o/c

Regd Post with A/D

Ref.No.: MGM/P&E/708 /19

Date : 26/09/2019

**The Member Secretary,**
**State Pollution Control Board, Orissa,**
**A/118, Nilakantha Nagar,**
**Bhubaneswar, Odisha-751012**

Sub : Submission of Annual Environment Statement (FORM-V) for Bamebari Manganese Mine, M/s TATA Steel Ltd. for the year 2018-19.

Dear Sir,

We are enclosing herewith Annual Environment Statement in Form-V for Bamebari Manganese Mine, M/s TATA Steel Ltd. for the year ending 31st March'2019.

This is for your kind perusal.

Thanking you,

Yours faithfully,

F: TATA STEEL LTD.

26/09/19

Agent &
Head, Manganese Gr. of Mines
Ferro Alloys & Minerals Division,
Joda.

Encl: as above.

Copy to : (1) The Regional Officer, State Pollution Control Board, Baniapat, DD College Road, Keonjhar, Odisha-758001
(2) Central Pollution Control Board Southernd Conclave, Block 502, 5th & 6th Floors 1582 Rajdanga Main Road Kolkata - 700 107 (W. B.)

**TATA STEEL LTD.**
Ferro Alloys & Minerals Division, Manganese Group of Mines, At/P.O.: Bichhakundi, Via: Joda,
Dist: Keonjhar Odisha – 758 034 Tel.: 9238101370, e-mail : mnminesadmin@tatasteel.com
Regd.Office : Bombay House, 24 Homi Modi Street, Mumbai – 400 001 Tel 912266658282, Fax 912266657724
Corporate Identity Number L27100MH1907PLC000260 website : www.tatasteel.com

# ENVIRONMENTAL STATEMENT

# 2018-19

# UNDER RULE 14 OF ENVIRONMENT (PROTECTION) RULES, 1986

# In

# FORM - V

## BAMEBARI MANGANESE MINES

## TATA STEEL LIMITED

## SEPTEMBER 2019

# FORM V
**[See Rule 14 of Environment (Protection) Rules, 1986]**

**ENVIRONMENTAL STATEMENT**
**FOR THE FINANCIAL YEAR ENDING THE 31ST MARCH 2018**

## PART – A

| | | | |
|---|---|---|---|
| (i) | Name and Address of the Owner / occupier of the industry operation or process. | : | **BAMEBARI MANGANESE MINE**<br><br>Nominated Owner :-<br>Mr. T.V. Narendran<br>Managing Director, M/s TATA Steel Ltd.<br>Jamshedpur, Dist- East Singhbhum<br>Jharkhand – 831 001<br><br>Agent :-<br>Mr. Amit Kumar Dubey,<br>Head(Manganese Group of Mines), Joda, FA & MD, TATA Steel<br>P.O.: Bichhakundi, Via : Joda<br>Dist : Keonjhar, Orissa – 758 034 |
| (ii) | Industry Category | : | Opencast Mining |
| (iii) | Production Capacity – Units | : | 83,200 TPA (Manganese Ore) |
| (iv) | Year of Establishment | : | 1938 |
| (v) | Date of the last environmental statement submitted | : | 28th Sept'2018 |

## PART – B

Water and Raw Material Consumption

(1) Water Consumption $m^3$/day

Process : 14.78 $m^3$/day (Water sprinkling – Avg. during 2018-19)
Cooling : Nil
Domestic : 44.6 $m^3$/day (Avg. during 2018-19)

| Name of the Products | Process water consumption per unit of product output | |
|---|---|---|
| | During the previous Financial year | During the current Financial year |
| | (1) | (2) |
| (1) Manganese Ore | Nil | Nil |

Remarks : Manganese Ore is produced by semi mechanized Mining method, which does not involve beneficiation and thus precludes the consumption of water.

(2) Raw material consumption

| Name of the raw materials | Name of the product | Consumption of raw materials per unit | |
|---|---|---|---|
| | | During the previous Financial year | During the current Financial year |
| Manganese Ore | Manganese Ore | Year – 2017-18<br>Production :- 66644.724 MT<br>Despatch :- 63032.570 MT | Year – 2018-19<br>Production :- 79619 MT<br>Despatch :- 67770.66 MT |

Remarks: Produced Manganese Ore dispatched for captive consumption in Ferro Alloys Plants within India.

**PART – C**

Pollution discharged to environment / unit of output

(Parameter as specified in the Consents issued)

| Pollution | Quantity of pollutants discharged (mass/day) | Concentrations of Pollutants in discharges (mass/volume) | Percentage of variation from prescribed standards with reasons |
|---|---|---|---|
| (a) Water | The process of Manganese Ore production includes blasting, removal of overburden, breaking and sizing of ore to required size and then transportation to the customer does not require consumption of water. Thus, there is no process discharge from the mine.<br>The monthly average (2018-19) surface water quality data is enclosed as **Annexure – I.** It shows that the concentrations of the pollutants are well within the permissible standards. | | |
| (b) Air | Since this is an open cast Mine, the dust generation is mainly due to the movement of vehicles in the haul roads, drilling activities etc, which is fugitive in nature and cannot be quantified. The fugitive dust is allayed by sprinkling of water by mobile tanker and development of green barrier by plantation around the residential area.<br>The monthly average ambient air quality data is enclosed as **Annexure – II**. It shows that the concentrations of the pollutants are well within the permissible standards. | | |

## PART – D

### Hazardous Wastes

[As specified under the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016]

| Hazardous Wastes | Total Quantity | |
|---|---|---|
| | During the previous Financial year | During the current Financial year |
| | Year – 2017-18 | Year – 2018-19 |
| (i) From Process | | |
| Waste containing Oil | 61 Kg | Nil |
| Used Oil (in Ltrs.) | 415 Ltrs | 42 Ltrs |
| Cotton Waste (in Kgs) | Nil | Nil |
| Duster (in Nos.) | Nil | Nil |
| Filters (in Nos.) | Nil | Nil |
| (ii) From pollution control facilities | Nil | Nil |

## PART – E

### Solid Wastes

| | Total Quantity | |
|---|---|---|
| | During the previous Financial year | During the current Financial year |
| | Year – 2017-18 | Year – 2018-19 |
| (a) From Process (Overburden rejects) | 169830.641 MT | 233308MT |
| (b) From pollution control facilities | Nil | Nil |
| (c) | | |
| (1) Quantity recycled or re-utilized within the unit | Nil | Nil |
| (2) Sold | Nil | Nil |
| (3) Disposal | 169830.641 MT | 233308 MT |

## PART – F

Please specify the characterization (in terms of composition and quantum) of hazardous as well as solid wastes and indicate disposal practice adopted for both these categories of wastes.

- **Characterization of Hazardous Waste: -** The composition of hazardous wastes like Waste Oil & used oil are Hydrocarbons, lead and used acids. The composition of the solid wastes (Overburden and rejects) contains lateritic morrum, shale and quartzite.

- **Disposal Practice:** -
  - SOLID WASTES -The overburden is systematically and scientifically dumped on a geologically barren area and the same will be reclaimed by plantation after being declared inactive.

  - WASTE OIL -The waste oil generated at various sources is collected in leak proof barrels and then is kept on an impervious floor with oil catch pit. It is also ensured that the caps of the barrels remain intact and horizontal. The storage area is properly fenced and caution board displayed. During transfer of waste oil to barrels, a trough is placed underneath in order to prevent land contamination due to oil spillage. Then at a fixed interval, these barrels are returned to Ferro Manganese Plant Stores for final disposal through auction to the authorized party.

  - USED COTTON WASTES - The used cotton wastes generated at various locations are kept in designated barrels and at a fixed interval, these wastes are handed over to the Shift in-charge of the Furnace Section of FAP, Joda for incinerating in the Electric Are Furnace at a temperature of more than 1100 degree C.

  - Provision of impervious pit for collection of oily waste in the workshop premises in addition to the existing practice of collection at specified barrels.

## PART – G

Impact of pollution abatement measures taken on conservation of natural resources and on the cost of production.

1. Water spraying on haul Roads and Mine Pits is done regularly to suppress the dust.
2. All the haul roads in the mining area are made up of morrum & compacted. Regular repair is being done by dozer & grader after spreading the layer of sweet morrum over it.
3. Wet drilling has been implemented in all drills. Controlled blasting pattern is being followed.

4. 5556 nos. of saplings of various forestry species were planted covering an area of 1.867 hectare within the leasehold areas of Bamebari Mn.Mine.
5. An amount of Rs. 1217513.5/- was incurred towards environmental monitoring job, plantation activities, vetiver plantation, dust suppression and construction of toe-wall, garland drain and check dams as included in environment management cost.
6. In addition, Tata Steel Rural Development Society also undertakes the peripheral development activities with a large magnitude.

## PART – H

Additional measures / investment proposal for environmental protection, abatement of pollution, prevention of pollution.

a) Garland drains and toe wall around the OB dumping shall be provided to check and channelize surface run-off.
b) Plantation of forestry species shall be planted over the inactive waste dump slopes to arrest the airborne dust.
c) Vetiver Plantation has been done in inactive dump slope.
d) Green belt has been developed along colony and mining.

## PART – I

Any other particulars for improving the quality of environment.

1. With compliance to conditions of Environment Clearance obtained from MoEF, the following monitoring is being done at regular interval.
   - Ground Water Level at nearby bore wells
   - Trace metal in dust fall
   - Ground water quality at lower level
   - Meteorological monitoring
   - 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.

2. Top soils generated during excavation are utilized immediately for nursery development and dump slope plantation.

3. Measures taken to control Air Pollution: -
   - Water sprinkling on the haul road,
   - Provision of dust masks to the workmen,
   - Adoption of wet drilling arrangement in the drill machines and
   - Black topped road in the residential colony.
   - Green belt along mining and colony
   - Native sapling and vetiver plantation in inactive dumps.

4. Measures taken to control Water Pollution: -
   - Construction of toe wall and garland drain along the dump slope to prevent surface run-off during monsoon.
   - Construction of soak pits for discharge of sanitary sewage.
   - Provision of oil separation pit for effluents coming out of work shop.
   - Native sapling and vetiver plantation in inactive dumps.
   - STP for domestic effluent in Bamebari colony.

5. Measures taken to control Noise & Ground Vibration: -
   - Thick plantation has been developed around the mines and office building to provide a canopy cover
   - Implementation of advance blasting technique(NONEL) to reduce the blast induced ground vibration and
   - Workmen are provided with ear-muff while working near heavy earth moving machineries.

6. Measures taken to control Land Degradation:-
   - Afforestation around the non-active dump for stabilization and
   - Reclamation and rehabilitation of mined out area as per approved Scheme of Mining.

7. Surveillance of Occupational Health: - 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 the year 2018-19, total 101 numbers of employees (Contractual -98, Departmental- 3) covered in PME. There are no findings of pneumoconiosis and manganese poisoning which is classified as occupational disease.

8. The mine is certified with ISO-14001 (Environment Management System).

Manager,
Bamebari Mn.Mine
M/s. TATA STEEL LTD.

**Annexure – I** : Surface Water Quality Monitoring at Bamebari Mn Mine (W1 Confluence Point at Kassia Nallah)

| Parameters | | | April'18 | May'18 | June'18 | July,18 | Aug-18 | Sept-18 |
|---|---|---|---|---|---|---|---|---|
| | **Unit** | **Standard** | Results | Results | Results | Results | Results | Results |
| Dissolved Oxygen (minimum) | mg/l | **4** | 5.6 | 5.3 | 5.2 | 5.1 | 4.9 | 5.2 |
| BOD (3) days at $27^0$C (max) | mg/l | **3** | < 1.8 | < 1.8 | < 1.8 | < 1.8 | < 1.8 | < 1.8 |
| Total Coli form | MPN/100 ml | **5000** | 270.0 | 210.0 | 320.0 | 280.0 | 120.0 | 150.0 |
| pH Value | -- | **6.0-9.0** | 7.18 | 7.23 | 7.21 | 7.26 | 7.24 | 7.28 |
| Colour (max) | Hazen | **300** | CL | CL | 6 | 6 | CL | CL |
| Total Dissolved Solids | mg/l | **1500** | 130 | 136 | 126 | 122 | 126 | 128 |
| Copper as Cu (max) | mg/l | **1.5** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Iron as Fe (max) | mg/l | **0.5** | 0.39 | 0.42 | 0.42 | 0.4 | 0.54 | 0.51 |
| Chloride (max) | mg/l | **600** | 28 | 33 | 25.8 | 25.2 | 25 | 28 |
| Sulphates ($SO_4$) (max) | mg/l | **400** | 4.9 | 5.1 | 4.1 | 4 | 5.3 | 5.5 |
| Nitrate as $NO_3$ (max) | mg/l | **50** | 1.76 | 2.04 | 1.4 | 1.6 | 2.1 | 2.3 |
| Fluoride as F (max) | mg/l | **1.5** | 0.015 | 0.017 | 0.016 | 0.018 | 0.02 | 0.022 |
| Phenolic Compounds as $C_6H_5OH$ (max) | mg/l | **0.005** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cadmium as Cd (max) | mg/l | **0.01** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Selenium as Se (max) | mg/l | **0.05** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Arsenic as As | mg/l | **0.2** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cyanide as CN (max) | mg/l | **0.05** | ND | ND | ND | ND | ND | ND |
| Lead as Pb(max) | mg/l | **0.1** | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Zinc as Zn(max) | mg/l | **15** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Hexa Chromium as $Cr^{+6}$ | mg/l | **0.05** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Anionic Detergents (max) | mg/l | **1.0** | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| | | | **Oct'18** | **Nov'18** | **Dec'18** | **Jan,19** | **Feb-19** | **March-19** |
| Dissolved Oxygen (minimum) | mg/l | **4** | 7.6 | 7.4 | 5.4 | 5.8 | 5.1 | 6.1 |
| BOD (3) days at $27^0$C (max) | mg/l | **3** | < 1.8 | < 1.8 | < 1.8 | < 1.8 | < 1.8 | < 1.8 |
| Total Coli form | MPN/100 ml | **5000** | 320 | 310 | 224 | 265 | 260 | 220 |
| pH Value | -- | **6.0-9.0** | 7.6 | 7.5 | 7.38 | 7.78 | 7.81 | 7.44 |
| Colour (max) | Hazen | **300** | 5 | 2 | CL | CL | CL | CL |
| Total Dissolved Solids | mg/l | **1500** | 228 | 198 | 132 | 126 | 132 | 144 |
| Copper as Cu (max) | mg/l | **1.5** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Iron as Fe (max) | mg/l | **0.5** | 0.2 | 0.18 | 0.45 | 0.65 | 0.61 | 0.52 |
| Chloride (max) | mg/l | **600** | 28.2 | 28.2 | 26 | 26 | 28 | 30 |
| Sulphates ($SO_4$) (max) | mg/l | **400** | 3.1 | 3.1 | 4.1 | 4.6 | 4.2 | 4.2 |
| Nitrate as $NO_3$ (max) | mg/l | **50** | 1.2 | 1.2 | 1.8 | 1.7 | 1.61 | 2.2 |
| Fluoride as F (max) | mg/l | **1.5** | 0.015 | 0.012 | 0.012 | 0.056 | 0.052 | 0.024 |
| Phenolic Compounds as $C_6H_5OH$ (max) | mg/l | **0.005** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cadmium as Cd (max) | mg/l | **0.01** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Selenium as Se (max) | mg/l | **0.05** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Arsenic as As | mg/l | **0.2** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cyanide as CN (max) | mg/l | **0.05** | ND | ND | ND | ND | ND | ND |
| Lead as Pb(max) | mg/l | **0.1** | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Zinc as Zn(max) | mg/l | **15** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Hexa Chromium as $Cr^{+6}$ | mg/l | **0.05** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Anionic Detergents (max) | mg/l | **1.0** | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |

**Annexure – I :** Surface Water Quality Monitoring at Bamebari Mn Mine (W2 Intake Point at Tindharia)

| Parameters | | | April'18 | May'18 | June'18 | July,18 | Aug-18 | Sept-18 |
|---|---|---|---|---|---|---|---|---|
| | **Unit** | **Standard** | Results | Results | Results | Results | Results | Results |
| Dissolved Oxygen (minimum) | mg/l | **4** | 5.8 | 5.4 | 5.8 | 6 | 4.8 | 5.6 |
| BOD (3) days at $27^0$C (max) | mg/l | **3** | < 1.8 | < 1.8 | < 1.8 | < 1.8 | < 1.8 | < 1.8 |
| Total Coli form | MPN/100 ml | **5000** | 310 | 350 | 440 | 220 | 150 | 120 |
| pH Value | -- | **6.0-9.0** | 7.24 | 7.27 | 7.2 | 7.18 | 7.18 | 7.22 |
| Colour (max) | Hazen | **300** | CL | CL | 6 | 2 | CL | CL |
| Total Dissolved Solids | mg/l | **1500** | 134 | 132 | 130 | 138 | 128 | 132 |
| Copper as Cu (max) | mg/l | **1.5** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Iron as Fe (max) | mg/l | **0.5** | 0.42 | 0.4 | 0.46 | 0.36 | 0.6 | 0.56 |
| Chloride (max) | mg/l | **600** | 30 | 31 | 26.2 | 36 | 28 | 31 |
| Sulphates ($SO_4$) (max) | mg/l | **400** | 5.3 | 5.2 | 4.2 | 4.2 | 4.8 | 5.1 |
| Nitrate as $NO_3$ (max) | mg/l | **50** | 1.82 | 1.96 | 1.8 | 1.18 | 1.5 | 2.2 |
| Fluoride as F (max) | mg/l | **1.5** | 0.016 | 0.018 | 0.021 | 0.018 | 0.016 | 0.018 |
| Phenolic Compounds as $C_6H_5OH$ (max) | mg/l | **0.005** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cadmium as Cd (max) | mg/l | **0.01** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Selenium as Se (max) | mg/l | **0.05** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Arsenic as As | mg/l | **0.2** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cyanide as CN (max) | mg/l | **0.05** | ND | ND | ND | ND | ND | ND |
| Lead as Pb(max) | mg/l | **0.1** | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Zinc as Zn(max) | mg/l | **15** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Hexa Chromium as $Cr^{+6}$ | mg/l | **0.05** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Anionic Detergents (max) | mg/l | **1.0** | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| **Parameters** | | | **Oct'18** | **Nov'18** | **Dec'18** | **Jan'19** | **Feb-19** | **March-19** |
| Dissolved Oxygen (minimum) | mg/l | **4** | 7.4 | 6.8 | 5.7 | 5.4 | 5.3 | 6.6 |
| BOD (3) days at $27^0$C (max) | mg/l | **3** | < 1.8 | < 1.8 | < 1.8 | < 1.8 | < 1.8 | < 1.8 |
| Total Coli form | MPN/100 ml | **5000** | 350.0 | 280.0 | 261.0 | 243.0 | 220.0 | 280.0 |
| pH Value | -- | **6.0-9.0** | 7.32 | 7.26 | 7.45 | 7.59 | 7.62 | 7.58 |
| Colour (max) | Hazen | **300** | 5 | 5 | CL | CL | CL | CL |
| Total Dissolved Solids | mg/l | **1500** | 238 | 212 | 145 | 157 | 148 | 156 |
| Copper as Cu (max) | mg/l | **1.5** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Iron as Fe (max) | mg/l | **0.5** | 0.35 | 0.26 | 0.49 | 0.51 | 0.58 | 0.66 |
| Chloride (max) | mg/l | **600** | 28.9 | 30.0 | 34.0 | 36.0 | 34.0 | 36.0 |
| Sulphates ($SO_4$) (max) | mg/l | **400** | 3.8 | 4.2 | 4.9 | 4.9 | 4.6 | 5.4 |
| Nitrate as $NO_3$ (max) | mg/l | **50** | 1.6 | 1.8 | 2.3 | 2.9 | 2.2 | 2.8 |
| Fluoride as F (max) | mg/l | **1.5** | 0.018 | 0.021 | 0.045 | 0.035 | 0.041 | 0.054 |
| Phenolic Compounds as $C_6H_5OH$ (max) | mg/l | **0.005** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cadmium as Cd (max) | mg/l | **0.01** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Selenium as Se (max) | mg/l | **0.05** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Arsenic as As | mg/l | **0.2** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cyanide as CN (max) | mg/l | **0.05** | ND | ND | ND | ND | ND | ND |
| Lead as Pb(max) | mg/l | **0.1** | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Zinc as Zn(max) | mg/l | **15** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Hexa Chromium as $Cr^{+6}$ | mg/l | **0.05** | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Anionic Detergents (max) | mg/l | **1.0** | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |

| **Annexure-II** : Ambient Air Quality Monitoring Report, Bamebari Manganese Mine, Sampling Location-1 (Bamebari Camp) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PARAMETERS | | | | | | | | | | | | |
| | PM10 (µg/m3) | PM2.5 (µg/m3) | SO2 (µg/m3) | NOx (µg/m3) | O3 (µg/m3) | CO mg/m3) | NH3 (µg/m3) | Pb (µg/m3) | Ni (ng/m3) | As (ng/m3) | C6H6 (µg/m3) | BaP (ng/m3) | Mn µg/m3) |
| Limit as per CPCB notification, New Delhi,18th Nov, 2009. for Ambient air quality | 100 | 60 | 80 | 80 | 180 | 4 | 400 | 1 | 20 | 6 | 5 | 1 | --- |
| Sampling and Analysis done according to | IS: 5182(Part-23)-1999 | USEPA CFR-40,Part-50, Appendix-L | IS: 5182 (Part-2)-2001 | IS: 5182 (Part-6)-2006 | IS: 5182 (Part- 9)-1974 | IS 5182 : Part.10-1999 | Air Sampling , 3rd Edn.By James P. Lodge (Method-401) | EPA IO-3.2 | EPA IO-3.2 | APHA 22nd-3114 C | IS 5182 : Part. 11 | IS 5182 : Part. 12 | EPA IO-3.2 |
| Apr-18 | 56.56 | 27.28 | 4.60 | 12.00 | 6.55 | 0.34 | 22.07 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| May-18 | 46.06 | 22.06 | 4.40 | 10.75 | <4.0 | 0.31 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Jun-18 | 48.30 | 23.90 | 4.08 | 11.06 | 7.80 | 0.34 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Jul-18 | 44.98 | 22.51 | 3.63 | 9.95 | 8.70 | 0.30 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Aug-18 | 46.79 | 20.65 | 4.17 | 11.80 | 6.74 | 0.25 | 23.07 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Sep-18 | 40.01 | 21.50 | 4.20 | 9.69 | 5.25 | 0.21 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Oct-18 | 41.89 | 17.94 | 4.10 | 10.00 | 5.34 | 0.21 | 23.50 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |
| Nov-18 | 51.24 | 22.94 | 4.23 | 10.09 | 5.13 | 0.30 | 21.60 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |
| Dec-18 | 52.04 | 24.18 | 4.28 | 9.91 | 4.53 | 0.35 | 22.33 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |
| Jan-19 | 54.18 | 25.51 | 4.45 | 10.55 | 4.83 | 0.42 | 24.73 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |
| Feb-19 | 51.65 | 26.64 | 4.53 | 10.73 | 5.00 | 0.41 | 27.47 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |
| Mar-19 | 43.04 | 24.62 | 4.58 | 10.90 | 4.69 | 0.41 | 22.98 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |

| **Annexure-II** : Ambient Air Quality Monitoring Report, Bamebari Manganese Mine, Sampling Location-2 (Bamebari Pit) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PARAMETERS | | | | | | | | | | | | |
| | PM10 (µg/m3) | PM2.5 (µg/m3) | SO2 (µg/m3) | NOx (µg/m3) | O3 (µg/m3) | CO mg/m3) | NH3 (µg/m3) | Pb (µg/m3) | Ni (ng/m3) | As (ng/m3) | C6H6 (µg/m3) | BaP (ng/m3) | Mn µg/m3) |
| Limit as per CPCB notification, New Delhi,18th Nov, 2009. for Ambient air quality | 100 | 60 | 80 | 80 | 180 | 4 | 400 | 1 | 20 | 6 | 5 | 1 | --- |
| Sampling and Analysis done according to | IS: 5182(Part-23)-1999 | USEPA CFR-40,Part-50, Appendix-L | IS: 5182 (Part-2)-2001 | IS: 5182 (Part-6)-2006 | IS: 5182 (Part- 9)-1974 | IS 5182 : Part.10-1999 | Air Sampling , 3rd Edn.By James P. Lodge (Method-401) | EPA IO-3.2 | EPA IO-3.2 | APHA 22nd-3114 C | IS 5182 : Part. 11 | IS 5182 : Part. 12 | EPA IO-3.2 |
| Apr-18 | 61.18 | 29.66 | 4.94 | 13.44 | 7.24 | 0.40 | 23.48 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| May-18 | 50.99 | 24.53 | 4.38 | 11.45 | <4.0 | 0.36 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Jun-18 | 40.66 | 20.94 | 4.00 | 10.30 | <4.0 | 0.31 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Jul-18 | 40.11 | 20.14 | 3.00 | 9.48 | 7.80 | 0.28 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Aug-18 | 56.40 | 20.14 | 3.00 | 9.50 | <4.0 | 0.27 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Sep-18 | 37.57 | 18.79 | 4.20 | 10.10 | <4.0 | 0.24 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Oct-18 | 41.43 | 18.09 | 4.14 | 9.84 | 4.93 | 0.22 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Nov-18 | 49.55 | 26.04 | 4.22 | 15.94 | 5.23 | 0.34 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Dec-18 | 55.37 | 26.24 | 13.14 | 10.50 | 4.73 | 0.47 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Jan-19 | 57.11 | 28.57 | 18.50 | 11.30 | 5.02 | 0.55 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Feb-19 | 53.19 | 27.96 | 8.22 | 10.88 | 4.83 | 0.52 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Mar-19 | 67.26 | 31.59 | 9.17 | 11.70 | 5.17 | 0.57 | 21.99 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |

| **Annexure-II** : Ambient Air Quality Monitoring Report, Bamebari Manganese Mine, Sampling Location-3 (Bamebari Weigh Bridge) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PARAMETERS | | | | | | | | | | | | |
| | PM10 (µg/m3) | PM2.5 (µg/m3) | SO2 (µg/m3) | NOx (µg/m3) | O3 (µg/m3) | CO mg/m3) | NH3 (µg/m3) | Pb (µg/m3) | Ni (ng/m3) | As (ng/m3) | C6H6 (µg/m3) | BaP (ng/m3) | Mn µg/m3) |
| Limit as per CPCB notification, New Delhi,18th Nov, 2009. for Ambient air quality | 100 | 60 | 80 | 80 | 180 | 4 | 400 | 1 | 20 | 6 | 5 | 1 | --- |
| Sampling and Analysis done according to | IS: 5182(Part-23)-1999 | USEPA CFR-40,Part-50, Appendix-L | IS: 5182 (Part-2)-2001 | IS: 5182 (Part-6)-2006 | IS: 5182 (Part- 9)-1974 | IS 5182 : Part.10-1999 | Air Sampling , 3rd Edn.By James P. Lodge (Method-401) | EPA IO-3.2 | EPA IO-3.2 | APHA 22nd-3114 C | IS 5182 : Part. 11 | IS 5182 : Part. 12 | EPA IO-3.2 |
| Apr-18 | 66.49 | 32.75 | 5.38 | 15.25 | 7.03 | 0.44 | 24.92 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| May-18 | 55.43 | 27.03 | 4.63 | 12.60 | 5.60 | 0.41 | <20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Jun-18 | 53.01 | 26.58 | 4.31 | 12.14 | 5.10 | 0.39 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Jul-18 | 51.46 | 25.29 | 3.70 | 12.14 | 5.10 | 0.39 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Aug-18 | 58.88 | 32.74 | 4.26 | 11.98 | 8.83 | 0.31 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Sep-18 | 49.64 | 24.10 | 4.27 | 11.71 | 8.70 | 0.30 | < 20.0 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |
| Oct-18 | 46.47 | 23.73 | 4.18 | 11.33 | 8.35 | 0.27 | 22.5 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |
| Nov-18 | 49.75 | 28.51 | 4.53 | 12.39 | 8.50 | 0.37 | 23.60 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |
| Dec-18 | 49.8 | 26.62 | 4.38 | 12.29 | 4.64 | 6.55 | 23.70 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |
| Jan-19 | 49.75 | 27.59 | 4.62 | 12.95 | 5.00 | 0.56 | 24.92 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |
| Feb-19 | 49.75 | 27.81 | 4.62 | 12.55 | 5.14 | 0.62 | 24.76 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | <0.001 |
| Mar-19 | 56.38 | 38.32 | 5.37 | 12.43 | 5.02 | 0.50 | 22.70 | < 0.001 | < 0.01 | < 0.001 | < 0.001 | < 0.002 | < 0.001 |