------------------|---------------------|
| 24.11.2015 | Well at Palsha | 579 | 576.03 | 2.97 |
| | Well at Joribahal | 515 | 509.38 | 5.62 |



S.S. Environics (India) Pvt. Ltd



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@sseenvironics.com

Ref No: SSE/14/R-3364

Date: 04.02.2015

GROUND WATER LEVEL MONITORING REPORT

Name of the Mines : Tiringpahar 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 Palsha | 579 | 575.20 | 3.80 |
| | Well at Joribahal | 515 | 507.85 | 7.15 |



S.S. Environics (India) Pvt. Ltd

Annexure – IV



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@ssevironics.com

Ref No: SSE/14/R-2856

Date: 04.12.2014

GROUND WATER QUALITY ANALYSIS REPORT

Name of the Mines : Tiringpahar Manganese Mines (Tata Steel Ltd)
 Location of Sampling : GW1: Well at Palsha
 : GW2: Well at Jaribahal
 Date of Sampling : 25.11.2014
 Date of Analysis : 28.11.2014

| 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 | 7.2 | 7.3 |
| 6 | Total Hardness (as CaCO ₃), mg/l, max | 300 | 63 | 55 |
| 7 | Iron (as Fe), mg/l, max | 0.3 | 0.13 | 0.11 |
| 8 | Chloride (as Cl), mg/l, max | 250 | 9.9 | 10.3 |
| 9 | Residual, free Chlorine, mg/l, min | 0.2 | ND | ND |
| Desirable Characteristics | | | | |
| 10 | Dissolved Solids, mg/l, max | 500 | 136 | 144 |
| 11 | Calcium (as Ca), mg/l, max | 75 | 9.6 | 9.8 |
| 12 | Copper (as Cu), mg/l, max | 0.05 | BDL | BDL |
| 13 | Manganese (as Mn), mg/l, max | 0.1 | 0.007 | 0.009 |
| 14 | Sulphate (as SO ₄), mg/l, max | 200 | 20.4 | 18.2 |
| 15 | Nitrate (as NO ₃), mg/l, max | 45 | 0.22 | 0.19 |
| 16 | Fluoride (as F), mg/l, max | 1.0 | 0.028 | 0.022 |
| 17 | Phenolic Compounds (as C ₆ H ₅ OH), 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 | 0.21 | 0.18 |
| 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 | 24 | 27 |
| 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, Fluoride-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.

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



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@sseenvironics.com

Ref No: SSE/14/R-3368

Date: 04.02.2015

GROUND WATER QUALITY ANALYSIS REPORT

Name of the Mines : Tiringpahar Manganese Mines (Tata Steel Ltd)
 Location of Sampling : GW1: Well at Palsha
 GW2: Well at Jaribahal
 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 | 7.1 | 7.2 |
| 6 | Total Hardness (as CaCO ₃), mg/l, max | 300 | 49 | 44 |
| 7 | Iron (as Fe), mg/l, max | 0.3 | 0.11 | 0.10 |
| 8 | Chloride (as Cl), mg/l, max | 250 | 9.5 | 9.1 |
| 9 | Residual, free Chlorine, mg/l, min | 0.2 | ND | ND |
| Desirable Characteristics | | | | |
| 10 | Dissolved Solids, mg/l, max | 500 | 122 | 114 |
| 11 | Calcium (as Ca), mg/l, max | 75 | 9.4 | 8.7 |
| 12 | Copper (as Cu), mg/l, max | 0.05 | BDL | BDL |
| 13 | Manganese (as Mn), mg/l, max | 0.1 | 0.012 | 0.017 |
| 14 | Sulphate (as SO ₄), mg/l, max | 200 | 29.5 | 27.5 |
| 15 | Nitrate (as NO ₃), mg/l, max | 45 | 0.26 | 0.22 |
| 16 | Fluoride (as F), mg/l, max | 1.0 | 0.019 | 0.014 |
| 17 | Phenolic Compounds (as C ₆ H ₅ OH), 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 | 0.17 | 0.14 |
| 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 | 27 | 29 |
| 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, Fluoride-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.



For S.S ENVIRONICS

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-2861

Date: 04.12.2014

ANALYSIS OF TRACE METALS IN GROUND WATER AT LOWER ELEVATION

Name of the Mines : **T.Pahar Manganese Mines (Tata Steel Ltd)**
Location of Sampling : **GW1: Borewell at Joribahal (Near Guruda Pit)**
Date of Sampling : **25.11.2014**
Date of Analysis : **28.11.2014**

| 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 | 0.28 |
| 10 | Manganese (as Mn), mg/l. max | 0.1 | 0.013 |

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.


 For: S.S. ENVIRONICS (I) PVT. LTD.



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-3377

Date: 04.02.2015

ANALYSIS OF TRACE METALS IN GROUND WATER AT LOWER ELEVATION

Name of the Mines : T.Pahar Manganese Mines (Tata Steel Ltd)
Location of Sampling : GW1: Borewell at Joribahal (Near Guruda Pit)
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 | 0.13 |
| 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 | 0.21 |
| 10 | Manganese (as Mn), mg/l, max | 0.1 | 0.020 |

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.



For S.S ENVIRONICS (INDIA) PVT. LTD.

Annexure – VI

| TIRINGPAHAR (UPSTREAM) W-1 | | | | 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 & \$ | 10 & U/O | 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 | 5.9 & U/O |
| 2 | Suspended Solids | mg/l | \$ | 53 | 58 | 49 | 38 | 43 | 36 | 28 | 20 | 21 | 18 | 24 | 14 | 33.50 |
| 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 | 151 | 163 | 121 | 129 | 118 | 121 | 118 | 104 | 125 | 109 | 117 | 97 | 122.75 |
| 5 | pH | -- | 6.5-8.5 | 7.1 | 7.1 | 7.3 | 7.2 | 7.2 | 7.3 | 7.2 | 7.1 | 7.2 | 7.2 | 7.2 | 7.3 | 7.20 |
| 6 | Temperature | °C | \$ | 24 | 24 | 24 | 24 | 24 | 23 | 22 | 22 | 24 | 24 | 25 | 25 | 23.75 |
| 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 | \$ | 0.52 | 0.58 | 0.39 | 0.29 | 0.36 | 0.26 | 0.23 | 0.25 | 0.21 | 0.28 | 0.18 | 0.21 | ND |
| 10 | Total Kjeldal Nitrogen as N | mg/l | \$ | 1.4 | 1.47 | 1.22 | 0.87 | 1.18 | 0.79 | 1.02 | 0.87 | 0.97 | 0.96 | 0.89 | 0.89 | 1.04 |
| 11 | Free Ammonia as NH ₃ | mg/l | \$ | 0.003 | 0.004 | 0.004 | 0.003 | 0.004 | 0.004 | 0.002 | 0.003 | 0.002 | 0.003 | 0.002 | 0.003 | ND |
| 12 | Dissolved Oxygen | mg/l | 4 | 7.2 | 7.1 | 7.2 | 7.3 | 7.3 | 7.4 | 7.4 | 7.4 | 7.3 | 7.3 | 7.3 | 7.3 | 7.29 |
| 13 | BOD(3) days at 27°C | mg/l | 3 | 1.19 | 1.21 | 1.14 | 1.17 | 1.06 | 1.11 | 0.9 | 1 | 1.1 | 1.1 | 1 | 1 | 1.08 |
| 14 | COD | mg/l | \$ | 3.65 | 3.72 | 3.39 | 3.52 | 3.28 | 3.46 | 2.65 | 2.65 | 2.37 | 3.38 | 2.87 | 3.27 | 3.18 |
| 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 | \$ | 0.16 | 0.19 | 0.14 | 0.13 | 0.13 | 0.11 | 0.15 | 0.09 | 0.12 | 0.1 | 0.1 | 0.086 | 0.13 |
| 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 | 0.15 | 0.17 | 0.18 | 0.18 | 0.14 | 0.17 | 0.24 | 0.16 | 0.19 | 0.13 | 0.16 | 0.11 | 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 | 0.065 | 0.077 | 0.05 | 0.05 | 0.04 | 0.06 | 0.06 | 0.06 | 0.05 | 0.05 | 0.05 | 0.04 | 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 ₆ H ₅ OH | 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 | \$ | 0.069 | 0.072 | 0.057 | 0.046 | 0.048 | 0.042 | 0.038 | 0.039 | 0.041 | 0.027 | 0.034 | 0.021 | 0.04 |
| 32 | Iron as Fe | mg/l | 50 | 0.33 | 0.35 | 0.29 | 0.28 | 0.26 | 0.26 | 0.22 | 0.21 | 0.19 | 0.21 | 0.16 | 0.17 | 0.24 |
| 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 | 0.24 | 0.18 | 0.19 | 0.16 | 0.16 | 0.14 | 0.14 | 0.11 | 0.18 | 0.09 | 0.14 | 0.16 |

| TIRINGPAHAR (DOWNSTREAM) W-2 | | | | 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 & \$ | 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 | CL & U/O | CL & U/O |
| 2 | Suspended Solids | mg/l | \$ | 29 | 32 | 52 | 41 | 47 | 39 | 31 | 23 | 26 | 21 | 29 | 17 | 32.25 |
| 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 | 114 | 117 | 128 | 133 | 122 | 127 | 122 | 111 | 131 | 115 | 123 | 101 | 120.33 |
| 5 | pH | -- | 6.5-8.5 | 7.2 | 7.2 | 7.2 | 7.2 | 7.2 | 7.2 | 7.2 | 7.2 | 7.3 | 7.2 | 7.2 | 7.2 | 7.21 |
| 6 | Temperature | ⁰ C | \$ | 25 | 25 | 24 | 24 | 24 | 23 | 22 | 22 | 24 | 24 | 25 | 25 | 23.92 |
| 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 | \$ | 0.34 | 0.39 | 0.44 | 0.33 | 0.41 | 0.29 | 0.27 | 0.28 | 0.24 | 0.33 | 0.2 | 0.25 | ND |
| 10 | Total Kjeldal Nitrogen as N | mg/l | \$ | 0.94 | 0.98 | 1.28 | 0.94 | 1.21 | 0.86 | 1.11 | 0.94 | 1.1 | 1.1 | 0.94 | 0.94 | 1.03 |
| 11 | Free Ammonia as NH ₃ | mg/l | \$ | 0.005 | 0.005 | 0.003 | 0.003 | 0.004 | 0.004 | 0.002 | 0.002 | 0.003 | 0.003 | 0.002 | 0.003 | ND |
| 12 | Dissolved Oxygen | mg/l | 4 | 7.2 | 7.2 | 7.2 | 7.3 | 7.3 | 7.3 | 7.3 | 7.3 | 7.3 | 7.3 | 7.2 | 7.2 | 7.26 |
| 13 | BOD(3) days at 27 ⁰ C | mg/l | 3 | 1.16 | 1.18 | 1.17 | 1.22 | 1.1 | 1.17 | 1 | 1.07 | 1.15 | 1.16 | 1.1 | 1.11 | 1.13 |
| 14 | COD | mg/l | \$ | 3.39 | 3.41 | 3.46 | 3.65 | 3.31 | 3.51 | 2.89 | 2.79 | 2.54 | 3.52 | 2.94 | 3.43 | 3.24 |
| 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 | \$ | 0.11 | 0.13 | 0.17 | 0.15 | 0.15 | 0.12 | 0.18 | 0.13 | 0.16 | 0.11 | 0.13 | 0.092 | 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 | 0.14 | 0.16 | 0.21 | 0.22 | 0.18 | 0.19 | 0.27 | 0.19 | 0.22 | 0.17 | 0.18 | 0.14 | 0.19 |
| 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 | 0.042 | 0.047 | 0.05 | 0.05 | 0.04 | 0.06 | 0.06 | 0.06 | 0.05 | 0.05 | 0.05 | 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 ₆ H ₅ OH | 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% | 98.00% |
| 31 | Manganese as Mn | mg/l | \$ | 0.055 | 0.059 | 0.062 | 0.051 | 0.051 | 0.048 | 0.046 | 0.046 | 0.049 | 0.033 | 0.041 | 0.026 | 0.05 |
| 32 | Iron as Fe | mg/l | 50 | 0.22 | 0.27 | 0.31 | 0.31 | 0.3 | 0.29 | 0.26 | 0.24 | 0.22 | 0.24 | 0.18 | 0.2 | 0.25 |
| 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 | 0.2 | 0.23 | 0.2 | 0.22 | 0.19 | 0.18 | 0.17 | 0.16 | 0.14 | 0.2 | 0.10 | 0.16 | 0.18 |

Annexure – VII

| TIRINGPAHAR 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 | Guruda Pit | 46.78 | 27.30 | 4.23 | 11.36 | 0.14 | 0.62 | 6.06 | BDL | BDL | 0.60 | BDL | BDL | BDL |
| Nov'14 | Guruda Pit | 44.75 | 26.43 | 4.03 | 11.49 | 0.12 | 0.64 | 5.55 | BDL | BDL | 0.58 | BDL | BDL | BDL |
| Dec'14 | Guruda Pit | 50.33 | 29.53 | 4.06 | 11.78 | 0.14 | 0.65 | 5.69 | BDL | BDL | 0.60 | BDL | BDL | BDL |
| January'15 | Guruda Pit | 48.33 | 28.02 | 4.11 | 10.98 | 0.13 | 0.68 | 5.39 | BDL | BDL | 0.63 | BDL | BDL | BDL |
| Feb'15 | Guruda Pit | 41.13 | 24.58 | 4.03 | 9.70 | 0.11 | 0.58 | 5.14 | BDL | BDL | 0.49 | BDL | BDL | BDL |
| March'15 | Guruda Pit | 40.00 | 23.66 | 4.00 | 10.18 | 0.11 | 0.46 | 5.03 | BDL | BDL | 0.58 | BDL | BDL | BDL |
| 6 Months Avgs | Guruda Pit | 45.22 | 26.59 | 4.08 | 10.91 | 0.13 | 0.61 | 5.48 | BDL | BDL | 0.58 | BDL | BDL | BDL |

| TIRINGPAHAR 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 | Purunapani | 44.33 | 25.72 | 4.11 | 10.99 | 0.13 | 0.58 | 5.80 | BDL | BDL | 0.56 | BDL | BDL | BDL |
| Nov'14 | Purunapani | 40.38 | 23.79 | 4.00 | 11.01 | 0.11 | 0.58 | 5.16 | BDL | BDL | 0.53 | BDL | BDL | BDL |
| Dec'14 | Purunapani | 45.67 | 26.90 | 4.00 | 11.33 | 0.12 | 0.60 | 5.40 | BDL | BDL | 0.54 | BDL | BDL | BDL |
| January'15 | Purunapani | 45.22 | 26.37 | 4.02 | 10.62 | 0.12 | 0.64 | 5.19 | BDL | BDL | 0.58 | BDL | BDL | BDL |
| Feb'15 | Purunapani | 36.50 | 21.73 | 4.00 | 9.40 | 0.11 | 0.54 | 5.04 | BDL | BDL | 0.45 | BDL | BDL | BDL |
| March'15 | Purunapani | 35.56 | 21.08 | 4.00 | 9.80 | 0.11 | 0.43 | 5.00 | BDL | BDL | 0.54 | BDL | BDL | BDL |
| 6 Months Avgs | Purunapani | 41.28 | 24.26 | 4.02 | 10.53 | 0.11 | 0.56 | 5.26 | BDL | BDL | 0.53 | BDL | BDL | BDL |

Annexure - VIII

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 – IX

Organizational Structure

