



By E-Mail

Ref.No.: MGM/P&E/ 31720

Date: 28/09/2020

To
The Member Secretary,
Odisha State Pollution Control Board,
Paribesh Bhawan,
A/118, Nilakantha Nagar,
Bhubaneswar, 751012

Subject: Submission of Annual Environmental Statement in FORM-V for the year ending 31st March 2020 in respect of Tiringpahar Iron and Manganese Mine of M/s Tata Steel Ltd.

Reference: Rule-14 under Environmental (Protection) Amendment Rule, 1993 (G.S.R.386,22.04.1993)

Dear Sir,

We are hereby submitting the Annual Environmental Statement in "FORM-V" prescribed under the above referenced statute, for the year ending 31st March 2020 in respect of Tiringpahar Iron and Manganese Mine of M/s Tata Steel Ltd., At/Po-Bichhakundi, Dist-Keonjhar, Odisha.

This is for your kind information and perusal please. Receipt of the same may please be acknowledged.

Thanking you,

Yours faithfully,

F: TATA STEEL LTD.


Head 28/9/2020

Mine & Production Planning
Ferro Alloys Mineral Division

Enclosure: Annual Environmental Statement (FORM-V) for the Financial Year ending 31st March 2020

Copy To:

- 1) Zonal Office Kolkata, Central Pollution Control Board, South end Conclave, Block 502, 5th and 6th Floors, 1582 Rajdanga Main Road, Kolkata, West Bengal 700107.
- 2) The Regional Officer, State Pollution Control Board, Baniapat, DD College Road, Keonjhar, Odisha-758001.
- 3) MoEF&CC Eastern Regional Office, A/3, Chandrasekharpur, Bhubaneswar-751023

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

FORM – V [2019-20]

**[Rule-14 under Environmental (Protection) Amendment Rule, 1993]
(G.S.R.386,22.04.1993)**

Submitted By:

Tiringpahar Iron & Manganese Mine

M/s. Tata Steel Limited

At/Po: Bichhakundi, Via-Joda

District- Keonjhar, Odisha -758 034

FORM V

[See Rule 14 of Environment (Protection) Amendment Rules, 1993]

ENVIRONMENTAL STATEMENT

for the financial year ending the 31st March 2020

PART - A

- (i) Name and Address of the Owner / occupier of the industry operation or process. : **TIRINGPAHAR IRON & MANGANESE MINE**

Nominated Owner:

Mr. T.V. Narendran
Managing Director, M/s TATA Steel Ltd.
Jamshedpur, Dist- East Singhbhum
Jharkhand – 831 001

Agent:

Mr. Amit Kumar Dubey,
Head(Manganese Group of Mines), Joda, FA
& MD, TATA Steel
P.O.: Bichhakundi, Via : Joda
Dist : Keonjhar, Orissa – 758 034

- (ii) Industry Category : Opencast Mining
- (iii) Production Capacity – Units : **85,000 Tonnes per annum** (Manganese Ore or 0.85 LTPA (as per Environmental Clearance)
- (iv) Year of Establishment : 1972
- (v) Date of the last environmental statement submitted : 26th Sept'2019

PART - B

Water and Raw Material Consumption: Mining is not a manufacturing process thus water is not a raw material essential for production; however, water is used for haul road dust suppression and other support services which are not directly linked with the quantum of production.

- (1) Water Consumption m³/day (Av. figures for 2019-20)
- Process : 21.98 m³/day (Water sprinkling) (**Total-8025.07m³**)
- Cooling : Nil
- Domestic : 125.9 m³/day (**Total-45973.2m³**)

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. Unlike manufacturing processes, production from mining doesn't involve water as raw material for any of the operational activities.*

(2) Raw material consumption: Unlike manufacturing processes, mining doesn't involve any such raw materials; However, uses various other resources for ancillary services essential to ensure mining such as Diesel, Electricity and Explosives, etc.

The table below reflects the production and dispatch figures for the last two financial year

Name of the raw materials	Name of the product	Consumption of raw materials per unit	
		During the previous Financial year (Year 2018-19)	During the current Financial year (Year 2019-20)
-Nil-	Manganese Ore	Production 84923.229 MT	Production 84998.000 MT
		Despatch 82963.770 MT	Despatch 74006.99 MT

Remarks: The ore produced from Mine head is used as raw material to produce ferro manganese. Other essential resources used during the reporting period (2019-20) is as follows: Diesel (390.179KL), Explosive (182975Kg), Electricity (24100 Kw-h from grid & 810 Kw-h from DG set).

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	-Nil-	-Nil-	Not Applicable

There are no direct/indirect source for discharge of effluents/pollutants to the environment. Ground water strata is much below the present pit depth and since mine is operated without intervening with the ground water thus potential source of water getting polluted/contaminated is eliminated. Environmental quality parameters are monitored from time to time to assess the water quality of the nearby streams/nallahs and monsoon runoff from the mining areas. The environmental quality parameters are monitored and reports are submitted to SPCB as well as MoEF&CC along with six monthly compliance reports.

(b) Air -Nil- -Nil- Not Applicable

There is no such point source of emission from the mine. Major source of air pollutants is fugitive dust generated mainly due to the movement of vehicles in the haul roads, drilling/blasting activities etc, which is fugitive in nature and thus has not been quantified (mass/day). More over the dust generated during mining operation is mainly driven by local meteorology and thus attributing the ambient air quality and fugitive dust emission to specific mine/activity will not be rational.

The environmental quality parameters are monitored and reports are submitted to SPCB as well as MoEF&CC along with six monthly compliance reports. Pls. Refer to Annexure-I (Env. Report)

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
	<u>Year (2018-19)</u>	<u>Year (2019-20)</u>
(i) From Process		
Waste containing Oil	Nil	Nil
Used Oil (in Ltrs.)	Nil	225 Ltrs
Cotton Waste (in Kgs)	Nil	5(approx.)
Duster (in Nos.)	Nil	Nil
Filters (in Nos.)	Nil	45(approx.)
(ii) From pollution control facilities	Nil	Nil

Remark: The quantity indicated reflects that of the quantity generated from the departmental HEMM fleets and is exclusive of the major chunk of generation, managed by the outsourced agencies deployed for mining. In the last environmental statement submitted the quantity mentioned is Nil, since there exist one common HW storage facility catering to both Bamebari & Tiringpahar Iron & Manganese Mines. In the current statement (FY2019-20) we have segregated the quantity mentioned from Form-4(annual return of Haz Waste). We have submitted one return for both the mines.

PART - E

(Solid Wastes)

	Total Quantity	
	During the previous Financial year	During the current Financial year
	<u>Year (2018-19)</u>	<u>Year (2019-20)</u>
(a) From Process (Overburden material)	461201.0 MT	424127.0 MT
(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	461201.0 MT	424127.0 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 significant source of hazardous waste is Used oil (HW-5.1) is mainly Hydrocarbons and consist of lubricants, coolants, transformer oil and hydraulic oil. Lead Acetate batteries are also used in HEMM fleet which are mainly of automotive fuel cells.
- Overburden being the only form of significant solid **waste** contains lateritic morrum, shale and quartzite, etc.
- **Disposal Practice:** -
 - SOLID WASTES -OB dumps are maintained as per the approved scheme of mine plan where proper terraces and peripheral drains are constructed supported with gabion wall/retention wall to arrest the silt/sediments during monsoon season. Once the slope of the dumps is stabilised then the dumps are reclaimed by plantation of native varieties of forestry saplings.
 - USED OIL -The used 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. The used oil collected from sites are centrally auctioned to an SPCB authorised/registered recycler for recycling. At present, used oil generated from the departmental HEMM fleet (TSL's fleet of HEMM) are managed by the company through auctioning; however major chunk of generation is due to the contractual operations, managed by outsourced agencies as per applicable norms.
 - 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 is practices along with controlled blasting followed for minimal dust generation and prevent fly rocks.
4. During FY 2019-20, total 6500 Nos of saplings of native forestry species and 49400 nos of vetiver slips have been planted as per the progressive mine closure plan.
5. The mine management proactively undertakes various environmental activities for the conservation/protection of environment. The cost incurred towards environmental measures are earmarked in a separate fund center. An abstract on the approximate cost spent towards environmental measures during FY 2019-20, in respect of Tiringpahar Iron & Manganese Mine is summarised in the table as follows:

Table. Environmental Expenditure for 2019-20

S.No.	Environmental Conservation/Protection Measures	Expenditure (Lacs-INR)	
		Proposed	Actual
1	Afforestation on Dump slopes	7.155	7.25
2	Construction of retaining wall	1.1053	1.12354
3	Construction of Garland drain, settling pits with check dam	0.303	0.325
4	Env. Awareness	15	16.2
5	Environmental monitoring	0.93125	0.95
	Total	24.49455	25.84854

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)

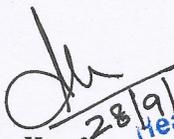
- a) Garland drains and toe wall around the OB dumping shall be provided to check and channelize surface run-off.
- b) Plantation of forestry species shall be planted over the inactive waste dump slopes to arrest the airborne dust.
- c) Vetiver Plantation has been done in inactive dump slope.
- d) Green belt has been developed along colony and mining.
- e) Soil Conditioning and treatment practices followed for land reclamation
- f) In-House nursery for development of native varieties of forestry saplings.

PART - I

(Any other 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 at Joribar.
 - Native sapling and vetiver plantation in inactive dumps.
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.
8. The mine is certified with ISO-14001:2015 (Environment Management System).


28/09/2020
Head (MPP)
A & M, JODA
Tata Steel Ltd.

Mine & Production Planning
Ferro Alloys Mineral Division
M/s Tata Steel Limited

Date: 28/09/2020

**Annexure-I to Environmental Statement (Form-V) for Tiringpahar Iron & Manganese Mine for
FY 2019-20**

ABSTRACT ON ENVIRONMENTAL MONITORING RESULTS

[PERIOD: APRIL 2019 TO MARCH 2020]

**MINE-TIRINGPAAR IRON & MANGANESE MINES
M/s TATA Steel Limited**

Annexure-I to Environmental Statement (Form-V) for Tiringpahar Iron & Manganese Mine for FY 2019-20

1. SURFACE WATER QUALITY ANALYSIS REPORT

SW1: Kundra Nallah entering Tiringpahar

Parameters	Unit	Standard	Apr-19	May-19	Jun-19	July-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar20
Dissolved Oxygen (minimum)	mg/l	4	5.2	6.1	5.4	5.2	5.8	5.3	5.3	5.6	5.6	6.1	6.2	5.8
BOD (3) days at 27°C (max)	mg/l	3	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Total Coli form	MPN/ 100 ml	5000	180	220	120	160	210	140	140	120	180	190	210	120
pH Value	--	6.0-9.0	7.48	7.56	7.51	7.58	7.66	7.49	7.49	7.42	7.56	7.61	7.66	7.62
Colour (max)	Hazen	300	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
Total Dissolved Solids	mg/l	1500	118	126	108	124	138	126	126	134	136	144	146	132
Copper as Cu (max)	mg/l	1.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron as Fe (max)	mg/l	0.5	0.48	0.66	0.42	0.42	0.44	0.40	0.4	0.42	0.42	0.44	0.46	0.41
Chloride (max)	mg/l	600	30	48	46	36	52	36	35.8	42.8	41.6	42.6	44.8	42
Sulphates (SO ₄) (max)	mg/l	400	5.6	6.8	6.1	4.6	6.1	4.7	4.7	4.2	5.6	6.1	6.6	5.8
Nitrate as NO ₃ (max)	mg/l	50	2.8	0.86	3.1	3.2	2.88	3.1	3.1	3.2	3.6	4.2	4.4	4.1
Fluoride as F (max)	mg/l	1.5	0.052	0.068	0.056	0.056	0.062	0.053	0.053	0.056	0.061	0.066	0.064	0.06
Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd (max)	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium as Se (max)	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic as As	mg/l	0.2	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cyanide as CN (max)	mg/l	0.05	ND	ND	ND	ND	ND	ND	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	<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	<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	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Annexure-I to Environmental Statement (Form-V) for Tiringpahar Iron & Manganese Mine for FY 2019-20

SW2: Kundra Nallah leaving Tiringpahar

Parameters	Unit	Standard	Apr-19	May-19	Jun-19	July-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
Dissolved Oxygen (minimum)	mg/l	4	6.1	5.4	6.2	5.8	5.3	5.7	5.7	6.4	6.2	6.6	6.4	6.4
BOD (3) days at 27°C (max)	mg/l	3	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Total Coli form	MPN/ 100 ml	5000	220	120	180	210	140	170	170	150	240	220	240	210
pH Value	--	6.0-9.0	7.56	7.51	7.66	7.66	7.49	7.65	7.65	7.62	7.72	7.68	7.71	7.78
Colour (max)	Hazen	300	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
Total Dissolved Solids	mg/l	1500	126	108	118	138	126	134	134	148	144	152	158	142
Copper as Cu (max)	mg/l	1.5	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron as Fe (max)	mg/l	0.5	0.66	0.42	0.61	0.44	0.40	0.42	0.42	0.48	0.46	0.48	0.52	0.44
Chloride (max)	mg/l	600	48	46	56	51.8	35.8	50.6	50.6	48.1	60.2	61.2	60.2	62
Sulphates (SO ₄) (max)	mg/l	400	6.8	6.1	7.2	6.1	4.7	6.3	6.3	6.6	6.8	7.2	7.1	6.2
Nitrate as NO ₃ (max)	mg/l	50	0.86	3.1	1.2	2.88	3.1	2.85	2.85	2.92	4.2	4.4	4.6	4.6
Fluoride as F (max)	mg/l	1.5	0.068	0.056	0.072	0.062	0.053	0.061	0.061	0.066	0.068	0.071	0.078	0.062
Phenolic Compounds as C ₆ H ₅ OH (max)	mg/l	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd (max)	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium as Se (max)	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic as As	mg/l	0.2	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cyanide as CN (max)	mg/l	0.05	ND	ND	ND	ND	ND	ND	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	<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	<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	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Annexure-I to Environmental Statement (Form-V) for Tiringpahar Iron & Manganese Mine for FY 2019-20

2. DRINKING WATER

MICROBIOLOGICAL ANALYSIS OF WATER AS PER IS: 10500 - 2012										
Sl No.	Test Parameters	Unit	Norms as per IS:10500-2012		Apr-19	May-19	June-19	July-20	Aug-20	Sep-20
1	Total Coli form Organism MPN/100ml	MPN/100 ml	Shall not be detectable in any 100ml sample		<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
2	Faecal Coli forms	MPN/100 ml	---		<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
3	E. Coli	MPN/100 ml	Shall not be detectable in any 100ml sample		Absent	Absent	Absent	Absent	Absent	Absent
CHEMICAL ANALYSIS OF WATER AS PER IS: 10500 - 2012										
Sl No.	Test Parameters	Unit	Norms as per IS: 10500-2012 (Amended on 2015 & 2018)							
			Desirable Limit	Permissible Limit	Apr-19	May-19	June-19	July-20	Aug-20	Sep-20
1	Colour (Unit)	Hazen	5	15	CL	CL	CL	CL	CL	CL
2	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	pH value (25°C)		6.5 - 8.5	No Relaxation	7.45	7.67	7.45	7.53	7.83	7.72
5	Turbidity	NTU	1	5	<1.0	<1	<1.0	<1.0	<1.0	<1.0
6	Total Dissolved Solids	mg/l	500	2000	120	132	140	132	123	128
7	Aluminium (as Al)	mg/l	0.03	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
8	Anionic Detergents (as MBAS)	mg/l	0.2	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
9	Boron (as B)	mg/l	0.5	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10	Calcium (as Ca)	mg/l	75	200	43	36	59.4	64.5	62	51
11	Chloride (as Cl)	mg/l	250	1000	44	51.2	51.6	54.8	56	50.8
12	Copper (asCu)	mg/l	0.05	1.5	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
13	Fluoride (as F)	mg/l	1	1.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
14	Residual Free Chlorine	mg/l	0.2(Min.)	---	ND	ND	ND	ND	ND	ND
15	Iron (as Fe)	mg/l	0.3	1	0.25	0.31	0.35	0.40	0.48	0.39
16	Magnesium (as Mg)	mg/l	30	100	15.6	12.5	30.7	33.5	38	31.5
17	Manganese (as Mn)	Hazen	0.1	0.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
18	Mineral Oil	--	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Nitrate (as NO ₃)	--	45	No Relaxation	0.57	1.96	0.69	0.67	0.67	0.64
20	Phenolic Compounds (as C ₆ H ₅ OH)		0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
21	Selenium (as Se)	NTU	0.01	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Sulphate (as SO ₄)	mg/l	200	400	3.6	5.1	3.7	4.9	4.4	3.1
23	Alkalinity (as CaCO ₃)	mg/l	200	600	67	48.7	76	60	71	79
24	Total Hardness(as CaCO ₃)	mg/l	300	600	73	85	83.4	80.9	85	80.3
25	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
26	Cyanide (as CN)	mg/l	0.05	No Relaxation	ND	ND	ND	ND	ND	ND
27	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

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29	Arsenic (as As)	mg/l	0.01	0.05	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001
30	Zinc (as Zn)	mg/l	5	15	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05
31	Chromium (as Cr ⁶⁺)	mg/l			<0.01	<0.01	<0.05	<0.05	<0.05	<0.05
32	Poly Aromatic Hydrocarbon as PAH	mg/l	<0.0001	--	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
33	Pesticide	µg/l	Absent		Absent	Absent	Absent	Absent	Absent	Absent

MICROBIOLOGICAL ANALYSIS OF WATER AS PER IS: 10500 - 2012										
Sl No.	Test Parameters	Unit	Norms as per IS:10500-2012		Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
1	Total Coli form Organism MPN/100ml	MPN/100 ml	Shall not be detectable in any 100ml sample		<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
2	Fecal Coli forms	MPN/100 ml	---		<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
3	E. Coli	MPN/100 ml	Shall not be detectable in any 100ml sample		Absent	Absent	Absent	Absent	Absent	Absent
CHEMICAL ANALYSIS OF WATER AS PER IS: 10500 - 2012										
Sl No.	Test Parameters	Unit	Norms as per IS: 10500-2012 (Amended on 2015 & 2018)							
			Desirable Limit	Permissible Limit	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
1	Colour (Unit)	Hazen	5	15	CL	CL	CL	CL	CL	CL
2	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	pH value (25°C)		6.5 - 8.5	No Relaxation	7.66	7.78	7.68	7.72	7.78	7.64
5	Turbidity	NTU	1	5	<1.0	<1	<1.0	<1.0	<1.0	<1.0
6	Total Dissolved Solids	mg/l	500	2000	118	124	124	122	126	120
7	Aluminium (as Al)	mg/l	0.03	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
8	Anionic Detergents (as MBAS)	mg/l	0.2	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
9	Boron (as B)	mg/l	0.5	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10	Calcium (as Ca)	mg/l	75	200	38	38.6	56.8	60.2	64	52
11	Chloride (as Cl)	mg/l	250	1000	44	51.2	51.6	54.8	56	50.8
12	Copper (asCu)	mg/l	0.05	1.5	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
13	Fluoride (as F)	mg/l	1	1.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
14	Residual Free Chlorine	mg/l	0.2(Min.)	---	ND	ND	ND	ND	ND	ND
15	Iron (as Fe)	mg/l	0.3	1	0.24	0.32	0.38	0.41	0.44	0.36
16	Magnesium (as Mg)	mg/l	30	100	16.6	11.8	30.6	31.2	36	32
17	Manganese (as Mn)	Hazen	0.1	0.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
18	Mineral Oil	--	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Nitrate (as NO ₃)	--	45	No Relaxation	0.56	1.94	0.71	0.66	0.68	0.68
20	Phenolic Compounds (as C ₆ H ₅ OH)		0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
21	Selenium (as Se)	NTU	0.01	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Sulphate (as SO ₄)	mg/l	200	400	3.8	5.2	3.8	4.2	4.8	3.2

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23	Alkalinity (as CaCO ₃)	mg/l	200	600	66	48.8	72	68	72	70
24	Total Hardness(as CaCO ₃)	mg/l	300	600	74	80.2	81.2	80.8	82	80.4
25	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
26	Cyanide (as CN)	mg/l	0.05	No Relaxation	ND	ND	ND	ND	ND	ND
27	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
29	Arsenic (as As)	mg/l	0.01	0.05	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001
30	Zinc (as Zn)	mg/l	5	15	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05
31	Chromium (as Cr ⁶⁺)	mg/l			<0.01	<0.01	<0.05	<0.05	<0.05	<0.05
32	Poly Aromatic Hydrocarbon as PAH	mg/l	<0.0001	--	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
33	Pesticide	µg/l	Absent		Absent	Absent	Absent	Absent	Absent	Absent

3. GROUND WATER

GW1: Palsa Village OW

Sl. No	Parameter	Unit	Standards as per IS: 10500:2012 Amended on 2015 & 2018		Analysis Result	
			Acceptable Limit	Permissible Limit	Aug-19	Nov-19
Essential Characteristics						
1	Colour	Hazen	5	15	CL	CL
2	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	5	1.4	1.2
5	pH Value	--	6.5-8.5	No Relaxation	7.64	7.56
6	Total Hardness (as CaCO ₃)	mg/l	200	600	112.0	110.0
7	Iron (as Fe)	mg/l	1.0	No Relaxation	0.21	0.28
8	Chloride (as Cl ⁻)	mg/l	250	1000	56.2	48.0
9	Residual, free Chlorine	mg/l	0.2	1	ND	ND
Desirable Characteristics						

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10	Dissolved Solids	mg/l	500	2000	130.0	146.0
11	Calcium (as Ca)	mg/l	75	200	30.8	38.8
12	Magnesium (as Mg)	mg/l	30	100	14.2	16.6
13	Copper (as Cu)	mg/l	0.05	1.5	<0.05	<0.05
14	Manganese (as Mn)	mg/l	0.1	0.3	0.026	0.032
15	Sulphate (as SO ₄)	mg/l	200	400	4.8	4.6
16	Nitrate (as NO ₃)	mg/l	45	No Relaxation	0.31	0.26
17	Fluoride (as F)	mg/l	1.0	1.5	0.016	0.018
18	Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	0.001	0.002	<0.001	<0.001
19	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.002	<0.002
20	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.01	<0.01
21	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.001	<0.001
22	Arsenic (as As)	mg/l	0.01	No Relaxation	<0.004	<0.004
23	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	<0.01
24	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01
25	Zinc (as Zn)	mg/l	5	15	1.26	1.26
26	Anionic Detergents (as MBAS)	mg/l	--	--	<0.2	<0.2
27	Chromium (as Cr ⁺⁶)	mg/l	0.5	No Relaxation	<0.05	<0.05
28	Mineral Oil	mg/l	200	600	<0.01	<0.01
29	Alkalinity	mg/l	0.03	0.2	128.0	128.0
30	Aluminium as(Al)	mg/l	0.5	2.4	<0.01	<0.01
31	Boron (as B)	mg/l	--	--	<0.5	<0.5
32	Poly Aromatic Hydrocarbon as PAH	mg/l	<0.0001	--	<0.0001	<0.0001
33	Pesticide	µg/l	Absent		Absent	Absent

GW2: Sandhya Guta Bore Well

Sl. No	Parameter	Unit	Standards as per IS: 10500:2012 Amended on 2015 & 2018		Analysis Result	
			Acceptable Limit	Permissible Limit	Aug-19	Nov-19
<i>Essential Characteristics</i>						
1	Colour	Hazen	5	15	CL	CL
2	Odour	--	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	5	1.8	2.1

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5	pH Value	--	6.5-8.5	No Relaxation	7.70	7.64
6	Total Hardness (as CaCO ₃)	mg/l	200	600	114.0	116.0
7	Iron (as Fe)	mg/l	1.0	No Relaxation	0.24	0.26
8	Chloride (as Cl)	mg/l	250	1000	42.8	38.2
9	Residual, free Chlorine	mg/l	0.2	1	ND	ND
<i>Desirable Characteristics</i>						
10	Dissolved Solids	mg/l	500	2000	142.0	152.0
11	Calcium (as Ca)	mg/l	75	200	41.6	44.2
12	Magnesium (as Mg)	mg/l	30	100	17.4	18.2
13	Copper (as Cu)	mg/l	0.05	1.5	<0.05	<0.05
14	Manganese (as Mn)	mg/l	0.1	0.3	0.031	0.036
15	Sulphate (as SO ₄)	mg/l	200	400	5.1	4.2
16	Nitrate (as NO ₃)	mg/l	45	No Relaxation	0.26	0.21
17	Fluoride (as F)	mg/l	1.0	1.5	0.021	0.022
18	Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	0.001	0.002	<0.001	<0.001
19	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.002	<0.002
20	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.01	<0.01
21	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.001	<0.001
22	Arsenic (as As)	mg/l	0.01	No Relaxation	<0.004	<0.004
23	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	<0.01
24	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01
25	Zinc (as Zn)	mg/l	5	15	1.62	1.31
26	Anionic Detergents (as MBAS)	mg/l	--	--	<0.2	<0.2
27	Chromium (as Cr ⁺⁶)	mg/l	0.5	No Relaxation	<0.05	<0.05
28	Mineral Oil	mg/l	200	600	<0.01	<0.01
29	Alkalinity	mg/l	0.03	0.2	130.8	136.0
30	Aluminium as(Al)	mg/l	0.5	2.4	<0.01	<0.01
31	Boron (as B)	mg/l	--	--	<0.5	<0.5
32	Poly Aromatic Hydrocarbon as PAH	mg/l	<0.0001	--	<0.0001	<0.0001
33	Pesticide	µg/l	Absent		Absent	Absent

Annexure-I to Environmental Statement (Form-V) for Tiringpahar Iron & Manganese Mine for FY 2019-20

1. AAQ MONITORING (CORE ZONE)

AAQ1: PURUNAPANI

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	O ₃ (µg/m ³)	CO mg/m ³	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	C ₆ H ₆ (µg/m ³)	BaP (ng/m ³)	Mn µg/m ³
Apr-19	50.70	24.00	6.10	10.90	8.40	0.40	29.90	BDL	BDL	BDL	BDL	BDL	BDL
May-19	52.30	26.70	6.50	11.00	9.10	0.60	35.60	BDL	BDL	BDL	BDL	BDL	BDL
June-19	52.43	24.53	6.71	11.83	10.33	0.62	34.30	BDL	BDL	BDL	BDL	BDL	BDL
July-19	43.40	18.90	7.50	11.90	9.30	0.60	27.40	BDL	BDL	BDL	BDL	BDL	BDL
Aug-19	43.20	28.10	7.40	11.90	9.30	0.60	27.00	BDL	BDL	BDL	BDL	BDL	BDL
Sep-19	26.70	15.30	4.70	9.60	8.50	0.30	21.30	BDL	BDL	BDL	BDL	BDL	BDL
Oct-19	38.51	18.24	6.81	9.39	6.16	0.14	24.28	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Nov-19	42.83	25.70	5.36	10.23	6.44	0.19	24.02	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Dec-19	60.84	36.51	7.49	16.23	8.16	0.50	24.28	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jan-20	63.02	37.81	8.38	16.16	8.18	0.45	21.84	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Feb-20	63.08	37.85	11.28	16.99	9.34	0.53	25.23	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Mar-20	63.31	37.99	9.27	15.40	8.20	0.47	24.03	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001

AAQ2: GURUDA PIT

Monthly Average	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	O ₃ (µg/m ³)	CO mg/m ³	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	C ₆ H ₆ (µg/m ³)	BaP (ng/m ³)	Mn µg/m ³
Apr-19	72.70	30.10	8.20	10.60	7.10	0.50	25.10	BDL	BDL	BDL	BDL	BDL	BDL
May-19	75.30	33.10	8.20	11.90	7.90	0.50	27.20	BDL	BDL	BDL	BDL	BDL	BDL
June-19	53.20	30.59	7.61	15.23	8.69	0.59	30.00	BDL	BDL	BDL	BDL	BDL	BDL
July-19	47.20	21.90	7.40	13.80	9.30	0.60	25.00	BDL	BDL	BDL	BDL	BDL	BDL
Aug-19	46.60	20.50	7.30	11.40	9.00	0.60	24.90	BDL	BDL	BDL	BDL	BDL	BDL
Sep-19	29.90	16.80	5.10	10.40	8.40	0.50	20.90	BDL	BDL	BDL	BDL	BDL	BDL
Oct-19	40.40	18.89	5.03	9.74	5.40	0.15	22.02	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Nov-19	43.09	25.85	8.27	11.44	6.54	0.22	22.47	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Dec-19	61.37	36.82	7.62	13.48	8.01	0.56	24.18	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Jan-20	67.78	40.67	7.37	13.23	8.33	0.61	28.94	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Feb-20	67.53	40.52	8.90	14.03	8.94	0.64	26.80	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001
Mar-20	60.71	36.43	8.61	12.54	8.80	0.49	23.37	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	< 0.001

Annexure-I to Environmental Statement (Form-V) for Tiringpahar Iron & Manganese Mine for FY 2019-20

2. AAQ MONITORING (BUFFER ZONE)

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)								
	Sampling Location	NAAQ Standard	Apr-19	May-19	June-19	July-20	Aug-20	Sep-20
BZ-1	JORIBAHAL		Analysis Result					
Parameters	Method of Measurement							
PM₁₀	Gravimetric method	100(µg/m³)	44	50.2	54.20	50.60	41.20	20.60
PM_{2.5}	Gravimetric method	60 (µg/m³)	24.64	28.112	30.60	29.20	28.60	11.50
SO₂	Improved West Gaeke method.	80 (µg/m³)	6.8	7.4	5.60	6.20	6.10	5.10
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	11.4	11.8	10.20	10.40	10.70	9.60
CO	NDIR Spectroscopy method	4(mg/m³)	0.55	0.52	0.66	0.60	0.50	0.40
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20.0	24.8	<20.0
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BZ-2	BALADA	NAAQ Standard	OCT-19	NOV-19	DEC-19	JAN-20	FEB-20	MAR-20
Parameters	Method of Measurement		Analysis Result					
PM₁₀	Gravimetric method	100(µg/m³)	48	51.8	56.20	51.60	40.70	22.60
PM_{2.5}	Gravimetric method	60 (µg/m³)	26.88	29.008	36.20	30.80	22.80	12.70
SO₂	Improved West Gaeke method.	80 (µg/m³)	6.2	6.6	6.20	5.60	5.20	4.60
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	10	11.4	9.80	9.20	9.60	9.80
CO	NDIR Spectroscopy method	4(mg/m³)	0.52	0.56	0.62	0.60	0.60	0.50
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20.0	26.2	<20.0

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As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C6H6	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

BZ-3	PALSA	NAAQ Standard	Apr-19	May-19	June-19	July-19	Aug-19	Sep-19
Parameters	Method of Measurement		Analysis Result					
PM₁₀	Gravimetric method	100(µg/m³)	46	49.6	62.2	52.0	43.2	25.4
PM_{2.5}	Gravimetric method	60 (µg/m³)	25.76	27.776	41.80	32.80	23.20	14.20
SO₂	Improved West Gaeke method.	80 (µg/m³)	6.9	7.1	5.90	6.2	6.10	5.20
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	10.4	11.6	10.20	9.80	9.50	10.10
CO	NDIR Spectroscopy method	4(mg/m³)	0.54	0.58	0.64	0.60	0.60	0.50
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20.0	25.8	<20.0
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C6H6	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

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2. AAQ MONITORING (BUFFER ZONE)

AMBIENT AIR QUALITY MONITORING REPORT (BUFFER ZONE)								
	Sampling Location	NAAQ Standard	OCT-19	NOV-19	DEC-19	JAN-20	FEB-20	MAR-20
BZ-1	JORIBAHAL		Analysis Result					
Parameters	Method of Measurement							
PM₁₀	Gravimetric method	100(µg/m³)	44	50.2	58.8	60.6	64.8	56
PM_{2.5}	Gravimetric method	60 (µg/m³)	24.64	28.112	35.28	36.36	38.88	33.6
SO₂	Improved West Gaeke method.	80 (µg/m³)	6.8	7.4	6.4	6.6	7.6	7.9
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	11.4	11.8	10.8	11.2	10.8	12.2
CO	NDIR Spectroscopy method	4(mg/m³)	0.55	0.52	0.56	0.61	6.8	0.68
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20.0	24.8	<20.0
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C₆H₆	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	BALADA	NAAQ Standard	OCT-19	NOV-19	DEC-19	JAN-20	FEB-20	MAR-20
Parameters	Method of Measurement		Analysis Result					
PM₁₀	Gravimetric method	100(µg/m³)	48	51.8	62.2	68.2	68.2	58
PM_{2.5}	Gravimetric method	60 (µg/m³)	26.88	29.008	37.32	40.92	40.92	34.8
SO₂	Improved West Gaeke method.	80 (µg/m³)	6.2	6.6	5.6	7.1	7.1	8.4
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	10	11.4	9.8	12.6	12.6	12.4
CO	NDIR Spectroscopy method	4(mg/m³)	0.52	0.56	0.62	0.72	0.72	0.68
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20.0	26.2	<20.0
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

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Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C6H6	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

BZ-3	PALSA	NAAQ Standard	OCT-19	NOV-19	DEC-19	JAN-20	FEB-20	MAR-20
Parameters	Method of Measurement		Analysis Result					
PM₁₀	Gravimetric method	100(µg/m³)	46	49.6	64.8	70.6	71.2	60.2
PM_{2.5}	Gravimetric method	60 (µg/m³)	25.76	27.776	38.88	42.36	42.72	36.12
SO₂	Improved West Gaeke method.	80 (µg/m³)	6.9	7.1	6.4	6.6	8.4	9.8
NO_x	Jacob & Hochhelser modified (Na-Arsenite) method	80(µg/m³)	10.4	11.6	10.8	12.4	13.8	11.8
CO	NDIR Spectroscopy method	4(mg/m³)	0.54	0.58	0.66	0.88	8.2	0.82
O₃	Chemical Method	100 (µg/m³)	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
NH₃	Indo Phenol Blue Method	400 (µg/m³)	<20.0	<20.0	<20.0	<20.0	25.8	<20.0
As	AAS Method	6ng/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ni	AAS Method	20µg/m³	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pb	AAS Method	1µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
C6H6	Gas Chromatography	5µg/m³	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bap	Gas Chromatography	1ng/m³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
HC	GC Method		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

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L-1	Near Sorting Yard (Guruda Block)	NAAQ Standard	Monitoring Date	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	
Parameters	Method of Measurement	1200($\mu\text{g}/\text{m}^3$)	Analysis Result		-	-	-	320.4		326.8		348.8	351.2	368.8	412.2	706.2
SPM	Gravimetric method								318.2							
L-2	Near Stack Yard (Guruda Block)	NAAQ Standard	Monitoring Date	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	
Parameters	Method of Measurement	1200($\mu\text{g}/\text{m}^3$)	Analysis Result	-	-	-	-	356.8	372.2	368.4	392.6	396.2	406.2	412.6	552.2	
SPM	Gravimetric method															
L-3	Near Haul Road (Guruda Block -Mine Pit)	NAAQ Standard	Monitoring Date	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	
Parameters	Method of Measurement	1200($\mu\text{g}/\text{m}^3$)	Analysis Result	-	-	-	-	408.2	412.8		418.2	446.8	478.8	488.6	492.6	518.8
SPM	Gravimetric method															

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1. PERSONAL DUST SAMPLING

Name of the Person	Personal Number	Oct-2019	Name of the Person	Personal Number	NOV-2019	Name of the Person	Personal Number	DEC-2019
		PM ($\mu\text{g}/\text{m}^3$)			PM ($\mu\text{g}/\text{m}^3$)			PM ($\mu\text{g}/\text{m}^3$)
Sudhir Kumar Karun	TSP/809982/0919	8.8	Gopabandhu Patra	TSP/798825/0919	8.1	Sudhir Kumar Karun	TSP/809982/0919	9.6
Naresh Singh	TSP/751501/0819	8.2	Martha Dungding	TSP/798847/0919	7.8	Naresh Singh	TSP/751501/0819	9.2
Krushna Lohar	TSP/811500/0919	7.8	Naresh Singh	TSP/751501/0819	7.6	Krushna Lohar	TSP/811500/0919	9.1
Ravi Kumar Gope	TSP/811202/0919	7.4	Ravi Kumar Gope	TSP/811202/0919	7.8	Tamina Bai	MWO719164188	8.2
Chanu Munda	TSP/753803/0819	8.4	Chanu Munda	TSP/753803/0819	8.3	Cham Munda	MW1216072525	8.6
						Silibanti Munda	MWO719164349	8.8
						Amit Dungdung	MO0719164536	8.9
						Jenaram Pingua	MW1216072560	9.4
Name of the Person	Personal Number	Jan-20	Name of the Person	Personal Number	Feb-20	Name of the Person	Personal Number	Mar-20
		PM ($\mu\text{g}/\text{m}^3$)			PM ($\mu\text{g}/\text{m}^3$)			PM ($\mu\text{g}/\text{m}^3$)
Sudhir Kumar Karun	TSP/809982/0919	9.2	Sudhir Kumar Karun	TSP/809982/0919	9.6	Suresh Naik	TSP/801522/0919	4.2
Naresh Singh	TSP/751501/0819	8.8	Naresh Singh	TSP/751501/0819	8.2	Kumari Patra	TSP/801276/0919	4.1
Krushna Lohar	TSP/811500/0919	8.6	Krushna Lohar	TSP/811500/0919	8.4	Laxmi Munda	TSP/775944/0819	3.9
Tamina Bai	MWO719164188	8.4	Tamina Bai	MWO719164188	8.2	Jema Patra	TSP/775945/0819	3.6
Cham Munda	MW1216072525	8.1	Cham Munda	MW1216072525	7.8	Rajesh Patra	TSP/785783/0819	4

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Silibanti Munda	MWO719164349	8.8	Silibanti Munda	MWO719164349	7.9	Sitara Hessa	TSP/770136/0819	4.2
Amit Dungdung	MO0719164536	9.1	Amit Dungdung	MO0719164536	8.4	Ajay Das	TSP/770126/0819	4.4
Jenaram Pingua	MW1216072560	9.2	Jenaram Pingua	MW1216072560	9.1	Sarjen Kulei	TSP/770178/0819	4.8

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1. DG SET STACK

Sampling Location: 15 KVA Purunapani DG SET				Jun-19	Sep-19	Dec-19	Marc-20
SL.No	Parameters Analyzed	Unit	CPCB LIMIT	Result			
1	Stack Temperature	⁰ C	.....	182.5	118	131	136
2	Velocity	m/Sec	.....	11.86	13.14	15.1	15
3	Concentration Of Particulate Matter As PM	mg/Nm ³	50	25.8	28.42	31.2	36
4	Oxides of Nitrogen as Nox	mg/Nm ³	400	60	62.6	66.8	70
5	Carbon Monoxide as CO	mg/Nm ³	150	32.5	36.6	32.6	34
6	Non Methyl Hydrocarbon as C	mg/Nm ³	6	6.6	6.2	6.8

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1. AMBIENT NOISE

Location ID	Location	Day time Equivalent						Standard as per CPCB	Night time Equivalent						Standard as per CPCB		
		Noise Level in dB (A) Leq							Noise Level in dB(A) leq								
		Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19		Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19			
		-	-	69.7	62.8	63.5	61.8		-	-	52.4	65.4	59.4	52.3			
		Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20			Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20		
N-1	Mines Area	66	68.8	68.8	71.2	69.6	65	75	52	54.6	56.4	61.2	58.8	52	70		

2. EQUIPMENT NOISE

Name of Location	Unit	Result		Name of Location	Result		Name of Location	Result	
		JUNE-19	OCT-19		JULY-19	NOV-19		Sep-19	Dec-19
Volvo EC 300 DL(Sovel-1)	dB	74.8	72.8	Drojer (OR09H5949/0919)	72.6	70.8	OD-09C-5167	71.5	73.2
OR-09M-7869(JCB)		79.4	71.4	Prima (OD09C5167)	79.8	72.6	OD-09C-1373	74.5	72.8
OD-09C-5166		81.2	70.8	JCB (OD09K3140)	81.2	73.8	OD-09K-3118	76.7	73.6
OR-09L-8475		78.4	72.1	PRIMA LX (OD09A4692)	78.8	74.6	OD009A-6540	71.9	72.2
				PRIMA (OD09C5267)	78.6	71.8	OD-09A-4692	74.3	71.8

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Name of Location	Unit	Result		Name of Location	Result		Name of Location	Result	
		June-19	Jan-20		July-19	Feb-20		Sep-19	Mar-20
OD-09C-5167	dB	75.7	74.8	OD-09C-5167	78.6	76.8	OD-09C-5167	76.9	78
OD-09C-1373		73.5	75.2	OD-09C-1373	76.5	74.6	OD-09C-1373	75.4	76.6
OD-09K-3118		76.8	75.6	OD-09K-3118	75.4	75.2	OD-09K-3118	78.9	80.2
OD009A-6540		77.6	76.2	OD009A-6540	76.3	75.8	OD009A-6540	79.0	81.8
OD-09A-4692		72.3	74.2	OD-09A-4692	72.8	74.2	OD-09A-4692	79.9	82.2

1. DUST FALL ANALYSIS

Date of Sampling	Total Dust Fall (t/km ² /month)	Analysis Result			
		Co (%)	Ni (%)	Hg (%)	As (%)
June-19	0.56	<0.001	<0.001	<0.001	<0.001
September-19	0.52	<0.001	<0.001	<0.001	<0.001
01.12.2019 TO 31.12.2019	0.44	<0.001	<0.001	<0.001	<0.001
01.03.2020 to 31.03.2020	0.51	<0.001	<0.001	<0.001	<0.001

2. SOIL QUALITY ANALYSIS

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Date of Sampling	Analysis Result			
	Co (%)	Ni (%)	Hg (%)	As (%)
Jun-19	0.019	0.056	<0.000002	<0.000002
Sep-19	0.0021	0.0042	<0.000002	<0.000002
Dec-19	0.038	0.058	<0.000002	<0.000002
Mar-20	0.044	0.056	<0.000002	<0.000002

**1. GROUND WATER QUALITY (TRACE METALS)
Panchayat Office Borewell**

Parameters	Iron as Fe	Copper as Cu	Manganese as Mn	Hexavalent Chromium as Cr ⁶⁺	Mercury as Hg	Cadmium as Cd	Selenium as Se	Arsenic as As	Lead as Pb	Zinc as Zn
May-19	0.25	<0.02	0.016	<0.05	<0.002	<0.01	<0.001	<0.004	<0.01	<0.05
November-19	0.28	<0.02	0.016	<0.05	<0.002	<0.01	<0.001	<0.004	<0.01	<0.05