



Ref No: SCM/ENV/002/044/17
Dated: 26th September, 2017

**The Member Secretary
State Pollution Control Board, Odisha
Paribesh Bhawan
A/118, Nilakantha Nagar
Unit-VIII, Bhubaneswar - 751012**

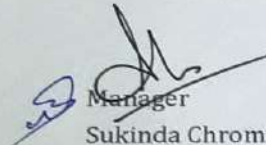
Sub: Submission of Annual Environment Statement for the year 2016-17

Dear Sir,

As per the provisions of Environment (Protection) Amendment Rules, 1993 under section 6 and section 25 of Environment (Protection) Act, 1986 we are submitting herewith the Annual Environment Statement for the year 2016-17 for Sukinda Chromite Mine, M/s Tata Steel Ltd. as per FORM – V (Rule 14).

Thanking you,

Yours faithfully,
f: Tata Steel Limited


Manager
Sukinda Chromite Mine

Copy to: Regional Officer, OSPCB, Kalinganagar
Central Pollution Control Board
MoEF & CC, Eastern Regional Office through e-mail

TATA STEEL LIMITED

Sukinda Chromite Mine PO Kalarangiatta Dist Jajpur Odisha 755028
Phone no 91 6726 268763 Fax 91 6726 268734
Registered Office Bombay House 24 Homi Mody Street Fort Mumbai 400 001 India
Tel 91 22 6665 8282 Fax 91 22 66657724
Corporate Identity Number L27100MH1907PLC000260 Website www.tatasteel.com

FORM - V
(See Rule -14)

ENVIRONMENT STATEMENT FOR THE FINANCIAL YEAR ENDING THE 31st MARCH, 2017

SUKINDA CHROMITE MINE, TATA STEEL LTD.

PART-A

1. Name and address of the owner/
Occupier of the industry, operation : Sukinda Chromite Mine
: Tata Steel Ltd., P.O-Kalarangiatta
: Dist. - Jajpur, Orissa -755028
- Agent : Mr.Rajesh Patel
- Nominated Owner : Mr.T V Narendran,
Managing Director
Tata Steel Ltd., Jamshedpur
2. Industry Category : Major
3. Production Capacity : Chrome Ore (ROM) : 2.4 MTPA
: Pyroxenite Ore (ROM) : 0.5 MTPA
: Chrome Concentrate : 0.65 MTPA
4. Year of establishment : 20.12.1960
5. Date of submission of previous
Environment Audit Report. : 29th September' 2016

PART-B

A)Water consumption in m³ / day under all the three heads for the assessment Year is as follows:

(i) Water Consumption:

Quarry water is used for processing, spraying and cooling.

Consumption Head	2015-16 (Cum/day) (Annual average)	2016-17 (Cum/day) (Annual average)
Process	2144.87	1336.1
Spraying in mine pit , services	792.73	1078.13
Cooling	Completely recycled	Completely recycled
Domestic	1960.08	1987.68
Process water consumption per product output		
Name of the product	During the previous financial Year (2015-16)	During the current financial Year (2016-17)
Chrome Concentrate	2.94 Cum / MT	1.47 Cum / MT **

** Chrome Concentrate production in FY 16 was 225645 MT while in FY 17 it is 332692 MT, thus low process water consumption per product output.

(ii) Raw Material Consumption

The following items have been consumed/ utilized:

Name of Raw materials	Consumption of Raw Material	
	During current financial Year (2015 - 16)	During current financial Year (2016 - 17)
High Speed Diesel	4945326 Liters	6923745 Liters
Lubricants	211 Barrels	254 Barrels
Brake fluid	330 Liters	230 Liters
Grease	40 Barrels	79 Barrels
Explosives of all types (Explosive, codex, detonator)	64385 kg, 22675 m, 12555 Nos	41675 kg, 26450 m, 23514 Nos.
Electric Power:		
Consumed	12520401 KWH	18829393 KWH
Generated	64612 KWH	82200 KWH
Gas	5784 Cu.M.	6892 Cu.M.
Tyres	32 Nos.	64 Nos.
Drill rods	4 Nos.	2 Nos.
Acids & Chemicals:		
Nitric Acid	240.0 litres	282.5 Litres
Sulphuric Acid	2.50 litres	2.5 Litres
Acetone	1.00 litres	1.5 Litres
Borax	43.0 Kg	46.5 Kg
Sodium Carbonate	51.0 Kg	71.5 Kg
Diphenyl Carbazide	50 gm	50 gm
Cobaltous Nitrate	7 Kg	1 Kg
Hydrochloric Acid	340.0 ltr	550 Ltr
IsoPropyle Alcohol	0.5 ltr	0.5 Ltr

PART-C

POLLUTION DISCHARGED TO ENVIROMENT/ UNIT OF OUTPUT **(Parameters as specified in the consent issued)**

Water Pollution:

The quarry water, which gets accumulated in the mine, is pumped out as and when required to continue mining operation. This water utilized for different purposes during 2016-17 are: Process -1336.1 Kl/day, Cooling - completely recycled, Spraying in mine pit & services - 1078.13 Kl / day. Process water as shown above is used in the COB plant for making the entire process wet so as to prevent pollution due to particulate matter. Eighty five percent of water is re-circulated for processing & makeup water is to the tune of only fifteen percent max. Slimes de-watering facility is added to the plant, and about 90% of the total slimes generated in the plant are being de-watered here, and at times due to no operation of de-watering facility, about max. 10% of slurry is discharged in to slime pond, from where clarified water is again recycles back to the plant.

The balance water is discharged out of lease boundary to the fallow land after necessary treatment. The status of water quality parameters for the financial year is as given below.

Details of Water Quality Monitoring:

Pollutants	Conc. of Pollutants (mg/ltrs.)	Standards (mg/ltrs.)	% of variation from standards
pH	7.25	5.5-9.0	-
TSS	33.25	100	- 66.75 %
Oil & Grease	ND	10	-100 %
BOD	1.54	30	-94.86 %
COD	5.02	250	-98 %
Cr+6	BDL	0.05	-100 %
Total Cr	0.24	2	-88 %
Nickel	BDL	3	-100 %
Iron	0.64	3	-78.66 %

Note: BDL- Below Detectable limit, ND- Not Detectable. (-) deviation implies better than standard

Air Pollution:

Details of Ambient Air Quality Monitoring:

Location	Type of Air	Avg. Conc. Of Pollutants (Annual Avg in µg/m3)	Prescribed Standards (Annual Avg in µg/m3)	Prescribed Standards (24 Hrs. Avg in µg/m3)	% of variation from the norms with reasons
Industrial Area COB Plant (Canteen top)	PM ₁₀	55.30	60	100	-44.7%
	PM _{2.5}	31.44	40	60	-47.6%
	SO ₂	4.55	50	80	-94.31%
	NOX	11.82	40	80	-85.22%
	CO*	0.19	2	4	-95.25%
Industrial Area Mining (Near Stack yard Office)	PM ₁₀	58.9	60	100	-41.1%
	PM _{2.5}	34.47	40	60	-42.5%
	SO ₂	4.9	50	80	-93.8%
	NOX	12.33	40	80	-84.5%
	CO*	0.23	2	4	-94.25%
Residential Area (Chemical Lab. Roof top)	PM ₁₀	50.70	60	100	-49.3%
	PM _{2.5}	29.19	40	60	-51.35%
	SO ₂	4.32	50	80	-94.6%
	NOX	11.33	40	80	-85.8%
	CO*	0.17	2	4	-95.75%
Sensitive Area (Near Hospital)	PM ₁₀	42.04	60	100	-58%
	PM _{2.5}	24.74	40	60	-58.76%
	SO ₂	4.07	20	80	-94.9%

	NOX	10.44	30	80	-87%
	CO*	0.13	2	4	-96.75%
Mining Complex	PM10	46.5	60	100	-53.5%
	PM2.5	27.01	40	60	-55%
	SO2	4.15	50	80	-94.85%
	NOX	10.9	40	80	-86.37%
	CO*	0.15	2	4	-96.25%
Near Tailing Pond	PM10	37.69	60	100	-62.3%
	PM2.5	22.2	40	60	-63%
	SO2	4.04	50	80	-95%
	NOX	9.98	40	80	-87.5%
	CO*	0.12	2	4	-97%

Note: *Unit of measure for CO is mg/m³, (-) deviation implies better than standard

This is an opencast mine and does not have any single point source of air pollution. Hence, quantitative estimation of air pollutants discharged in Kg/day cannot be ascertained. The above ambient air quality data shows that the concentrations of the pollutants are well within the permissible standards.

PART-D

HAZARDOUS WASTES

As specified under the Hazardous Waste (Management, Handling and Transboundary) Rules, 2008 and amendment thereof

Hazardous Wastes	Total Quantity	
	During the Previous Financial Year (2015-16)	During the Current Financial Year (2016-17)
I) From Process:		
▪ Used Oil	40.6 MT	41 MT
▪ Waste containing Oil	1.10 MT	10.08 MT
▪ Waste Battery	166 Nos.	178 Nos.
▪ ETP Sludge	148.170 MT	97.27 MT
II) From Pollution Control Facility:		
▪ Waste oil from oil & grease separation pit	} Included in the Item I	} Included in the Item I
▪ Sludge from oil and grease separation pit		

PART-E

SOLID WASTES

Sources	TOTAL QUALITY	
	During the Current Year (2015-16)	During the Current Year (2016-17)
a) From Process: <ul style="list-style-type: none">▪ From Mining as Overburden▪ From COB plant as Tailing▪ From Canteen, Office, Colony etc	66.17 Lakh Cum 347774.638 MT 0.54 MT	50.3 Lakh Cum 454632 MT 0.75 MT
b) From Pollution Control Facility	Not Applicable	Not Applicable
c) i. Quantity recycled or reused within the unit	Study under Progress	Study under Progress
ii. Quantity sold <ul style="list-style-type: none">▪ General Office Waste	1.65 MT	1.3 MT
iii. Quantity disposed <ul style="list-style-type: none">▪ Mining overburden▪ Canteen and colony waste	6616921 Cum Organic wastes are disposed off in the bio gas plant & in compost pits.	5030651 Cum Organic wastes are disposed off in the bio gas plant & in compost pits.

The slime generated from the beneficiation plant has a potential mineral value. So it is pumped into the tailing/slime pond where it is stored for future use.

PART-F

THE CHARACTERISTICS (in terms of composition and quantum) OF HAZARDOUS AS WELL AS SOLID WASTES AND INDICATE DISPOSAL PRACTICE ADOPTED FOR BOTH THESE CATEGORIES OF WASTES.

The composition of hazardous wastes like used oil & waste containing oil are Gear oil: SP460, 320, 220 & 90, Hydraulic oil: 68, 10, 46, and 100, Mobil oil: 20W40, 30, 40 Transformer oil, Grease: Senogem EP2, KG 10. The composition of ETP sludge is compounds of Cr, Fe, Ni, Al, Si, etc. The composition of the solid wastes (overburden) contains nickeliferous limonite, serpentinite, and quartzite.

DISPOSAL PRACTICE:-

a) SOLID WASTES:

The overburden is systematically and scientifically dumped on a geologically barren area and properly supported with hard material and the same is being reclaimed by plantation after being declared inactive.

The organic wastes from the canteen and other places are stored in buckets (3 cum capacity) which are later on disposed on the over burden dumps to enrich the nutrient content. This has been found to hasten the plant growth and the seeds contained in the vegetable waste have contributed to the green cover in the dumps. They are also disposed in compost pits.

The food and vegetable wastes from the canteens of the mine, plant, hospital, guest house, clubs etc. are processed in bio-gas plants (two nos.). While the gas generated is used for cooking, the waste is used as manure.

The municipal solid wastes (other than above) are segregated as per their characteristics e.g. paper, jute bags, tins, bottles, plastics, metal scraps etc. and are sold to a party at Cuttack for recycling. The inert material like building debris etc. is used as landfills development of landscapes etc.

b) HAZARDOUS WASTE:

ETP Sludge:

ETP sludge removed from the ETP is kept in an impervious pit so that the moisture from the sludge gets evaporated and it becomes easy to handle the material.

After drying, it is disposed by OSPCB authorized party "Orissa Waste Management Project, a Division of M/s Ramky Enviro Engineers Ltd" which disposes the ETP sludge at their Common Hazardous Waste- Treatment Storage Disposal Facility (CHWTSDF) located at Kanchichuan near Sukinda of Jajpur district.

Used Oil:

The waste oil generated at various sources is collected in leak proof barrels and then are kept under a covered roof and on concrete platforms (Capacity – 200 Kl) in the barrels very carefully and sealed properly to avoid any spillage or leakage. 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 disposed through auction to the authorized recycler after due intimation to State Pollution Control Board. After dispatch of same, intimation of auction along with copy of manifest is also being sent to State Pollution Control Board

Waste containing Oil:

Oil soaked jutes, filter and filter materials are produced during the schedule maintenance and repair of the vehicles from the workshop. It is stored in the HDPE lined placer dumper buckets. The HDPE enclosure prevents contamination of land and water bodies. Oil soaked sand/soil are stored in a vat made before the oil and grease separation system. Water is added to make the waste free from oil. The oil containing water is led to oil and grease separation system and the sand/soil is disposed off like filters and filter material mentioned above.

We have made an agreement with M/s West Bangal Waste Management Limited, a division of Ramky Enviro Engineers Limited located at Haldia, West Bangal to dispose the waste containing oil falling in line with the recent directive from Member Secretary, State Pollution Control Board, Orissa vide his letter no. 14315/ IND-IV-Misc,-256, dated 04.09.09.

c) WASTE BATTERIES :

The used lead acid batteries with diluted acid and caps intact are kept under a shed having impervious floor. Then at a fixed interval, these batteries are disposed through auction to the

authorized recycler after due intimation to State Pollution Control Board. After dispatch of same, intimation of auction along with copy of manifest is also being sent to State Pollution Control Board.

PART-G

IMPACT OF POLLUTION ABATEMENT MEASURES TAKEN ON CONSERVATION OF NATURAL RESOURCES AND ON THE COST OF PRODUCTION

DUST SUPPRESSION:

- Stationary water sprinkler system has been installed alongside main haulage road covering a length of 1.5 KM.
- Water spraying on mine haulage roads by water sprinklers has reduced the dust levels in the ambient air. The spraying of water in crushers, screens and transfer points has improved the work zone environment at Chrome ore beneficiation plant & Lumpy Ore Processing Plant. Spray nozzle assembly along with dry fog system has been installed at jaw crusher and cone crusher discharge chutes in Naresh Kumar Plant to reduce fugitive dust generation.
- Tarpaulin sheets are now being used to cover the concentrate stacks to avoid dust nuisance during dry seasons.
- Additional plantation has been made to provide a thick green belt in between the colony and mining area to prevent dust from reaching the colony area.
- The people working in the areas of potential dust generation points have been provided with dust respirators.
- To reduce dust generation in workshop area, automatic sprinkling system has been installed.
- To reduce dust generation at dry tailing plant, floor concreting and sise drain construction had been made.
- Concreting of the parking area of the administrative building has also been made to reduce fugitive dust generation.
- Tarpaulin covers are being used in stock yard and COBP to reduce dust generation with the expenditure of Rs. 10 Lakh per year.
- Dust sampling study including dust fall monitoring and mineralogical composition analysis had been carried out during the year.
- Photographs of different activities of dust suppression are attached as **Annexure-1**

MANAGEMENT OF ASSOCIATED MINERAL STORAGE AREAS:

- Garland drains around the mines of 15,755 m stretch have been maintained regularly at the toe of dumps, periphery of the quarries, stack yard, COB plant and camp area. Prior to monsoon above drains are cleaned and made ready to check runoff from overburden dumps and to prevent surface runoff from entering into the quarry. These drains (avg. width 1.5 m and depth min. 1m) are made ready by constructing new ones, wherever required, and cleaning the existing ones through machines as well as by manual excavation. Settling pits are made ready to arrest the suspended solids. The washout from the OB dumps was diverted through effluent treatment plants located at Old Geological camp and near Jagannath temple for treatment before final discharge out of leasehold.
- We had implemented Vetiver System technology for over burden dump stabilization at Kakudia dump in collaboration with IIT, Kharagpur and this year planted more than one lakh vetiver slips which had shown encouraging results and good growth and prevented soil erosion of the dump slopes. Photographs are attached as **Annexure-11**.

- Hard rocky material was dumped at outer slope of running overburden dump benches to stop erosion of dump slope. Boulder patching had also been done on critical places of the dump to prevent wash out by channelizing the storm water through rocky patches.
- To prevent soil erosion and to stabilize the dump slope of associated minerals, 95,000 m² slope area was planted with 33,000 Nos. of native variety plants during the year FY 2016-17.
- Besides this, more than 1,10,000 nos. of vetiver slips had been planted along the dump slopes for dump slope stabilization.
- We had also planted about 8000 plants in miyawaki method on the dump slope which had shown encouraging growth and survival.
- Company has engaged CIMFR for dump stability study and IMMT Bhubaneswar for dump soil testing during the year.
- NIT Rourkela has conducted a study on the drainage pattern of the mines and has suggested effective recommendations for proper drainage of storm water and to ensure dump slope stabilization.
- Photographs of dumps management activities are attaches **as Annexure-2.**

SOLID WASTE MANAGEMENT:

- Organic waste of canteen was put to the bio-gas plant made near canteen for the purpose. Organic waste of Hospital, Guest House & Valley club are also put to the bio-gas plant made near Valley club and other biodegradable waste including plant wastes are put in the overburden dumps to improve the nutrient content and thereby the plant growth.
- Each work place has been provided with containers for segregation of solid wastes depending on its characteristics for proper management.
- All the houses in the camp have been provided with two separate buckets for storage of degradable and non-degradable waste separately for safe disposal.
- Compost pits have been built from which compost is being used for plantation activities.

WATER TREATMENT & RECYCLING:

- During 2016-17 company has spent nearly Rs. 65.00 Lakh towards mine water treatment to ensure that the water quality meets all the parameters as prescribe by the statutory authorities.
- The oil and grease separation system was in effective operation for treating workshop effluent. For operation & maintenance of the system the company has spent an amount of nearly Rs. 4 Lakh during the period.
- Herbal Treatment Plant is in use at our COB Plant for treatment of Hexavalent Chromium in the chrome concentrate. The water from tailing dam is recycled back to COBP for further reuse.
- Company has introduced single line intake system at COB Plant to monitor and reduce water consumption.
- One state- of- the- art, brand new integrated Effluent Treatment Plant with 4500 cum/hr capacity with on-line monitoring of parameters had been commissioned inside the mine for effective treatment of the mine discharge water and its recycling e and reuse.
- Rain water harvesting study had been conducted and one roof top harvesting structure had been constructed inside General Office premises which will be also extended to other buildings.
- Photographs of water treatment are attached **as Annexure-3.**

ENVIRONMENTAL MONITORING:

- An amount of Rs.49.63 Lakh was spent towards monitoring of various environmental parameters. This consists of air quality monitoring at a frequency of twice in a week with 24 hourly sampling and water quality monitoring once in a month for all the parameters.
- Weather monitoring is done through automatic weather monitoring station and compiled report on rain fall, humidity, temperature, wind speed, wind direction etc.

PREVENTION OF LAND CONTAMINATION:

- The entire area of the HEMM maintenance workshop has “Epoxy Flooring” for preventing any oil to reach the soil or ground.
- Usage of movable oil collection tray with built in pneumatic oil pump during any kind of HEMM maintenance to reduce oil leakage incidents.
- Targets have been put at various concerned locations to reduce the leakage/ spillage of oil which are monitored in a structured manner as per the laid down EMS procedure.
- Installation of one water column near the pit maintenance shop has reduced the lead distance significantly thereby reducing the diesel consumption considerably.
- Introduction of barrel handler for handling of oil barrels to reduce oil leakage and spillage.
- Introduction of off line oil cleaner resulting in enhancement of oil life (increased oil replacement interval) and thereby reducing waste oil generation.
- Modification of the hose kits in CAT dumper that has resulted in oil consumption. Separate dust bins have been provided at COB Plant and workshop for collection of oil soaked waste to prevent contamination of land.
- Photographs of Oil Separation Pit are attached as **Annexure-4**.

AFFORESTATION:

- A total of 33,000 Nos. of saplings of native varieties were planted during 2016-17 to stabilize 95,000 sq.m. of overburden dumps.
- Apart from the above, we had distributed more than 6000 numbers of fruit bearing saplings to the nearby villagers for improvement of environment.
- The previous year plantations were maintained and the dead plants were replaced to maintain the original no. of plants planted at the beginning.
- Miyawaki method of plantation is being practiced on dump slopes covering area of nearly 3000 m² which has resulted in better growth of plants.
- Vetiver system technology had been implemented for over burden dump stabilization at Kakudia dump and more about 110000 nos of vetiver slips had been planted during the year with considerable growth. Photographs attached as **Annexure-11**.
- On the above items, we have spent Rs. 75.5 Lakh.
- This cost does not include the plantation done by Tata Steel Rural Development Society in the nearby villages.
- We are also doing coir matting in scientific manner by proper terracing at 1 m height and plantation in every meter horizontally in staggered manner.
- Further to above, under the guidance of Dr. V. P Upadhyay, Director (S), MoEF, the unit has developed “Demonstration Plantation Plots” on experimental basis during 2011-12 & 2012-13 on Dump Surface and Dump Slope to gain in confidence and set standard operating procedures for its future reclamation and rehabilitation plans. The demonstration plantation plot on Dump surface and slope have been developed over an area of 2000 sq. m each wherein 10000 nos. of saplings of 22 native varieties has been planted. The species include Babul, Khaira, Bel, Kala

Sirisa, Kadamba, Neem, Mahaneem, Palas, Sissoo, Anala, Gambhar, Mahua, Mango, Karanja, Sagwan, Muchkunda, Jamun, Arjuna, Bahada, Barakoli, Harida. Growth of the plants has shown considerable growth in the last 4 years.

- Photographs of afforestation, coir matting & Demo plot are attached as **Annexure-5**.

NOISE REDUCTION:

- In-house ambient noise monitoring is carried out once in three months and the noise level has been found to be within the prescribed norms of Noise Pollution (Regulation & Control) Rules, 2000.
- To reduce the noise level at source, a lot of work has been done at COB plant and in the machines. In all the places proper operational control procedures have been practiced for the same.
- In the crusher area polymer liners have been fitted to reduce noise.
- Constant monitoring and adjustment reduced the noise level by 4 dB in 30% of mining equipment deployed in mines, COBP, & LOP Plant
- All the shovels and haul pack cabins have been air conditioned to prevent adverse impact of dust and noise on the operators. To start with two dozer cabins have been made air conditioned.
- The DG sets working inside the camp have been provided with acoustic enclosures. The noise outside the acoustic enclosure, at the time of running DG sets measures to be within 45 - 65 dB.
- Employees working in the noisy areas have been provided earmuffs to reduce impact of noise.
- Noise mapping study of both core and buffer zone had been conducted.
- Photographs of noise reduction measures & noise monitoring data are attached as **Annexure-6**.

BEAUTIFICATION:

- For landscaping and horticultural development in the colony and workplaces an amount of Rs.51 Lakh was spent including watering arrangement to different gardens and plantation sties.

SANITATION & WATER SUPPLY:

- Towards potable water supply for the camp resident, Rs 34.5 lakhs were spent during 2016-17.
- For sanitation jobs in the residential areas as well as work place and for maintenance of sewer lines and storm water drains, an amount of Rs 50 Lakh was spent.
- Towards operation & maintenance of full-fledged STP an amount of Rs.6.84 lakh was spent during 2015-16.
- Company has spent Rs. 2.69 Lakhs for renovation of colony drains and septic tanks.
- Photographs of Sewage Treatment Plant are attached as **Annexure-7**.

MALARIA ERADICATION:

- Mines took integrated mosquito control management program to eradicate malaria cases in the colony. For this Rs. 7 lakh was spent in FY 16-17.
- TSRDS has done several mobile treatment programs in different villages regarding diseases and their remedial measures with full checkup.
- Mosquito net have been procured by Tata steel for the villagers.
- Regular medicine distribution and anti-mosquito spray was being spread inside the colony area.

RESOURCE CONSERVATION:

- The establishment of Chrome ore beneficiation plant has been able to utilize low grade ore having no market to produce beneficiated ore of the desired market value. This has been the best example of our dedication towards the conservation of natural resources, which would otherwise have been wasted. The water from slime dam was also been re-circulated to COB plant for reuse.
- Tailing dewatering plant has been established in the Chrome Ore Beneficiation (COB) plant premises. Higher and instant recovery of clear water is now possible using filter press process. With this effort, we had achieved reduction in water consumption in the COB plant and eliminated loss of water from the tailing pond.
- To measure quantities of water used for various purposes like processing & cooling in COBP, sprinkling on mine haul rods and domestic/ human consumption, water meters are installed at the inlet points of each connections.
- In COB plant translucent sheets have been fixed on the roof for the purpose of reducing wastage of electricity and to reduce water consumption water recycling sump pump with automation was in operation.
- Documents have been made as per the provisions of ISO-14001: 2014 and targets have been put off reduce generation of solid waste/ overburden to prevent land degradation due to dumping.
- Composting of garden waste is done at major locations.
- Different measures have been taken to prevent oil leakage and spillage resulting reduction in 35% oil consumption by equipment and one environmental management programme is going on now for further conservation.
- Diesel pumps used for pumping water from Damsala River to drinking water treatment plant have been replaced with electric pumps resulting prevention of waste oil generation, leakage of lubricant and diesel, reduction of noise and air pollution.
- Installation of Fuel indicator, Magnetizer and HSD additives reduces fuel consumption in mining machinery compared to the base year.
- Vehicular exhaust monitoring for all diesel and petrol driven vehicles is done once in six months as per the provisions of EP Act, 1986.. It has also helped to optimize the HSD and petrol consumption by vehicles.
- Achieved reduction of oil leakage by 95% and grease by 10% in VS ball mill of COB plant over the years.
- COBP uses about 85% of re-circulated water.
- One pump with hydro cyclone and level sensors has been installed in COBP for arresting the washout beneficiated chrome ore concentrate to ensure mineral conservation.
- Flocculent dosing was changed from pump dosing to gravity dosing, which reduced 8000 running hour of 2 KW motor per year.
- With the expenditure of Rs. 1.2 Lakhs company has modified the tailing management system which results as reduction of 8000 hours of 75 KW motor per year.
- With the expenditure of Rs. 1.5 Lakh we installed a single pump to remove slurry during COB plant maintenance, which results reduction of 4 hours of 1850 KW machineries per year.
- We have installed sun reflectors in Chrome Ore Beneficiation Plant with the expenditure of Rs. 5 Lakhs, which results as 937 KWH energy per light per year.
- We have installed Turbo Ventilators in Chrome Ore Beneficiation Plant with the expenditure of Rs. 2.50 Lakhs, which results as 1753 KWH energy per year per turbo ventilator.
- Photographs of sun reflectors & turbo ventilator are attached as **Annexure-8**.

HEALTH MONITORING:

All the employees do undergo periodical medical examination (PME) in hospital in every five years. However, as per the recent notification, PME of all the employees will have to be carried out once in three years for the employees who had attended the age of 45 years or more. As of now, no occupational disease had been reported in our Mine. Accordingly PME of all the departmental and contractor employees are undergone for IME and PME as per the above system. To improve the occupational health and removing the safety hazards at industrial work place, Wellness@Workplace program is also undertaken by the company.

The medical facilities are also extended to the local community. Health initiatives in the nearby villages are taken care by our TSRDS unit. Company had conducted series of “health camps”, eye screening camps, blood donation camp, TB awareness camp, cataract screening camp and pulse polio camp etc.

The hospital is equipped with all the modern medical equipment like, digital X’ Ray system, critical care equipment for the ICU, one critical care ambulance etc. which has enhanced the medical emergency care facilities to a significant level and served the purpose of the employees as well as the near-by community.

ENVIRONMENT AWARENESS:

To make the camp residents and local people aware on the environment, the mine celebrated World Environment Day on 5th June’ 2016. Padayatra and mass plantation in villages, was organized. To remember the occasion video show and meetings were organized in the camp and village. Also poster and slogan competition among school children were organized and 40 Nos. of prizes were distributed.

“National Pollution Prevention Day” was observed on 2nd December’2016 with wide participation from the employees family members and the local community. As a part of our environment awareness initiative, we had organised a program called JAIBA KALA VIVIDHATA – bio diversity expressed through art and paint on 23rd and 24th January 2017 at Sukinda. A painting competition was organized on the following themes - Mythological Animals, Extinct Animals & Contemporary Animals which was open for all.

World Forestry Day was celebrated on 21st March’2016 with the theme of “Forests and Energy”. Plantation was done within the camp area to commemorate the event.

Green Therapy – a workshop on herbal tribal medicine was organized in June 2016. Around 150 villagers and vedyas participated in it and enriched their knowledge about the traditional herbal medicines.

Similarly the “Prajatiya Khadyotsab Festival” was also organized to create awareness on different food habits of the indigenous people from the natural sources and preservation of the traditional varieties of pulses like rice in presence of experts from research organizations of national repute to create awareness among the community.

Mines Environment and Mineral Conservation week was observed by participation of most of the mines of Bhubaneswar region, under the aegis of Indian Bureau of Mines, Govt. of India. Our mine bagged total 5 number of prizes including the coveted “Par excellence” award for overall best

performance among all participating mines. Apart from it we also won trophies in segments such as Systematic and scientific development of mines, waste dump management and afforestation.. The mine also hosted the environment awareness programme amongst school children, organized by SGAT.

Besides the above, from time to time knowledge sharing sessions on environment, biodiversity and climate change are also organized by top industry leaders and domain experts to spread awareness among all stakeholders.

Drive has also been taken to combat climate change. Carbon footprints of all the units & employees had been mapped and suitable action plan had been initiated to reduce the CO₂ emission. Energy audit had also been conducted by ERDA and various actions had also been taken up to reduce the energy consumption level. In order to promote awareness among the employees and community, hoarding boards depicting environment related issues had been put at key locations.

Biodiversity conservation program was started with the help of IUCN. The objective of this initiative was to adopt a comprehensive Biodiversity Conservation & Management Policy for Sukinda Chromite Mine to enhance the knowledge on biodiversity conservation among all the stakeholders and develop collaborative activities for its implementation. The Comprehensive Biodiversity Plan had been prepared and is under implementation.

Campaign for safe segregation and disposal of household waste was organized among camp ladies and environmental awareness was developed. Photos of different programmes conducted are attached in **Annexure 12**

PERIPHERAL DEVELOPMENT:

The Tata Steel Rural Development Society, an independent body of Tata Steel is engaged in peripheral development activities in the nearby villages around the mine. During 2016-17 a total amount of Rs.464.79 Lakh were spent on various plantation programmes, civil projects, agricultural extensions, medical facilities, and sports, cultural and other developmental activities taken up in these villages. The above expenditure does not include statutory payments, the cost of in-built pollution control facilities in the Chrome ore beneficiation plant, and other equipment like wet drilling etc., the wages, medical facilities and other allowance/ facilities given to the concerned employees.

The above abatement measures have resulted in improvement of air and water quality, reduction in noise levels, stabilization of dump slopes, conservation of natural resources, prevention of land contamination, proper management of hazardous wastes, greenery and aesthetics in the mine as well as residential areas.

PART-H

ADDITIONAL MEASURES/ INVESTMENT PROPOSAL FOR ENVIRONMENTAL PROTECTION INCLUDING ABATEMENT OF POLLUTION, PREVENTION OF POLLUTION

The following budgetary provisions have been made for 2016-17

SI No.	Item	Plan (Lakh)	Actual (Lakh)
1	Afforestation	84.19	75.5
2	Dust suppression	180	184.5
3	Treatment of mine discharge & recycling	55.00	65.00
4	Environment & weather , exhaust monitoring	49.63	49.63
5	Horticulture development	54.97	51
6	Drinking water supply	35.00	34.50
7	STP Operation & Maintenance	6.84	6.84
8	Sanitation	51.00	50.00
9	Herbal Treatment	5.00	5.00
9	Malaria Eradication	7.00	7.00
10	Garland drain & storm water drain	2.50	2.69
11	Family planning	1.00	00
12	Slime dam management	10.00	10.50
13	Environment awareness (EMS)	10.00	13.00
14	Community development through TSRDS	455.28	464.79
15	Hazardous waste management	21.5	6.00
16	Bio medical waste	4.00	3.00
	Total	1032.91	1028.95

PART-I

ANY OTHER PARTICULARS FOR IMPROVING THE QUALITY OF THE ENVIRONMENT

- Company is committed for prevention of pollution, continual improvement of environmental performance, committed to comply with relevant environmental and other legislation, regulation & other requirements and continual effort are made to minimize the adverse environmental impacts of our activities, products or services.
- The mine has already been certified to ISO-14001 (Environment Management System), ISO-9001 (Quality Management System), OHSAS-18001 (Occupational Health and Safety Assessment Series), (SA-8000) Social Accountability system and maintaining the systems satisfactorily.
- Rain water harvesting study had been conducted and one roof top harvesting structure had been constructed inside General Office premises which will be also extended to other buildings.
- Company has installed a new ETP in modules of 1500 KL/ hr each with total capacity 4500 KL/Hr with an expenditure of around 330 Lakh rupees to cater the future requirement of mine discharge water and surface runoff. The new sophisticated ETP has automated dosing system, clarifocculator, and flash mixture, dry sludge collection system, multi-bed filtration system etc.

to ensure more effective treatment of surface runoff and mine discharge water before it is let out of the lease boundary. All phases of the above mentioned ETP are now in operation.

- Herbal Treatment Plant has been installed in our COB Plant for removal of hexavalent chromium from chrome concentrate in eco-friendly way by using naturally occurring plant product (Organic reductant). It does not create/contribute additional pollution like conventional method. Hence the chrome concentrates treated using the developed technology is green (eco-friendly) product. Company spent Rs. 1.5 Lakhs on material cost and operation for the treatment in 2014-15. Further, the conventional technology requires huge (~200lit/ton) amount of water for treatment whereas the Organic reductant method requires negligible amount of additional water due to its online nature in continuous production process. Therefore, the developed process technology saves huge quantity of water. Company was awarded DISR National Award for the Herbal Treatment Plant installed at our COB Plant for treatment of Hexavalent Chromium.
- The Management regularly conducts the awareness and development programme on environmental protection for school children and camp residents.
- Company has also started initiatives to combat Climate Change. Energy Audit has already been conducted and time bound action plan has been made to reduce energy consumption. Further, "Green School Project- a campaign in collaboration with The Energy and Resources Institute (TERI) has been launched with the objective of sensitizing school students of mid class level about various environmental domains covering Biodiversity, Waste, Water and Climate Change."
- The Mine management celebrates and participates in 'Mine Environment & Mineral Conservation Week' every year under the aegis of Indian Bureau of Mines, Bhubaneswar Region and company has spent Rs. 4.5 lakh for the same.
- Company is operating online weather monitoring system at mine office.
- Company is updating real time data board at Main gate. Further company has installed one Multi Line Electronic Display Board to display the Environmental parameters. Photograph of the same is attached as **Annexure-9**.
- Company has bagged 5 awards in 19th MEMC Final Day, including par excellence award among all participating mines, Gem Granite Environment award by FIMI, Greentech Environment GOLD Award for Environment Management. National Energy Conservation award in 2014 and 15.
- Environmental Monitoring data of air, water & Noise are attached as **Annexure-10**.
- Meteorological Data for the year 2016-17:

Maximum temperature: - 42.6° C (17th May'16)

Minimum temperature: - 8.5° C (20th Dec'16)

Cumulative rainfall: - 1420.29 mm.


Manager,
Sukinda Chromite Mine,
Tata Steel Limited.

Copy to: Regional Officer, OSPCB, Kalinganagar.
Central Pollution Control Board, Kolkata
MoEF & CC, Eastern Regional office through Email.

Annexure - 1
Dust Control Measures



Stationary Water Sprinkling System



Photograph showing concrete roads



Photograph showing Chrome Concentrates covered with tarpaulins

Photograph showing covering of trucks by tarpaulin



COVERING OF TRUCK BY TARPULIN

Photograph showing Green Barrier



In front of Mine Office



Between Workshop and Colony



Along Northern Boundary of Lease

**Annexure II
Dump Management**



Concrete Garland drain



Settling pit and Toe wall



Coir Matting on Dump



Inwardly Slope Dump Top

Plantation on dump area



Rocky material on running dump slope



Toe wall along the dump



Drainage System (Concrete Channel)



Annexure 3 Effluent Treatment Plant



Herbal Treatment Plant



**Annexure IV
Oil Separation Plant**



Annexure V
Afforestation



Coir matting over dump



Plantation over dump



Annexure - VI
Noise Control Measure



Acoustic enclosure for DG set



Air tight air conditioned cabin in HEMM



**Annexure VII
Sewage Treatment Plant**



**Annexure VIII
Energy Conservation Measures**



Pipe Lights



Turbo Ventilators

Annexure - IX
Multiline electronic display board at the Mines gate



Annexure 10
Ambient Air Quality Report (Annual Average) April' 16 to March 17

1. COB PLANT

Monthly Average	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a)Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
Apr-16	59.56	33.42	4.97	11.76	0.21	6.74	BDL	BDL	0.81	BDL	BDL	BDL
May-16	61.22	34.64	5.00	12.43	0.22	7.04	BDL	BDL	0.81	BDL	BDL	BDL
Jun-16	55.22	31.52	4.56	11.8	0.2	6.3	BDL	BDL	0.79	BDL	BDL	BDL
Jul-16	50.38	28.74	4.22	11.47	0.16	5.93	BDL	BDL	0.74	BDL	BDL	BDL
Aug-16	46.22	26.77	4.13	10.97	0.14	5.89	BDL	BDL	0.67	BDL	BDL	BDL
Sep-16	46.56	26.47	4.18	10.86	0.15	5.66	BDL	BDL	0.70	BDL	BDL	BDL
Oct-16	56.63	32.45	4.58	12.05	0.2	5.39	BDL	BDL	0.79	BDL	BDL	BDL
Nov-16	59.78	33.60	4.57	12.30	0.20	6.63	BDL	BDL	0.81	BDL	BDL	BDL
Dec-16	60.67	34.4	4.98	12.56	0.24	7.1	BDL	BDL	0.84	BDL	BDL	BDL
Jan-17	53.33	30.54	4.39	11.59	0.2	6.09	BDL	BDL	0.74	BDL	BDL	BDL
Feb-17	56.25	31.81	4.48	11.95	0.19	6.25	BDL	BDL	0.77	BDL	BDL	BDL
Mar-17	57.78	32.87	4.57	12.07	0.21	6.5	BDL	BDL	0.78	BDL	BDL	BDL
ANNUAL AVERAGE	55.30	31.44	4.55	11.82	0.19	6.29	BDL	BDL	0.77	BDL	BDL	BDL
BDL VALUES	5	2	4	9	0.1	5	0.00005	20	0.1	0.1	0.05	0.05

2. STACK YARD

Monthly Average	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a)Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
Apr-16	64.00	36.41	5.38	12.18	0.25	7.16	BDL	BDL	0.89	BDL	BDL	BDL
May-16	67.00	37.77	5.36	13.02	0.27	7.48	BDL	BDL	0.90	BDL	BDL	BDL
Jun-16	60.00	34.18	4.83	12.32	0.24	6.78	BDL	BDL	0.86	BDL	BDL	BDL
Jul-16	55.00	31.73	4.42	11.90	0.19	6.34	BDL	BDL	0.80	BDL	BDL	BDL
Aug-16	50.00	29.30	4.29	11.48	0.17	6.33	BDL	BDL	0.73	BDL	BDL	BDL
Sep-16	52.00	30.19	4.40	11.42	0.17	6.02	BDL	BDL	0.75	BDL	BDL	BDL
Oct-16	62.00	35.13	4.98	12.54	0.24	5.63	BDL	BDL	0.85	BDL	BDL	BDL
Nov-16	64.00	36.32	4.99	12.74	0.24	7.19	BDL	BDL	0.88	BDL	BDL	BDL
Dec-16	68.00	38.58	5.47	13.14	0.28	7.57	BDL	BDL	0.93	BDL	BDL	BDL
Jan-17	58.00	33.06	4.69	12.14	0.23	6.58	BDL	BDL	0.81	BDL	BDL	BDL
Feb-17	62.00	35.15	4.96	12.46	0.24	6.9	BDL	BDL	0.85	BDL	BDL	BDL
Mar-17	63.00	35.81	5.02	12.63	0.25	7.02	BDL	BDL	0.85	BDL	BDL	BDL
ANNUAL AVERAGE	58.90	34.47	4.90	12.33	0.23	6.75	BDL	BDL	0.84	BDL	BDL	BDL

3. LABORATORY TOP

Monthly Average	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a)Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
Apr-16	54.33	31.24	4.63	11.23	0.18	6.32	BDL	BDL	0.75	BDL	BDL	BDL
May-16	56.00	31.93	4.66	11.77	0.18	6.50	BDL	BDL	0.73	BDL	BDL	BDL
Jun-16	51.00	29.54	4.32	11.38	0.17	5.84	BDL	BDL	0.74	BDL	BDL	BDL
Jul-16	46.22	26.69	4.09	11.02	0.14	5.53	BDL	BDL	0.66	BDL	BDL	BDL
Aug-16	41.89	24.81	4.13	10.57	0.13	5.63	BDL	BDL	0.62	BDL	BDL	BDL
Sep-16	42.67	25.09	4.09	10.49	0.13	5.41	BDL	BDL	0.65	BDL	BDL	BDL
Oct-16	52.13	30.13	4.35	11.51	0.17	5.26	BDL	BDL	0.71	BDL	BDL	BDL
Nov-16	55.56	31.58	4.27	11.83	0.17	6.18	BDL	BDL	0.73	BDL	BDL	BDL
Dec-16	56.11	31.82	4.54	12.01	0.21	6.61	BDL	BDL	0.76	BDL	BDL	BDL
Jan-17	48.44	28.17	4.21	11.07	0.17	5.67	BDL	BDL	0.68	BDL	BDL	BDL
Feb-17	51.63	29.75	4.21	11.45	0.16	5.84	BDL	BDL	0.69	BDL	BDL	BDL
Mar-17	52.44	29.57	4.28	11.58	0.18	6.07	BDL	BDL	0.7	BDL	BDL	BDL
ANNUAL AVERAGE	50.70	29.19	4.32	11.33	0.17	5.91	BDL	BDL	0.70	BDL	BDL	BDL

4.HOSPITALTOP

Monthly Average	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a)Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
Apr-16	44.89	26.22	4.19	10.43	0.14	5.36	BDL	BDL	0.62	BDL	BDL	BDL
May-16	47.00	27.29	4.16	10.83	0.14	5.58	BDL	BDL	0.63	BDL	BDL	BDL
Jun-16	42.00	24.74	4.08	10.51	0.14	5.31	BDL	BDL	0.63	BDL	BDL	BDL
Jul-16	37.22	21.76	4.00	10.1	0.11	5.1	BDL	BDL	0.55	BDL	BDL	BDL
Aug-16	34.78	20.44	4.02	9.88	0.11	5.19	BDL	BDL	0.52	BDL	BDL	BDL
Sep-16	35.56	21.10	BDL	9.81	0.11	5.14	BDL	BDL	0.55	BDL	BDL	BDL
Oct-16	43.5	25.46	4.04	10.6	0.13	5.05	BDL	BDL	0.62	BDL	BDL	BDL
Nov-16	46.78	27.34	BDL	10.83	0.13	5.28	BDL	BDL	0.6	BDL	BDL	BDL
Dec-16	46.89	27.03	4.11	11.11	0.15	5.59	BDL	BDL	0.64	BDL	BDL	BDL
Jan-17	41	24.3	4.02	10.08	0.13	5.14	BDL	BDL	0.57	BDL	BDL	BDL
Feb-17	42.5	26.35	4.04	10.4	0.13	5.13	BDL	BDL	0.54	BDL	BDL	BDL
Mar-17	42.33	24.83	4.02	10.71	0.14	5.32	BDL	BDL	0.58	BDL	BDL	BDL
ANNUAL AVERAGE	42.04	24.74	4.07	10.44	0.13	5.27	BDL	BDL	0.59	BDL	BDL	BDL

5. Mining Complex

Monthly Average	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a)Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
Apr-16	49.44	28.73	4.4	10.93	0.16	5.82	BDL	BDL	0.68	BDL	BDL	BDL
May-16	51.67	29.67	4.38	11.31	0.16	6.00	BDL	BDL	0.65	BDL	BDL	BDL
Jun-16	46.78	27.21	4.17	10.93	0.15	5.51	BDL	BDL	0.67	BDL	BDL	BDL
Jul-16	41.44	24.8	4.00	10.61	0.13	5.27	BDL	BDL	0.6	BDL	BDL	BDL
Aug-16	38.11	22.33	4.07	10.22	0.12	5.43	BDL	BDL	0.56	BDL	BDL	BDL
Sep-16	39.22	23.00	4.04	10.13	0.12	5.24	BDL	BDL	0.60	BDL	BDL	BDL
Oct-16	47.75	27.61	4.19	11.06	0.15	5.13	BDL	BDL	0.66	BDL	BDL	BDL
Nov-16	51.22	29.43	4.06	11.36	0.15	5.70	BDL	BDL	0.65	BDL	BDL	BDL
Dec-16	51.33	29.62	4.23	11.59	0.18	6.00	BDL	BDL	0.7	BDL	BDL	BDL
Jan-17	44.89	25.98	4.12	10.58	0.15	5.34	BDL	BDL	0.62	BDL	BDL	BDL
Feb-17	47.63	27.81	4.1	10.94	0.14	5.40	BDL	BDL	0.6	BDL	BDL	BDL
Mar-17	48.56	27.96	4.09	11.14	0.16	5.66	BDL	BDL	0.64	BDL	BDL	BDL
ANNUAL AVERAGE	46.50	27.01	4.15	10.90	0.15	5.54	BDL	BDL	0.64	BDL	BDL	BDL

6. Near Tailing Pond

Monthly Average	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a)Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
Apr-16	40.33	23.71	4.07	9.89	0.12	4.98	BDL	BDL	0.56	BDL	BDL	BDL
May-16	43.11	25.40	4.02	10.32	0.13	5.23	BDL	BDL	0.58	BDL	BDL	BDL
Jun-16	37.44	22.28	BDL	10.03	0.12	5.14	BDL	BDL	0.57	BDL	BDL	BDL
Jul-16	32.67	19.31	BDL	9.66	BDL	BDL	BDL	BDL	0.49	BDL	BDL	BDL
Aug-16	31.78	18.97	BDL	9.51	BDL	5.19	BDL	BDL	0.47	BDL	BDL	BDL
Sep-16	32.11	19.08	BDL	9.49	0.11	5.14	BDL	BDL	0.50	BDL	BDL	BDL
Oct-16	38.25	22.16	BDL	10.06	0.12	BDL	BDL	BDL	0.57	BDL	BDL	BDL
Nov-16	41.33	24.42	BDL	10.33	0.12	5.28	BDL	BDL	0.54	BDL	BDL	BDL
Dec-16	42.11	24.2	4.04	10.52	0.13	5.32	BDL	BDL	0.57	BDL	BDL	BDL
Jan-17	36.67	21.63	BDL	9.66	0.12	5.04	BDL	BDL	0.51	BDL	BDL	BDL
Feb-17	38	22.31	BDL	9.99	0.11	5.04	BDL	BDL	0.48	BDL	BDL	BDL
Mar-17	38.44	22.94	BDL	10.24	0.13	5.14	BDL	BDL	0.53	BDL	BDL	BDL
ANNUAL AVERAGE	37.69	22.20	4.04	9.98	0.12	5.15	BDL	BDL	0.53	BDL	BDL	BDL

Ambient Air Quality Report in buffer zone April' 16 to March 17

Sl. No	Location	Month of Monitoring	PM10 µg/m ³	PM2.5 µg/m ³	SO ₂ µg/m ³	NO _x µg/m ³	CO mg/m ³	O ₃ µg/m ³	Pb µg/m ³	NH ₃ µg/m ³	Benzene µg/m ³	Benzo(a) Pyrene ng/m ³	Arsenic ng/m ³	Nickel ng/m ³
1	Birasal	June'16	45	27.5	BDL	10.8	0.14	5.3	BDL	BDL	0.68	BDL	BDL	BDL
		Sep'16	35	20.4	BDL	10.1	0.12	BDL	BDL	BDL	0.59	BDL	BDL	BDL
		Dec'16	52	29.5	BDL	10.9	0.16	5.8	BDL	BDL	0.74	BDL	BDL	BDL
		Mar'17	49	28.6	BDL	11.3	0.14	6	BDL	BDL	0.71	BDL	BDL	BDL
2	Kanehipal	June'16	39	23.4	BDL	10.2	0.12	5.3	BDL	BDL	0.68	BDL	BDL	BDL
		Sep'16	31	17.6	BDL	9.8	0.11	BDL	BDL	BDL	0.53	BDL	BDL	BDL
		Dec'16	46	26.9	BDL	10.3	0.14	5.3	BDL	BDL	0.69	BDL	BDL	BDL
		Mar'17	46	26.5	BDL	10.1	0.12	5.4	BDL	BDL	0.66	BDL	BDL	BDL
3	Kalarangiatta	June'16	55	30.6	BDL	11.6	0.18	BDL	BDL	BDL	0.61	BDL	BDL	BDL
		Sep'16	49	28.1	BDL	11.2	0.16	5.7	BDL	BDL	0.66	BDL	BDL	BDL
		Dec'16	63	35.4	4.8	12.1	0.23	6.9	BDL	BDL	0.85	BDL	BDL	BDL
		Mar'17	57	32.9	4.6	11.8	0.21	6.2	BDL	BDL	0.78	BDL	BDL	BDL
4	Kaliapani	June'16	41	25.8	BDL	10.4	0.13	6.1	BDL	BDL	0.74	BDL	BDL	BDL
		Sep'16	36	21.3	BDL	9.9	0.12	BDL	BDL	BDL	0.58	BDL	BDL	BDL
		Dec'16	54	30.2	BDL	11.2	0.18	6.2	BDL	BDL	0.77	BDL	BDL	BDL
		Mar'17	41	26.4	BDL	9.6	0.1	5	BDL	BDL	0.64	BDL	BDL	BDL
5	Kakudia	June'16	33	18.2	BDL	9.2	BDL	BDL	BDL	BDL	0.63	BDL	BDL	BDL
		Sep'16	29	17.5	BDL	BDL	BDL	BDL	BDL	BDL	0.5	BDL	BDL	BDL
		Dec'16	42	25.7	BDL	9.9	0.13	BDL	BDL	BDL	0.64	BDL	BDL	BDL
		Mar'17	36	21.8	BDL	9.4	0.1	BDL	BDL	BDL	0.59	BDL	BDL	BDL
6	Sendashara	June'16	28	16.1	BDL	BDL	BDL	BDL	BDL	BDL	0.56	BDL	BDL	BDL
		Sep'16	31	18.1	BDL	BDL	BDL	BDL	BDL	BDL	0.44	BDL	BDL	BDL
		Dec'16	48	27.5	BDL	10.5	0.15	5.4	BDL	BDL	0.7	BDL	BDL	BDL
		Mar'17	31	16.9	BDL	9.1	BDL	BDL	BDL	BDL	0.51	BDL	BDL	BDL
7	Laxmidharpr	June'16	42	25.7	BDL	10.6	0.13	BDL	BDL	BDL	0.51	BDL	BDL	BDL
		Sep'16	36	21.7	BDL	9.9	0.11	BDL	BDL	BDL	0.59	BDL	BDL	BDL
		Dec'16	53	29.6	BDL	10.8	0.17	6.1	BDL	BDL	0.76	BDL	BDL	BDL
		Mar'17	45	26.4	BDL	9.8	0.12	5.4	BDL	BDL	0.68	BDL	BDL	BDL
8	Sukarangi	June'16	49	28.4	BDL	11.3	0.15	BDL	BDL	BDL	0.67	BDL	BDL	BDL
		Sep'16	43	25.0	BDL	10.7	0.12	5.2	BDL	BDL	0.53	BDL	BDL	BDL
		Dec'16	59	33.1	4.4	11.3	0.2	6.6	BDL	BDL	0.82	BDL	BDL	BDL

		Mar'17	54	30.7	4.3	11.7	0.16	6.2	BDL	BDL	0.76	BDL	BDL	BDL
9	Muruabil	June'16	30	16.2	BDL	BDL	BDL	BDL	BDL	BDL	0.54	BDL	BDL	BDL
		Sep'16	27	15.8	BDL	BDL	BDL	BDL	BDL	BDL	0.48	BDL	BDL	BDL
		Dec'16	40	23.7	BDL	9.6	0.12	BDL	BDL	BDL	0.61	BDL	BDL	BDL
		Mar'17	33	18.5	BDL	BDL	BDL	BDL	BDL	BDL	0.55	BDL	BDL	BDL
10	Kharkhari	June'16	42	24.9	BDL	10.5	0.13	BDL	BDL	BDL	0.68	BDL	BDL	BDL
		Sep'16	38	22.2	BDL	10.1	0.11	BDL	BDL	BDL	0.62	BDL	BDL	BDL
		Dec'16	52	29	BDL	9.9	0.15	5.8	BDL	BDL	0.74	BDL	BDL	BDL
		Mar'17	40	24.8	BDL	9.6	0.11	BDL	BDL	BDL	0.61	BDL	BDL	BDL

Annual Average in Buffer Zone

Sl.No	Location		PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	CO mg/m3	O3 µg/m3	Pb µg/m3	NH3 µg/m3	Benzene µg/m3	Benzo(a)Pyrene ng/m3	Arsenic ng/m3	Nickel ng/m3
1	Birasa Birasal	AVERAGE	50.50	29.05	BDL	11.10	0.15	BDL	BDL	BDL	0.73	BDL	BDL	BDL
2	Kanehipal	AVERAGE	46.00	26.70	BDL	10.20	0.13	BDL	BDL	BDL	0.68	BDL	BDL	BDL
3	Kalarangiatta	AVERAGE	60.00	34.15	4.70	11.95	0.22	BDL	BDL	BDL	0.82	BDL	BDL	BDL
4	Kaliapani	AVERAGE	47.50	28.30	BDL	10.40	0.14	BDL	BDL	BDL	0.71	BDL	BDL	BDL
5	Kakudia	AVERAGE	39.00	23.75	BDL	9.65	0.12	BDL	BDL	BDL	0.62	BDL	BDL	BDL
6	Sendashara	AVERAGE	39.50	22.20	BDL	9.80	0.15	BDL	BDL	BDL	0.61	BDL	BDL	BDL
7	Laxmidharpur	AVERAGE	49.00	28.00	BDL	10.30	0.15	BDL	BDL	BDL	0.72	BDL	BDL	BDL
8	Sukarangi	AVERAGE	56.50	31.90	4.35	11.50	0.18	BDL	BDL	BDL	0.79	BDL	BDL	BDL
9	Muruabil	AVERAGE	36.50	21.10	BDL	9.60	0.12	BDL	BDL	BDL	0.58	BDL	BDL	BDL
10	Kharkhari	AVERAGE	46.00	26.90	BDL	9.75	0.13	BDL	BDL	BDL	0.68	BDL	BDL	BDL

Water Quality Parameters of ETP - Inlet Sukinda Chromite Mine TATA STEEL LTD. (2016-2017)

Sl. No	Parameter	Unit	Standards (In land Surface)	Feb'16	Mar'16	Apr'16	May'16	June'16	July'16	Aug'16	Sep'16	Oct'16	Nov'16	Dec'16	Jan'17	Feb'17	Mar'17	AVERAGE
				Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet
1	Colour & Odour	Hazan/	5.0 / U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	2 & U/O	3 & U/O	4 & U/O	3 & U/O	2 & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	3.5 & U/O
2	Suspended Solids	mg/ltr	100	47	53	48	56	49	63	140	127	96	44	69	46	44	49	69.25
3	Particular Size of Suspended Solids	μ(micron)	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850
4	PH	--	5.5-9.0	6.7	6.8	6.9	6.8	6.6	6.7	6.21	6.8	6.7	6.8	7.2	7.2	7.4	6.7	6.83
5	Temperature	^o c.	Shall not exceed 5°C	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25.00
6	Oil & Grease	mg/ltr	10	0.7	0.9	0.8	0.9	1.1	0.94	1.1	1	1.1	0.8	0.08	0.09	1.1	0.86	ND
7	Total Residual Chlorine	mg/ltr	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	Amm. Nitrogen as N	mg/ltr	50	0.39	0.44	0.39	0.46	0.52	0.64	0.72	0.66	0.53	0.36	0.48	0.58	0.44	0.39	0.51
9	Total Kjeldal Nitrogen as NH ₃	mg/ltr	100	1.27	1.52	1.46	1.63	1.78	1.97	2.12	1.92	1.77	1.24	1.36	1.49	1.31	1.48	1.63
10	Free Ammonia as NH ₃	mg/ltr	5	0.002	0.003	0.003	0.004	0.005	0.004	0.005	0.004	0.004	0.002	0.004	0.005	0.003	0.004	ND
11	BOD (3) days at 27 ^o C	mg/ltr	30	2.65	1.96	1.88	1.96	2.1	2.2	2.34	2.26	4.63	2.62	2.78	2.86	2.86	1.88	2.53
12	COD	mg/ltr	250	6.7	5.85	4.9	5.74	6.42	6.57	7.28	7.12	12.8	6.6	7.4	7.8	7.41	5.78	7.15
13	Arsenic as As	mg/ltr	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14	Mercury as Hg	mg/ltr	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15	Lead as Pb	mg/ltr	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16	Cadmium as Cd	mg/ltr	2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	Hexa Chromium as Cr ⁺⁶	mg/ltr	0.1	0.23	0.26	0.2	0.18	0.2	0.17	0.13	0.19	0.15	0.22	0.14	0.075	0.07	0.24	0.164
18	Total Chromium as Cr	mg/ltr	2	0.28	0.38	0.33	0.29	0.37	0.31	0.21	0.23	0.28	0.26	0.17	0.16	0.34	0.36	0.28
19	Copper as Cu	mg/ltr	3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20	Zinc as Zn	mg/ltr	5	0.34	0.43	0.38	0.33	0.44	0.53	0.43	0.56	0.44	0.32	0.44	0.37	0.41	0.38	0.42
21	Selenium as Se	mg/ltr	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	Nickel as Ni	mg/ltr	3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	Cyanide as CN	mg/ltr	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24	Fluoride as F	mg/ltr	2	0.06	0.08	0.06	0.07	0.09	0.12	0.2	0.19	0.15	0.05	0.07	0.098	0.08	0.07	0.104
25	Diss. Phosphate as P	mg/ltr	5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26	Sulphide as S	mg/ltr	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	BDL
27	Phenolic Compounds as	mg/ltr	1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	Bio-assay Test	--	90% survival of fish	97%	97%	97%	97%	96%	97%	97%	97%	97%	97%	97%	97%	97%	97%	97.00%
29	Manganese as Mn	mg/ltr	2	0.029	0.025	0.021	0.028	0.033	0.042	0.036	0.031	0.028	0.027	0.036	0.025	0.033	0.023	0.03
30	Iron as Fe	mg/ltr	3	0.38	0.41	0.39	1.1	0.6	0.69	1.4	1.3	0.91	0.36	1.13	0.65	0.68	0.38	0.80
31	Vanadium as V	mg/ltr	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
32	Nitrate Nitrogen	mg/ltr	10	0.26	0.33	0.26	0.33	0.33	0.41	0.53	0.48	0.39	0.24	0.3	0.24	0.31	0.31	0.34
33	Pesticides (as Benzene hexa	μg/l	10	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

NB . C.L. Colourless, O.L – Odourless, BDL- Below Detectable Limit. ND- Not Detectable.

Water Quality Parameters of ETP -Outlet Sukinda Chromite Mine TATA STEEL LTD. (2016-2017)

Sl. No	Parameter	Unit	Standards (In land Surface)	Feb'16	Mar-16	Apr'16	May'16	June'16	July'16	Aug'16	Sep'16	Oct'16	Nov'16	Dec'16	Jan'17	Feb'17	Mar'17	AVERAGE
				Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet
1	Colour & Odour	Hazan/	5.0 / 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	CL & U/O	CL & U/O	2 & U/O
2	Suspended Solids	mg/ltr	100	35	44	39	29	34	41	38	31	28	34	25	28	31	41	33.25
3	Particular Size of Suspended	µ(mic	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850
4	PH	--	5.5-9.0	7.1	7.2	7.1	7.2	7.1	7.2	7.65	7.3	7.2	7.2	7.4	7.3	7.2	7.1	7.25
5	Temperature	°c.	shall not exceed 30°C	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25.00
6	Oil & Grease	mg/ltr	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7	Total Residual Chlorine	mg/ltr	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	BDL
8	Amm. Nitrogen as N	mg/ltr	50	0.32	0.36	0.31	0.39	0.47	0.55	0.6	0.58	0.49	0.31	0.53	0.61	0.36	0.35	0.46
9	Total Kjeldal Nitrogen as NH ₃	mg/ltr	100	1.19	1.39	1.4	1.51	1.66	1.74	1.6	1.52	1.64	1.18	1.44	1.53	1.22	1.36	1.48
10	Free Ammonia as NH ₃	mg/ltr	5.0	0.002	0.003	0.002	0.003	0.004	0.004	0.004	0.004	0.003	0.002	0.003	0.004	0.003	0.003	ND
11	BOD (3) days at 27 ^o c	mg/ltr	30	1.47	1.58	1.46	1.54	1.48	1.63	1.86	1.63	1.39	1.44	1.52	1.77	1.25	1.52	1.54
12	COD	mg/ltr	250	5.9	4.73	4.6	4.2	5.1	6.03	4.29	4.16	4.1	5.7	6.5	7.1	3.76	4.71	5.02
13	Arsenic as As	mg/ltr	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14	Mercury as Hg	mg/ltr	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15	Lead as Pb	mg/ltr	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16	Cadmium as Cd	mg/ltr	2.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	Hexa Chromium as Cr +6	mg/ltr	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18	Total Chromium as Cr	mg/ltr	2.0	0.31	0.29	0.26	0.23	0.34	0.29	0.17	0.2	0.23	0.3	0.12	0.13	0.29	0.28	0.24
19	Copper as Cu	mg/ltr	3.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20	Zinc as Zn	mg/ltr	5.0	0.29	0.36	0.32	0.28	0.36	0.47	0.35	0.41	0.37	0.27	0.38	0.28	0.33	0.34	0.347
21	Selenium as Se	mg/ltr	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	Nickel as Ni	mg/ltr	3.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	Cyanide as CN	mg/ltr	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24	Fluoride as F	mg/ltr	2.0	0.05	0.06	0.05	0.05	0.06	0.08	0.11	0.14	0.11	0.04	0.05	0.06	0.07	0.06	0.073
25	Diss. Phosphate as P	mg/ltr	5.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26	Sulphide as S	mg/ltr	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	BDL
27	Phenolic Compounds as	mg/ltr	1.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	Bio-assay Test	--	90% survival of fish	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98.00%
29	Manganese as Mn	mg/ltr	2.0	0.022	0.019	0.016	0.02	0.029	0.033	0.028	0.025	0.022	0.021	0.029	0.019	0.025	0.018	0.024
30	Iron as Fe	mg/ltr	3.0	0.31	0.34	0.31	2.68	0.84	0.75	0.39	0.32	0.43	0.3	0.79	0.2	0.29	0.33	0.64
31	Vanadium as V	mg/ltr	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
32	Nitrate Nitrogen	mg/ltr	10	0.22	0.25	0.21	0.27	0.29	0.34	0.41	0.36	0.31	0.2	0.24	0.2	0.26	0.24	0.28
33	Pesticides (as Benzene hexa	µg/l	10	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

NB .C.L. Colourless, O.L – Odourless, BDL- Below Detectable Limit. ND- Not Detectable.

Water Quality Parameters at Oil Separation System -Inlet Sukinda Chromite Mine TATA STEEL LTD. (2016-2017)

Sl. No	Parameter	Unit	Standards	Apr'16	May'16	June'16	July'16	Aug'16	Sep'16	Oct'16	Nov'16	Dec'16	Jan'17	Feb'17	Mar'17	AVERAGE
				Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet	Inlet
1	Colour & Odour	--	5 & U/O	2 & U/O	CL & U/O	CL & U/O	2 & U/O	4 & U/O	3 & U/O	CL & U/O	CL & U/O	CL & U/O	CL & U/O	3 & U/O	3 & U/O	2.5 U/O
2	Suspended Solids	mg/l	100	47	56	72	81	94	88	76	46	58	69	56	48	65.92
3	Particular Size of S.S.	μ(micro	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850
4	pH	--	5.5-9.0	7.6	7.5	7.5	7.6	7.7	7.6	7.5	7.5	7.4	7.3	7.5	7.4	7.51
5	Temperature	⁰ C	Shall not	25	25	25	25	25	25	25	25	25	25	25	25	25.00
6	Oil & Grease	mg/l	10	1	0.94	1.1	1.25	1.36	1.29	1.17	1.2	1.3	1.1	1.1	1	1.15
7	Total Residual Chlorine	mg/l	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	Amm. Nitrogen as N	mg/l	50	0.29	0.36	0.43	0.57	0.63	0.57	0.44	0.24	0.35	0.49	0.26	0.32	0.41
9	Total Kjeldal Nitrogen as NH ₃	mg/l	100	1.18	1.28	1.36	1.46	1.52	1.46	1.28	1.11	1.28	1.4	1.18	1.24	1.31
10	Free Ammonia as NH ₃	mg/l	5	0.003	0.004	0.004	0.005	0.004	0.004	0.004	0.002	0.003	0.004	0.003	0.003	ND
11	BOD(3) days at 27 ⁰ c	mg/l	30	1.1	1.16	1.22	1.34	1.25	1.17	1.18	1	1.24	1.18	1.23	1.3	1.20
12	COD	mg/l	250	3.36	3.48	3.64	3.78	3.65	3.58	3.43	3.19	3.78	3.56	3.65	3.86	3.58
13	Arsenic as As	mg/l	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14	Mercury as Hg	mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15	Lead as Pb	mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16	Cadmium as Cd	mg/l	2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	Hexa Chromium as Cr ⁺⁶	mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18	Total Chromium as Cr	mg/l	2	0.23	0.28	0.35	0.41	0.33	0.29	0.25	0.2	0.18	0.25	0.28	0.23	0.27
19	Copper as Cu	mg/l	3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20	Zinc as Zn	mg/l	5	0.25	0.33	0.46	0.58	0.63	0.58	0.42	0.22	0.3	0.39	0.36	0.26	0.40
21	Selenium as Se	mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	Nickel as Ni	mg/l	3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	Cyanide	mg/l	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24	Fluoride as F	mg/l	2	0.05	0.063	0.075	0.094	0.072	0.066	0.058	0.04	0.07	0.08	0.04	0.05	BDL
25	Diss. Phosphate as P	mg/l	5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26	Sulphide as S	mg/l	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	BDL
27	Phenolic Compounds as C ₆ H ₅ OH	mg/l	1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	ND
28	Bio-assay Test,	%	90% survival	98%	98%	97%	97%	97%	97%	97%	98%	98%	98%	98%	98%	97.08%
29	Manganese as Mn, mg/l	mg/l	2	0.019	0.025	0.033	0.041	0.051	0.046	0.022	0.021	0.033	0.026	0.031	0.033	0.032
30	Iron as Fe, mg/l	mg/l	3	0.29	0.34	0.41	0.53	0.62	0.58	0.37	0.31	0.42	0.38	0.28	0.37	0.41
31	Vanadium as V, mg/l	mg/l	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
32	Nitrate Nitrogen , mg/l	mg/l	10	0.19	0.16	0.22	0.19	0.37	0.29	0.25	0.21	0.31	0.22	0.34	0.26	0.25
33	Pesticides (as Benzene hexa	μg/l	10	Absen	Absen	Absent	Absen	Absen	Absen	Absen	Absen	Absen	Absen	Absen	Absen	Absent

NB : C.L. Colourless, O.L – Odourless, BDL- Below Detectable Limit., ND- Not Detectable.

Water Quality Parameters at Oil Separation System –Outlet Sukinda Chromite Mine TATA STEEL LTD. (2016-2017)

Sl. No	Parameter	Unit	Standards	Apr'16	May'16	June'16	July'16	Aug'16	Sep'16	Oct'16	Nov'16	Dec'16	Jan'17	Feb'17	Mar'17	AVERAGE
				Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet	Outlet
1	Colour & Odour	--	5 & 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	CL & U/O
2	Suspended Solids	mg/l	100	29	34	63	49	38	36	31	22	27	23	29	29	34.17
3	Particular Size of S.S.	μ(micro	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850	<850
4	pH	--	5.5-9.0	7.2	7.1	7.2	7.2	7.3	7.2	7.2	7.1	7.1	7.1	7.2	7.2	7.18
5	Temperature	°C	Shall not	25	25	25	25	25	25	25	25	25	25	25	25	25.00
6	Oil & Grease	mg/l	10	ND	ND	ND	0.47	0.59	0.53	0.41	ND	ND	ND	ND	ND	ND
7	Total Residual Chlorine	mg/l	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8	Amm. Nitrogen as N	mg/l	50	0.24	0.32	0.38	0.48	0.38	0.33	0.32	0.2	0.28	0.42	0.22	0.28	0.32
9	Total Kjeldal Nitrogen as NH ₃	mg/l	100	1.1	1.17	1.29	1.33	1.26	1.31	1.17	1.06	1.19	1.30	1.11	1.19	21.75
10	Free Ammonia as NH ₃	mg/l	5	0.002	0.003	0.004	0.004	0.004	0.005	0.004	0.002	0.003	0.003	0.003	0.002	ND
11	BOD(3) days at 27°C	mg/l	30	1	1.09	1.15	1.2	1.1	1	1.11	1	1.16	1	1.1	1.14	1.09
12	COD	mg/l	250	2.94	3.17	3.42	3.56	3.39	3.26	3.29	2.79	3.49	2.87	3.27	3.42	3.24
13	Arsenic as As	mg/l	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14	Mercury as Hg	mg/l	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
15	Lead as Pb	mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16	Cadmium as Cd	mg/l	2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	Hexa Chromium as Cr ⁺⁶	mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
18	Total Chromium as Cr	mg/l	2	0.19	0.23	0.29	0.37	0.26	0.22	0.18	0.16	0.15	0.19	0.22	0.19	0.221
19	Copper as Cu	mg/l	3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
20	Zinc as Zn	mg/l	5	0.21	0.29	0.38	0.45	0.51	0.46	0.35	0.19	0.24	0.33	0.31	0.24	0.33
21	Selenium as Se	mg/l	0.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
22	Nickel as Ni	mg/l	3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	Cyanide	mg/l	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
24	Fluoride as F	mg/l	2	0.05	0.057	0.068	0.081	0.06	0.057	0.046	0.04	0.05	0.05	0.03	0.04	BDL
25	Diss. Phosphate as P	mg/l	5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26	Sulphide as S	mg/l	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	BDL
27	Phenolic Compounds as C ₆ H ₅ OH	mg/l	1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	ND
28	Bio-assay Test,	%	90% survival	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98.00%
29	Manganese as Mn, mg/l	mg/l	2	0.016	0.019	0.028	0.035	0.044	0.041	0.016	0.017	0.028	0.021	0.024	0.028	0.026
30	Iron as Fe, mg/l	mg/l	3	0.27	0.31	0.36	0.41	0.48	0.43	0.31	0.26	0.36	0.29	0.21	0.31	0.33
31	Vanadium as V, mg/l	mg/l	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
32	Nitrate Nitrogen , mg/l	mg/l	10	0.18	0.13	0.17	0.15	0.23	0.2	0.19	0.19	0.24	0.18	0.26	0.22	0.20
33	Pesticides (as Benzene hexa	μg/l	10	Absen	Absen	Absent	Absen	Absen	Absen	Absen	Absen	Absen	Absen	Absen	Absen	Absent

NB : C.L. Colourless, O.L – Odourless, BDL- Below Detectable Limit., ND- Not Detectable.

Water Quality Parameters of Domestic Effluent at Sukinda Chromite Mine TATA STEEL LTD. (2016-2017)

INLET OF DOMESTIC EFFLUENT			STANDARD	INLET	INLET	INLET	INLET	INLET	INLET	INLET	INLET	INLET	INLET	INLET	INLET	INLET
Sl. No	Parameter	Unit	Inlan Surface Water Sewers (Part-A Effluents)	Apr'16	May'16	June'16	July'16	Aug'16	Sep'16	Oct'16	Nov'16	Dec'16	Jan'17	Feb'17	Mar'17	Average
1	TSS	mg/l	100	197	184	202	179	188	177	194	192	182	197	202	228	193.50
2	pH	-	5.5-9.0	8.8	8.2	8.5	7.7	7.6	7.7	7.5	8.5	8.1	7.8	8.8	9.3	8.21
3	BOD (3) days at 27c	mg/l	30	113	102	98	65	72	76.0	88	96	79	84	101	101	89.6
4	COD	mg/l	250	326	311	287	196	219	198.0	239	282	244	239	328	299	264
5	Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
6	Total Chromium as Cr	mg/l	2.0	0.19	0.22	0.28	0.22	0.3	0.3	0.33	0.15	0.19	0.24	0.17	0.22	0.23
7	Oil & Grease	mg/l	10	1.16	1.25	1.19	0.98	1.1	1.0	1.4	1	0.9	0.81	0.96	1.19	1.08

OUTLET OF DOMESTIC EFFLUENT			STANDARD	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET
Sl. No	Parameter	Unit	Inlan Surface Water Sewers (Part-A Effluents)	Apr'16	May'16	June'16	July'16	Aug'16	Sep'16	Oct'16	Nov'16	Dec'16	Jan'17	Feb'17	Mar'17	Average
1	TSS	mg/l	100	21	26	33	24	27	33.00	18	31	26	26	36	31	27.67
2	pH	-	5.5-9.0	7.5	7.6	7.9	7.4	7.3	7.40	7.3	7.2	7.4	7.3	7.2	7.8	7.44
3	BOD (3) days at 27c	mg/l	30	12.9	9.9	9.2	8.1	9.4	9.60	7.9	9.5	8.7	9.2	9.8	9.6	9.48
4	COD	mg/l	250	37.4	28.7	26.4	23.9	28.1	21.80	23.6	28.8	25.3	27.1	31.6	30.1	27.73
5	Hexavalent Chromium as Cr ⁺⁶	mg/l	0.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
6	Total Chromium as Cr	mg/l	2.0	0.16	0.19	0.23	0.16	0.19	0.19	0.28	0.12	0.17	0.19	0.15	0.17	0.18
7	Oil & Grease	mg/l	10	0.85	0.84	0.77	0.65	0.82	0.73	0.91	0.76	0.63	0.55	0.81	0.86	0.77

Noise survey report at COB plant, LOP plant of SCM TSL

SL.No.	LOCATION	June'16	Sep'16	Dec'16	March'17	AVERAGE
		Noise level in dB(A)	Noise level in dB(A)	Noise level in dB(A)	Noise level in dB(A)	
1	COB Plant Gate	69.1	70.4	69.5	70.8	70.2
2	Canteen	62.9	62.3	61.6	61.0	61.3
3	Work Shop	67.8	66.9	67.7	66.8	67.3
4	Office	57.2	58.5	59.6	60.9	60.3
5	D.G.Shed	91.4	90	89.1	87.7	88.4
6	MCC Room	65.4	66.1	67.4	68.1	67.8
7	Vibrating Screen	73.0	72.1	71.5	70.6	71.1
8	Scrubber	67.7	69	68.1	69.4	68.8
9	Control Room	65.3	64.7	66	65.4	65.7
10	Secondary Apron	67.2	66.3	65.7	64.8	65.3
11	Cone Crusher	68.7	70	69.1	70.4	69.8
12	DTJ Crusher	77.5	76.9	73.2	72.6	72.9
13	Concentrated Ore Loading	67.5	66.6	67.9	67.0	67.5
14	Wobbler area	73.1	74.4	73.5	74.8	74.2
15	Primary Apron feeder	75.1	73.7	75	73.6	74.3
16	C -1A	67.1	67.8	67.2	67.9	67.6
17	Shaking Table	78.3	77.4	76.5	75.6	76.1
18	Multiple Bin	76.9	78.2	79.5	80.8	80.2
19	H.T Room	65.8	65.2	64.3	63.7	64.0
20	Hydro Cyclone	67.0	66.1	65.2	64.3	64.8
21	Spirals	64.1	63.4	64	63.3	63.7
22	VS Ball Mill	91.2	92	93.1	93.9	93.5
23	C.6A	78.0	79.1	78.6	79.7	79.2
24	H.F Screen	75.9	75	75	74.1	74.6
25	Sieve band area	77.7	79	79.8	81.1	80.5
26	C3	74.2	73.6	74.7	74.1	74.4
27	C4	74.6	73.7	72.8	71.9	72.4
28	LOPP Sayaji Crusher	60.2	61.5	60.5	61.8	61.2
29	LOPP Screen	63.5	62.9	63.9	63.3	63.6
30	LOPP Control Room	63.4	62.5	62.4	61.5	62.0
31	LOPP Hopper	58.0	57.1	56.2	55.3	55.8

Ambient Noise Level Survey in Residential Areas of SCM, TSL from 6AM to 6AM (Next Day)

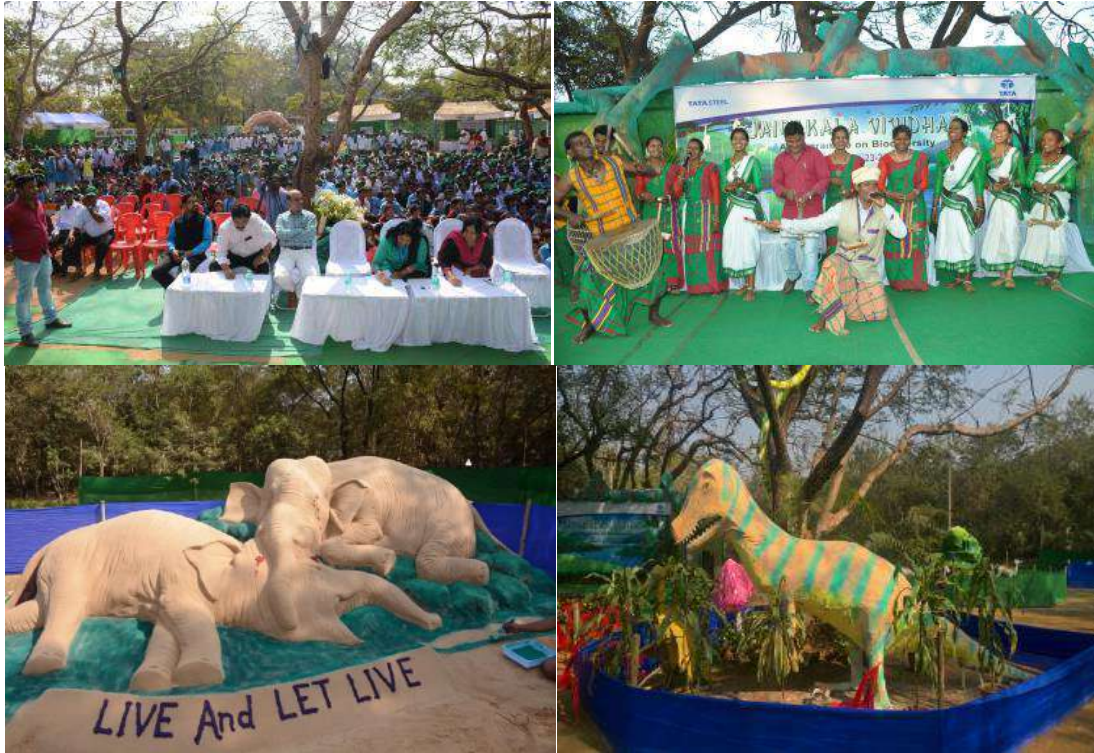
Sl.No	Time in Hrs.	Locations	June'16	Sep'16	Dec'16	March'17	AVERAGE
			Noise level in dB(A)	Noise level in dB(A)	Noise level in dB(A)	level in dB(A)	
1	6.00	Main Gate	64.5	65.8	67.1	68.4	66.5
2	6.30	Market Complex	58.1	57.5	56.1	55.2	56.7
3	7.00	Hospital	47.6	46.7	47.4	48.7	47.6
4	7.30	Post Office	43.3	44.6	43.7	43.1	43.7
5	8.00	Study Center	46	44.6	45.9	45	45.4
6	8.30	Water treatment P	52.9	53.6	53	54.3	53.5
7	9.00	STP	51.3	50.4	49.5	48.9	50.0
8	9.30	Shishu Mandir	<40	<40	<40	<40	<40
9	10.00	Children's Park	48.6	48	47.4	48.2	48.1
10	10.30	3RSF Qtrs	49.8	48.9	48	49.1	49.0
11	11.00	L2R Qtrs	52.9	54.2	55.5	54.6	54.3
12	11.30	Recreation Club	47.8	47.2	45.8	46.3	46.8
13	12.00	B4-B6 Block Qtrs	55.7	54.8	55.5	56.3	55.6
14	12.30	B3-B4 Block Qtrs	51.3	52.6	51.7	52.8	52.1
15	13.00	Geological Camp	45.1	43.7	45	44.1	44.5
16	13.30	Babu Line	51.7	52.4	51.8	51.1	51.8
17	14.00	Guest House	48.1	47.2	46.3	47.1	47.2
18	14.30	3R Qtrs	57.3	58.6	57.9	59	58.2
19	15.00	VT Centre	52.4	51.8	52.6	51.7	52.1
20	15.30	SS High school	45.9	45	46.1	46.6	45.9
21	16.00	2RF Qtrs	47.5	46.8	45.9	46.7	46.7
22	16.30	CT Qtrs	<40	<40	<40	<40	<40
23	17.00	STP	46.5	47.6	47	48.1	47.3
24	17.30	Police Out Post	51	50.1	49.2	48.3	49.7
25	18.00	Jagannath Temple	47.2	48.5	49.8	50.3	49.0
26	18.30	GM Banglow	47.3	46.7	46.1	46.9	46.8
27	19.00	Market Complex	59.2	58.3	57.4	58.5	58.4
28	19.30	Laboratory	46.5	47.8	46.9	46	46.8
29	20.00	Chrome Vally Club	51	50.4	51.7	51	51.0
30	20.30	Atwal's Camp	47.1	46.2	45.3	46.1	46.2
31	21.00	Duplex Qtrs	44.7	43.8	45.1	51	46.2
32	21.30	FootBall Ground	<40	<40	<40	<40	<40
33	22.00	B4-B6 Block Qtrs	42.1	43.4	42.5	49	44.3
34	22.30	Sisu Mandir	<40	<40	<40	<40	<40
35	23.00	5 Star Qtrs	46	46.7	46.1	49.1	47.0
36	23.30	Stewart School	<40	<40	48.5	50.5	<40
37	0.00	A9-A13 Qtrs	49.7	51	51.8	53.8	51.6
38	0.30	A14-A19 Qtrs	43.4	42.8	43.9	50	45.0
39	1.00	A-17 - A23 Qtrs	<40	<40	<40	<40	<40
40	1.30	B1-B3 Block	<40	<40	<40	<40	<40
41	2.00	Hospital	<40	<40	<40	<40	<40
42	2.30	SBI	<40	<40	<40	<40	<40
43	3.00	Jagannath Temple	<40	<40	<40	<40	<40
44	3.30	TSRDS	<40	<40	<40	<40	<40
45	4.00	Babu Line	42.2	42.9	43.7	43.1	43.0
46	4.30	Guest House Ann	<40	<40	<40	<40	<40
47	5.00	Banabharati Danc	<40	<40	<40	<40	<40
48	5.30	Main Gate	45.6	45	45.5	44.1	45.1

Ambient Noise Level Survey in Industrial Areas of SCM, TSL from 6AM to 6AM(Next Day)							
SI.No	Time in Hrs.	Location	June'16	Sep'16	Dec'16	March'17	AVERAGE
			Noise level in d B(A)	Noise level in d B(A)	Noise level in d B(A)	Noise level in d B(A)	
1	6.00	Canteen Gate	52.2	51.6	51.0	50.4	51.3
2	6.30	Quarry Pump House	62.3	61.4	60.5	59.6	61.0
3	7.00	Stack Yard	61.5	62.8	64.1	65.4	63.5
4	7.30	Lumpy Plot	59.4	58	57.4	56.0	57.7
5	8.00	40 t. Weigh Bridge	63.8	64.5	63.6	64.3	64.1
6	8.30	Concentrated Ore Stack Y	64.1	63.2	62.3	61.4	62.8
7	9.00	OB Dump	62.7	64	65.3	66.6	64.7
8	9.30	OB IX Quarry	46.6	46	45.1	44.5	45.6
9	10.00	Atwal's Pyroxinate Crusher	65.7	64.8	66.0	65.1	65.4
10	10.30	Magazine	67.9	69.2	68.6	69.9	68.9
11	11.00	Pyroxinate Quarry	69.7	69.1	68.2	67.6	68.7
12	11.30	OB-II Quarry	64.1	63.2	64.5	63.6	63.9
13	12.00	OB Dump	62.4	63.7	63.1	64.4	63.4
14	12.30	Naresh Kumar Crusher	71.6	70.2	69.3	67.9	69.8
15	13.00	OB-X Quarry	70.9	71.6	72.4	73.1	72.0
16	13.30	Old ETP	50	49.1	50.2	49.3	49.7
17	14.00	Mining Complex	69.7	71	70.1	71.4	70.6
18	14.30	Slime Dam	55.8	55.2	55.7	55.1	55.5
19	15.00	OB-IX Quarry	61.8	60.9	61.7	60.8	61.3
20	15.30	Pyroxinate Plot	62.2	61.5	62.6	61.9	62.1
21	16.00	OB Dump	61.8	62.6	61.7	62.5	62.2
22	16.30	Temple Gate	44	45.1	44.4	45.5	44.8
23	17.00	Air Strip	46.8	45.9	46.7	45.8	46.3
24	17.30	Hauling Gate	58.7	60	61.1	62.4	60.6
25	18.00	Work Shop	66.6	66	65.1	64.5	65.6
26	18.30	New ETP	46.6	45.7	46.2	45.3	46.0
27	19.00	20T Weigh Bridge	48.6	49.9	50.7	52.0	50.3
28	19.30	Engg. Complex	47.8	47.2	48.0	47.4	47.6
29	20.00	Atwal's Chrome Crusher	54.7	53.8	54.9	54.0	54.4
30	20.30	New ETP	51.6	50.7	49.8	48.9	50.3
31	21.00	Canteen Gate	58.8	60.1	60.6	61.9	60.4
32	21.30	Hauling Gate	51.5	50.6	51.4	50.5	51.0
33	22.00	Work Shop	55.6	54.7	55.8	55.2	55.3
34	22.30	Old ETP	45.6	46.9	46.0	45.1	45.9
35	23.00	Petrol Pump	46.1	44.7	44.0	45.3	45.0
36	23.30	Quarry Pump House	47.2	47.9	48.7	48.1	48.0
37	0.00	Hospital Gate	43	42.1	48.0	47.1	45.1
38	0.30	OB X Quarry	59.8	61.1	63.1	63.9	62.0
39	1.00	Atwal's chrome crusher	64.3	63.7	70.0	71.1	67.3
40	1.30	Atwal's Garage	57.3	56.4	64.0	63.1	60.2
41	2.00	Old OK Line	41	42.3	45.3	45.8	43.6
42	2.30	Air Strip	<40	<40	<40	<40	<40
43	3.00	Stack Yard	59.5	58.6	60.6	61.7	60.1
44	3.30	40Ton Weigh Bridge	62.9	64.2	70.0	69.1	66.6
45	4.00	Naresh Kumar Crusher	65.9	64.5	73.2	72.5	69.0
46	4.30	OB IX Quarry	60	60.7	63.7	64.5	62.2
47	5.00	Work shop	72.3	71.4	73.4	74.5	72.9
48	5.30	Canteen Gate	51.2	52.5	59.0	58.1	55.2

Annexure - 11
Vetiver plantation on dump slope.



1. Jaiba Kala Vividhata



2. Prajatiya Khadyotsav



3. Snakes are Friends



4. SUKINDA ECORACE



5. World Environment Day

