To,
The Additional Director
Ministry of Environment and Forests
Eastern Regional Office,
A/3, Chandrasekharpur
Bhubaneswar- 751023

Ref No: MGM/P&E/991/2018
Date: 28.05.2018

Sub: Submission of Six monthly compliance report on implementation of environmental safeguards of Tiringpahar Manganese Mine for the period from October' 17 to March'18.

Ref: Ministry of Environment and Forests Letter No: J-11015/87/2004-IA.II(M) dated 17.11.2005

Dear Sir,

We are herewith submitting the six monthly compliance report in respect of the stipulated environmental clearance conditions of Tiringphar Manganese Mine for the period from October' 17 to March'18 as per EIA Notification, 2006.

We trust that the measures taken towards environmental safeguards comply with the stipulated environmental conditions. We look forward to your further guidance which shall certainly help us in our endeavor for further improve upon our Environmental Management practices.

Thanking you,
Yours faithfully
F: TATA STEEL LTD.

Agent, Tiringphar Manganese Mine &
Head (Manganese Group of Mines), Joda

CC: Zonal Office Kolkata, Central Pollution Control Board
Encl: As above

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
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COMPLIANCE REPORT PERIOD: October 17 to March18

ENVIRONMENTAL CLEARANCE TO TIRINGPAHAR MANGANESE MINE OF TATA STEEL LIMITED VIDE MoEF's LETTER NO. J-11015/87/2004-IA.II (M) DATED 17.11.2005 COMMENTS SUBMITTED TO THE MINISTRY OF ENVIRONMENT & FORESTS, GOVERNMENT OF INDIA

Present Status of the Project:-

The Scheme of Mining and Progressive Mine Closure Plan for Tiringpahar Manganese Mine over an area of 643.710 ha. (RML – 169 ha & ML – 474.710 ha) was submitted under Rule No.12, MCDR 1988 for the period 2015-16 to 2019-20 and was approved by IBM vide letter no. MS/OTFM/34-ORI/BHU/2014-15

Sl. No	A : Specific conditions	Compliance status
1	Mining shall not be undertaken in areas of forestland within the lease without the necessary approvals / forestry clearance.	The mine has obtained forest clearance over 52.348 ha vide MoEF's letter No 8-80/2004-FC dt 28.03.2007. Further, in accordance to the MoEF & CC Circular dated F.No.8-78/1996-FC, dated 10.03.2015, the forest area as on 25.10.1980 (i.e. Sabik Settlement) 64.260ha. within the mining lease of 169 ha is now termed as forest land. Hence, fresh forest diversion proposal over an area of 80.826 ha (Sabik forest+ Balance forest) has been applied on 19.06.2016. The mining operation and allied activities are confined within the approved diverted area only.
2	Topsoil should be stacked properly with proper slope at earmarked site(s) with adequate measures and should be used for reclamation and rehabilitation of mined out area.	Around 200 m3 top soil generated during the period of Oct' 17 to Mar' 18. Most of the top soil generated earlier has been used for development of park and nursery within the lease-hold area and plantation in the inactive dump slopes within the mine. Some of top soil which is unused has been stacked at earmarked site. Proper step like grass spreading has been taken for preservation of soil.

3	OB and other wastes should be stacked at earmarked sites only and should not be kept active for long periods of time. Plantation should be taken up for soil stabilisation along the slopes of the dump and terraced after every 5-6 m of height and overall slope angle shall be maintained not exceeding 28°. Sedimentation pits shall be constructed at the corners of the garland drains. Retention/toe walls shall be provided at the base of the dumps.	OB and other wastes are being dumped as per approved Scheme of Mining. The dump is terraced at every 10m and overall slope is maintained well within 28° as per approved Scheme of Mining. The inactive portion of OB dumps area being stabilized by plantation of local species. The inactive portion of OB dumps area being stabilized by plantation of fast growing species. During the year 2017-18, 20,000 nos. were planted in inactive slope covering 1.25 ha. Beside this we have also planted 40,000 vetiver slips in inactive dump slopes. The local forest species like Gambhari, Chakunda, Mahanimba, Kala Sirs, Sisu, etc) were planted. The retaining wall and garland drain with sedimentation pit at corners near toe of OB dump at maximum places has been constructed. Their dimensions are matching the requirements to arrest effectively the run off.
4	Minerals rejects shall be stacked separately at earmarked site/dump only.	The mineral rejects generated during manual processing of manganese ore (i.e. sorting, dressing and sizing) has been stacked separately at earmarked site.
5	Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from soil, 0B and mineral dumps. The drains should be regularly desilted and maintained properly. Garland drains (size, gradient & length) and sump capacity should be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity should also provide adequate retention period to allow proper settling of silt material.	Existing catch drains and garland drains are covering the entire dump slope at low lying part. The catch drains and sedimentation pits are periodically de-silted and maintained properly. Size, gradient and length of the drains will be adequate to take care of the peak flow. The retaining wall and garland drain with sedimentation pit at corners near toe of OB dump at maximum places has been constructed. Their dimensions are matching the requirements to arrest

	Storm water return system should be provided. Storm water should not be allowed to go to the effluent treatment plant during high rainfall/super cyclone period. A separate storm water sump for this purpose should be created.	effectively the run off.
6	Dimension of retaining wall at the toe of OB dumps and benches within the mine to check run-off and siltation should be based on the rainfall data.	In order to prevent the siltation and check the run-off, retaining wall and garland drain are provided with the dimension as; <u>Dimension of the Retaining Wall</u> : Height – 1 to 1.2 mtr. Width – 1 mtr. <u>Dimension of the Garland Drain</u> : Depth – 1.20 to 1.5 mtr. Width – 1 to 1.2 mtr.
7	Trace Metals such as Ni, Co, As and Hg should be analyzed in dust fall and soil samples for at least one year during summer, monsoon and winter seasons. If concentrations of these metals are found below the standards then with prior approval of MOEF this specific monitoring could be discontinued.	Samples have been analyzed in dust fall & soil for trace metal in month of Nov'17 and Feb'18. The detail analysis result is enclosed as **Annexure-I (Dust Fall) & II (Soil).**
8	Mine Mineral and OB transportation shall be in trucks/dumpers covered with tarpaulins. Vehicular emissions should be kept under control and regularly monitored. Suitable measures should be taken to check fugitive emissions from haulage roads & transfer points, etc.	The trucks are covered with tarpaulin during dispatch of manganese ore from mine to Ferro Alloys Plant and Railway Siding at Joda. OB is being transported by shovel – dumper combination from mine face to dumps located near the quarry itself within 1.5 Km. So, it is not in practice to cover the OB transpiration trucks with tarpaulin. All the trucks meant for transportation of mineral from mine to our captive plant & Railway Siding at Joda is bearing the "Pollution under Control" certificate. The emissions are under control. Provision of water sprinkling by mobile water sprinklers to suppress fugitive emission from haul roads and other potential area like OB dump and stackyard has been made. The processed manganese ore is being transferred manually; hence there is no fugitive emission during transfer of ore.

9	A green belt of adequate width should be raised by planting the native species around ML area. Plantation should also be carried out along roads, OB dump sites etc. in consultation with the local DFO *I* Agriculture Department. The density of the trees should be not less than 2500 plants per ha.	• Reclamation and plantation programmes have been drawn. We have planted 203619 nos. of saplings over an area of around 44.250 ha in dumps, avenue and as green belt till 2017-18 • During the year 2017-18, 20,000 nos. were planted in inactive slope. Beside this we have also planted 40,000 vetiver slips in inactive dump slopes. • Tree density is maintained at the rate of 2500 saplings per ha. The plantation includes the local species like Gambhari, Chakunda, Mahanimba, Kala Sirs, Sisu, etc.
10	Groundwater shall not be used for mine operations. Prior approval of CGWA shall be obtained for using groundwater.	The ground water is not being used for mining and its allied activities.
11	Mining will not intersect groundwater. Prior pennission of the MOEF and CGWA shall be taken to mine below water table.	Mining is not intersecting the ground water as the Ground water being at lower level in comparison to existing maximum quarry depth.
12	Regular monitoring of ground water level and quality should be carried out by establishing a network of existing wells and constructing new piezometers. The monitoring should be done for quantity four times a year in pre-monsoon (April / May), monsoon (August). Post-monsoon (November) and winter (January) seasons and for quality in May. Data thus collected should be submitted to the Ministry of Environment & Forests and the Central Ground Water Authority quarterly.	Ground water table is much below the existing mine workings because of mining operations are confined at hilly topography only. However, ground water level & quality at existing well at nearby villages is being monitored. The ground water level and quality monitoring results are enclosed as **Annexure III & IV** respectively.
13	Trace metals such as Fe, Cr+6, Cu, Se, As, Cd, Hg, Pb, Zn and Mn at specific locations for both surface water downstream and in ground water at lower elevations from mine area, shall be periodically monitored in consultation with the OSPCB and State Ground Water Board. Suitable treatment measures shall be undertaken in case levels are found to be higher than permissible limits.	Trace metals such as Fe, Cr+6, Cu, Se, As, Cd, Hg, Pb, Zn and Mn at specific locations for both surface water (downstream & upstream) and ground water at lower elevation is being periodically monitored by referring to the standards as per BIS : 10500. The details of analysis result for ground water and surface water with standards are enclosed as **Annexure –V & VI** respectively.

14	"Consent to Operate" should be obtained from SPCB before expanding mining activities.	“Consent to operate” has been obtained from State Pollution Control Board, Orissa vide Order no.115 issued by letter no. 1482 / IND-I-CON-190 dated 19.01.2016 & it is valid up to 31.03.2021.
15	A Conservation Plan for conservation of endangered fauna including the Indian Elephant found in and around the mine area shall be prepared and implemented in consultation with identified agencies/institutions and with the State Forest Department. The Plan should be dovetailed with that prepared/under implementation/proposed for the endangered fauna found in the Reserve Forest in the buffer zone of the project site. The costs for the specific activities/tasks should be earmarked in the Conservation Plan and shall not be diverted for any other purpose. Year wise status of the implementation of the Plan and the expenditure thereon should be reported to the Ministry of Environment & forests, RO, Bhubaneshwar.	We have deposited Rs.25,20,385/- on 15.12.2005 with DFO, Keonjhar, Orissa being the contribution towards implementation of Wild Life Management Plan prepared for Bonai & Keonjhar division. We have also paid additional amount of Rs. 8,59,615 with DFO, Keonjhar, Orissa towards differential payment for implementation of regional Wildlife Management Plan prepared for Bonai & Keonjhar division. An amount of Rs. 3887000/- has been made on 30.07.2015 towards differential payment for implementation conservation of regional Wildlife management at the rate 43,000/ha. Further, Site Specific wildlife management plan has been approved as per the new guidelines.
16	A Final Mine Closure Plan along with details of Corpus Fund should be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.	Scheme of Mining along with progressive mine closure plan for the period from 2014-15 to 2019-20 has been approved by Indian Bureau of Mine (IBM). The final mine closure plan along with details of Corpus fund will be submitted to the Ministry of Environment & Forests in advance of final mine closure for approval.
Sl.No.	**B : General Conditions**	**Compliance Status**
1	No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.	No change in mining technology and scope of working has been made at the mine. If any changes proposed in technology and scope of workings, prior approval shall be sought from Ministry of Environment & Forests.
2	No change in the calendar plan including excavation, quantum of manganese ore and waste should be made.	Plan for production of Manganese Ore and excavation of waste has been prepared and is being strictly adhered. The plan vs actual for the year 2017-18 is given below.

		Year 2017-18	Plan (2017-18)	Actual
		Total Excavation (cum)	7,37,000	3,06,878
		OB (cum)	6,94,470	2,80,127
		Production (MT)	85,000	56,845
3	Four ambient air quality-monitoring stations should be established in the core zone as well as in the buffer zone for RPM. SPM, SO2, NOx. monitoring. Location of the stations should be decided based on the meteorological data, topographical features, and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Data on ambient air quality (RPM, SPM, SO2 & NOx.) should be regularly submitted to the Ministry including its Regional office at Bhubaneshwar and the State Pollution Control Board *I* Central Pollution Control Board once in six months.	Six ambient air quality monitoring stations have been established out of which 2 nos. in core zone (Near Purnapani Quarry and Near Guruda mining area) & 3 nos. in buffer zone (at Jaribahal, Palasa & Balda). Samples are drawn twice in a week in core zone and once in a quarter in buffer zone to ascertain the 24 hour monitoring average for PM_{10}, $PM_{2.5}$, SO_2 & NOx, CO & Mn. It was observed that, a) PM_{10} varied from 38.5 µg/m3 (Oct-17) to 58.82 µg/m3 (Mar-18) in purunapani pit. b) PM_{10} varied from 40.3 µg/m3 (Oct-17) to 63.04 µg/m3 (Mar-18) in Guruda pit. c) $PM_{2.5}$ varied from 18.2 µg/m3 (Oct-17) to 29 µg/m3 (Mar-18) in purunapani pit. d) $PM_{2.5}$ varied from 19 µg/m3 (Oct-17) to 31.33 µg/m3 (Mar-18) in Guruda pit e) $S0_2$ varied from 4.0 µg/m3 (Oct-17) to 4.33 µg/m3 (Dec-17) in purunapani pit. f) SO_2 varied from 4.0 µg/m3 (Oct-17) to 4.57 µg/m3 (Dec-17) in Guruda pit. g) NO_x varied from 9.2 µg/m3 (Oct-17) to 10.92 µg/m3 (Mar-18) in purunapani pit. h) NO_x varied from 9.3 µg/m3 (Oct-17) to 11.7 µg/m3 (Jan-18) in Guruda pit. i)CO varied from 0.14 mg/m3 (Oct-17) to 0.33 mg/m3 (Mar-18) in purunapani pit. j) CO varied from 0.14 mg/m3 (Oct-17) to 0.39 mg/m3 (Mar-18) in Guruda pit. The report of ambient air quality monitoring for every month is submitted to State Pollution Control Board on monthly basis. Abstract of the monthly monitoring data on ambient air quality is

		enclosed as **Annexure – VII.**
4	Drills should be wet operated or with dust extractors and controlled blasting should be practiced.	Wet drilling concept is already in place. Controlled blasting technique with NONEL is being practiced where ever required.
5	Fugitive dust emissions from all the sources should be controlled regularly monitored and data recorded properly. Water spraying arrangements on haul roads, wagon loading, dumpers/ trucks, loading & unloading points should be provided and properly maintained.	Effective water sprinkling by mobile water tanker is being done on haul roads. The Ambient Air Quality Report of Tiringpahar Mine is attached in **Annexure VII.**
6	Adequate measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in blasting and drilling operations, operations of HEMM, etc should be provided with ear plugs/ muffs.	Ear plugs & Ear muffs are provided to the workers working in drilling operations & DG operations. Noise monitoring done during the period October'17 to March 18 is attached in **Annexure VIII**
7	In Industrial waste water (workshop and waste water from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 191b May, 1993 and 31 II December, 1993 or as amended from time to time. Oil and grease trap should be installed before discharge of workshop effluents.	No infrastructural facility has been installed for equipment/ vehicle within the lease hold area. The equipment and vehicles deployed in the mine are maintained at Bamebari Mn. Mines which is under same management control. The oil separation system has been provided at workshop at Bamebari and working effectively.
8	Environmental laboratory should be established with adequate number and type of pollution monitoring and analysis equipment in consultation with the State Pollution Control Board.	It is being done by M/s Visiontek Consultancy Service Pvt. Ltd Recognized as "A" category consultant as by State Pollution Control Board, Orissa). The type of pollution monitoring and analysis equipment used by M/s Visiontek Consultancy Service Pvt. Ltd is enclosed as **Annexure – IX.**
9	Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.	Suitable dust masks are being provided to employees (departmental & contractual) engaged in dusty operations. It is also ensured that they use the same. Employees are undergoing Periodical Medical Examination which is inclusive of lungs function test and audiometry. All the personnel are trained on safety in work place and continuous awareness programmes are being conducted for all

	Occupational health surveillance program of the workers should be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed.	employees to avert manganese poisoning. Periodical Medical Examination of employees (departmental & contractual) are conducted as per prescribed norms of Mines Rule, 1955. The initial and periodical examination includes blood haematology, blood pressure, detailed cardiovascular assessment, neurological examination etc. All chest radiographs are being classified for detection of pneumoconiosis, diagnosis and documentation made in accordance to ILO classifications. During the calendar year IME was conducted for 89 employees (Contractual-89, Departmental-0) and PME was conducted for 29 employees (Contractual-26, Departmental -3). There are no findings of pneumoconiosis and manganese poisoning which is classified as occupational disease.
10	A separate environmental management cell with suitable qualified personnel should be set up under the control of a Senior Executive, who will report directly to the Head of the Organization.	The department is in place and the Head of the department is reporting to General Manager of the division. The organizational structure in place is enclosed as **Annexure-X.**

11	The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional Office located at Bhubaneshwar.	Funds allocated for environmental management are spent only for environment related purposes and not diverted to any other purpose. For the year 2017-18, Rs 15,00,000 was allocated for Environment monitoring out of which Rs 5,82,200 was spent and Rs. 4,35,750 was allocated for plantation out of which 8,33,016 was spent. Environmental monitoring in core and buffer zone is being done as per the stipulated conditions in CTO and EC, however the cost incurred in environment monitoring was less, due to less price was quoted by third party compare to projected cost for doing environment monitoring job.
12	The Regional Office of this Ministry located at Bhubaneshwar shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data *I* information *I* monitoring reports.	We shall extend to full co-operation to the officers of the Regional Office by furnishing the requisite date/information/monitoring reports.
13	A copy of clearance letter will be marked to the concerned Panchayat/local NGO, if any, from whom suggestion/ representation has been received while processing the proposal.	Copy of the clearance letter marked to Sarpanch, Gram Panchayat, Jajang on 12.01.2006.
14	The State Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industry Centre and Collector's Office/Tehsildar's Office for 30 days.	This is applicable to State Pollution Control Board, Orissa.
15	The project authorities should advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular of the locality concerned within seven days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution	A detail of Environmental Clearance with regard to Tiringpahar Manganese Mine was published in Oriya News Papers Anupam Bharat & Aam Khabar dated 10.01.2006.

	Control Board and may also be seen at Web Site of the Ministry of Environment & Forests at http://envfor.nic.in and a copy of the same should be forwarded to the Regional Office of this Ministry located at Bhubaneswar.	
16	The Ministry or any other competent authority may stipulate any further condition for environmental protection.	Noted
17	Failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance.	Noted
18	The above conditions will be enforced, inter alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1991 along with their amendments and rules.	Noted

Yours faithfully
F: TATA STEEL LTD.

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

Visiontek Consultancy Services Pvt. Ltd.

(An Enviro Engineering Consulting Cell)

ISO 9001 : 2008
ISO 14001 : 2004
OHSAS 18001 : 2007

Ref.: VCSPL/17/R-3138 *Date:* 04.12.2017

DUST FALL MONITORING REPORT FOR THE MONTH OF NOV-2017

1. Name of Industry : **Tiringpahar Manganese Mines Manganese Mines (M/s TATA Steel Limited)**
2. Sample collected by : VCSPL Representative in presence of TATA Representative

Sl No.	Parameters	Unit	Analysis Results
			DF-1
1.	Cobalt as Co	%	<0.001
2.	Nickel as Ni	%	<0.001
3.	Mercury as Hg	%	<0.001
4.	Arsenic as As	%	<0.001

Total Dust fall for the month of Nov-2017=0.498 t/km^2/month

VISIONTEK CONSULTANCY SERVICES PVT LTD

For Visiontek Consultancy Services Pvt. Ltd.

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E-mail : visiontekin@yahoo.co.in, visiontekin@gmail.com , Visit us at: www.vcspl.org

Committed For Better Environment

Ref.: EnvLab/18/R-495 *Date:* 03/03/18

DUST FALL MONITORING REPORT FOR THE MONTH OF FEB-2018

1. Name of Industry : **Tiringpahar Manganese Mines (M/s TATA Steel Limited)**
2. Sample collected by : VCSPL Representative in presence of TATA Representative

Sl No.	Parameters	Unit	Analysis Results
			DF-1
1.	Cobalt as Co	%	<0.001
2.	Nickel as Ni	%	<0.001
3.	Mercury as Hg	%	<0.001
4.	Arsenic as As	%	<0.001

Total Dust fall for the month of Feb-2018=0.948 t/km^2/month

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For Visiontek Consultancy Services Pvt. Ltd.

Annexure II

Visiontek Consultancy Services Pvt. Ltd.

(An Enviro Engineering Consulting Cell)

ISO 9001 : 2008
ISO 14001 : 2004
OHSAS 18001 : 2007

Ref.: VCSPL/17/R-3139 Date: 04.12.2017

SOIL QUALITY ANALYSIS REPORT FOR THE MONTH OF NOV-2017

1. Name of Industry : **Tiringpahar Manganese Mines (M/s TATA Steel Limited)**
2. Sampling Location : **S-1: Near Block-I**
3. Date of Sampling : 10.11.2017
4. Date of Analysis : 11.11.2017 to 16.11.2017
5. Sample collected by : VCSPL Representative in presence of TATA Representative

Sl No.	Parameters	Unit	Analysis Results
			S-1
1.	Cobalt as Co	%	0.0019
2.	Nickel as Ni	%	0.048
3.	Mercury as Hg	%	<0.000002
4.	Arsenic as As	%	<0.000002

For Visiontek Consultancy Services Pvt. Ltd.

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Annexure III

Visiontek Consultancy Services Pvt.Ltd.
(An Enviro Engineering Consulting Cell)
ISO 14001:2004
ISO 9001: 2008
OHSAS 18001:2007

Ref.: VCSPL/17/R-3143 Date.: 04.12.17

GROUND WATER (LEVEL) QUALITY ANALYSIS REPORT FOR THE MONTH OF NOV-2017

1. Name of Industry : **Tiringpahar Manganese Mines (M/s TATA Steel Limited)**
2. Sampling Location : **GW-1:** Palasa Village **GW-2:** Joribahal
3. Label measured by : VCSPL Representative in presence of TATA Representative

Sl. No	Date of Sampling	Name of Village	Unit	Result
1	28.11.2017	Palasa	Mt./bgl	3.6
2	28.11.2017	Joribahal	Mt./bgl	3.8

VISIONTEK CONSULTANCY SERVICES Pvt. Ltd.

*For **Visiontek Consultancy Services Pvt. Ltd.***

Ref.: Env lab/18/2-507 *Date:* 03.03.2018

GROUND WATER (LEVEL) QUALITY ANALYSIS REPORT FOR THE MONTH OF FEB-2018

1. Name of Industry : **Tiringpahar Manganese Mines (M/s TATA Steel Limited)**
2. Sampling Location : **GW-1:** Palasa Village **GW-2:** Joribahal
3. Label measured by : VCSPL Representative in presence of TATA Representative

Sl. No	Date of Sampling	Name of Village	Unit	Result
1	**02.02.2018**	Palasa	Mt./bgl	11.1
2	**23.02.2018**	Joribahal	Mt./bgl	11.6

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

*For **Visiontek Consultancy Services Pvt. Ltd.***

Visiontek Consultancy Services Pvt.Ltd.
(An Enviro Engineering Consulting Cell)
ISO 14001:2004
ISO 9001: 2008
OHSAS 18001:2007

Ref.: VCSPL/171R-3226 Date.: 04.12.2017

GROUND WATER QUALITY ANALYSIS REPORT FOR THE MONTH OF NOV-2017

1. Name of Industry : **Tiringpahar Manganese Mines (M/s TATA Steel Limited)**
2. Sampling Location : **GW-1: Borewell at Sandhy Guta**
   GW-2: Open Well at Palasa Chak
3. Date of sampling : 27.11.2017
4. Date of analysis : 28.11.2017 to 04.12.2017
5. Sample collected by : VCSPL Representative in presence of TATA Representative

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS -10500:1991	Analysis Results	
					GW-1	GW-2
Essential Characteristics						
1	Colour	APHA 2120 B, C	Hazen	**5**	CL	CL
2	Odour	APHA 2150 B	--	**U/O**	U/O	U/O
3	Taste	APHA 2160 C	--	**Agreeable**	Agreeable	Agreeable
4	Turbidity	APHA 2130 B	NTU	**5**	<0.2	<0.2
5	pH Value	APHA 4500H^+ B	--	**6.5-8.5**	7.34	7.48
6	Total Hardness (as $CaCO_3$)	APHA 2340 C	mg/l	**300**	146.0	148.0
7	Iron (as Fe)	APHA 3500Fe, B	mg/l	**0.3**	0.27	0.26
8	Chloride (as Cl)	APHA 4500Cl^- B	mg/l	**250**	37.0	35.0
9	Residual, free Chlorine	APHA 4500Cl, B	mg/l	**0.2**	ND	ND
Desirable Characteristics						
10	Dissolved Solids	APHA 2540 C	mg/l	**500**	225.0	222.0
11	Calcium (as Ca)	APHA 3500Ca B	mg/l	**75**	39.7	40.1
12	Magnesium (as Mg)	APHA 3500Mg B	mg/l	**30**	11.4	11.7
13	Copper (as Cu)	APHA 3111 B,C	mg/l	**0.05**	<0.05	<0.05
14	Manganese (as Mn)	APHA 3500Mn B	mg/l	**0.1**	0.012	0.011
15	Sulphate (as SO_4)	APHA 4500 SO_4^{2-} E	mg/l	**200**	5.8	4.6
16	Nitrate (as NO_3)	APHA 4500 NO_3^- E	mg/l	**45**	2.3	1.88
17	Fluoride (as F)	APHA 4500F^- C	mg/l	**1.0**	0.015	0.016
18	Phenolic Compounds (as C_6H_5OH)	APHA 5530 B,D	mg/l	**0.001**	<0.001	<0.001
19	Mercury (as Hg)	APHA 3500 Hg	mg/l	**0.001**	<0.001	<0.001
20	Cadmium (as Cd)	APHA 3111 B,C	mg/l	**0.01**	<0.001	<0.001
21	Selenium (as Se)	APHA 3114 B	mg/l	**0.01**	<0.001	<0.001
22	Arsenic (as As)	APHA 3114 B	mg/l	**0.05**	<0.001	<0.001
23	Cyanide (as CN)	APHA 4500 CN^- C,D	mg/l	**0.05**	ND	ND
24	Lead (as Pb)	APHA 3111 B,C	mg/l	**0.05**	<0.001	<0.001
25	Zinc (as Zn)	APHA 3111 B,C	mg/l	**5**	<0.05	<0.05
26	Anionic Detergents (as MBAS)	APHA 5540 C	mg/l	**0.2**	<0.2	<0.2
27	Chromium (as Cr^{+6})	APHA 3500Cr B	mg/l	**0.05**	<0.05	<0.05
28	Mineral Oil	APHA 5220 B	mg/l	**0.01**	<0.01	<0.01
29	Alkalinity	APHA 2320 B	mg/l	**200**	135.0	136.0
30	Aluminium as(Al)	APHA 3500Al B	mg/l	**0.03**	<0.001	<0.001
31	Boron (as B)	APHA 4500B, B	mg/l	**1**	<0.01	<0.01
32	Poly Aromatic Hydrocarbon as PAH	APHA 6440 B	µg/l	--	<0.001	<0.001
33	Pesticide	APHA 6630 B,C	mg/l	**Absent**	Absent	Absent

Note: CL : Colourless, AL: Agreeable, U/O : Unobjectionable, ND:Not Detected.

*For **Visiontek Consultancy Services Pvt. Ltd.***

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

Ref.: Envlab/181R-505 *Date:* 03.03.2018

GROUND WATER QUALITY ANALYSIS REPORT FOR THE MONTH OF FEB-2018

1. Name of Industry : **Tiringpahar Manganese Mines (M/s TATA Steel Limited)**
2. Sampling Location : **GW-1: Borewell at Sandhy Guta**
   GW-2: Open Well at Palasa Chak
3. Date of sampling : 15.02.2018
4. Date of analysis : 16.02.2018 to 22.02.2018
5. Sample collected by : VCSPL Representative in presence of TATA Representative

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS -10500:1991	Analysis Results	
					GW-1	GW-2
Essential Characteristics						
1	Colour	APHA 2120 B, C	Hazen	**5**	CL	CL
2	Odour	APHA 2150 B	--	**U/O**	U/O	U/O
3	Taste	APHA 2160 C	--	**Agreeable**	Agreeable	Agreeable
4	Turbidity	APHA 2130 B	NTU	**5**	<0.2	<0.2
5	pH Value	APHA 4500H^+ B	--	**6.5-8.5**	7.38	7.42
6	Total Hardness (as $CaCO_3$)	APHA 2340 C	mg/l	**300**	154.0	160.0
7	Iron (as Fe)	APHA 3500Fe, B	mg/l	**0.3**	0.25	0.24
8	Chloride (as Cl)	APHA 4500Cl^- B	mg/l	**250**	41.0	39.0
9	Residual, free Chlorine	APHA 4500Cl, B	mg/l	**0.2**	ND	ND
Desirable Characteristics						
10	Dissolved Solids	APHA 2540 C	mg/l	**500**	241.0	241.0
11	Calcium (as Ca)	APHA 3500Ca B	mg/l	**75**	42.9	44.5
12	Magnesium (as Mg)	APHA 3500Mg B	mg/l	**30**	11.4	11.9
13	Copper (as Cu)	APHA 3111 B,C	mg/l	**0.05**	<0.05	<0.05
14	Manganese (as Mn)	APHA 3500Mn B	mg/l	**0.1**	0.014	0.01
15	Sulphate (as SO_4)	APHA 4500 SO_4^{2-} E	mg/l	**200**	6.4	5.5
16	Nitrate (as NO_3)	APHA 4500 NO_3^- E	mg/l	**45**	2.34	1.96
17	Fluoride (as F)	APHA 4500F^- C	mg/l	**1.0**	0.016	0.013
18	Phenolic Compounds (as C_6H_5OH)	APHA 5530 B,D	mg/l	**0.001**	<0.001	<0.001
19	Mercury (as Hg)	APHA 3500 Hg	mg/l	**0.001**	<0.001	<0.001
20	Cadmium (as Cd)	APHA 3111 B,C	mg/l	**0.01**	<0.001	<0.001
21	Selenium (as Se)	APHA 3114 B	mg/l	**0.01**	<0.001	<0.001
22	Arsenic (as As)	APHA 3114 B	mg/l	**0.05**	<0.001	<0.001
23	Cyanide (as CN)	APHA 4500 CN^- C,D	mg/l	**0.05**	ND	ND
24	Lead (as Pb)	APHA 3111 B,C	mg/l	**0.05**	<0.001	<0.001
25	Zinc (as Zn)	APHA 3111 B,C	mg/l	**5**	<0.05	<0.05
26	Anionic Detergents (as MBAS)	APHA 5540 C	mg/l	**0.2**	<0.2	<0.2
27	Chromium (as Cr^{+6})	APHA 3500Cr B	mg/l	**0.05**	<0.05	<0.05
28	Mineral Oil	APHA 5220 B	mg/l	**0.01**	<0.01	<0.01
29	Alkalinity	APHA 2320 B	mg/l	**200**	146.0	148.0
30	Aluminium as(Al)	APHA 3500Al B	mg/l	**0.03**	<0.001	<0.001
31	Boron (as B)	APHA 4500B, B	mg/l	**1**	<0.01	<0.01
32	Poly Aromatic Hydrocarbon as PAH	APHA 6440 B	µg/l	--	<0.001	<0.001
33	Pesticide	APHA 6630 B,C	mg/l	**Absent**	Absent	Absent

Note: CL : Colourless, AL: Agreeable, U/O : Unobjectionable, ND:Not Detected.

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

For Visiontek Consultancy Services Pvt. Ltd.

Annexure V

Visiontek Consultancy Services Pvt.Ltd.
(An Enviro Engineering Consulting Cell)
ISO 14001:2004
ISO 9001: 2008
OHSAS 18001:2007

Ref.: VCSPL/17/R-3227 Date.: 04.12.2017

GROUND WATER (TRACE METAL) QUALITY ANALYSIS REPORT FOR THE MONTH OF NOV-2017

1. Name of Industry : **Tiringpahar Manganese Mines (M/s TATA Steel Limited)**
2. Sampling Location : **GW-1: Borewell at Sandhy Guta**
3. Date of sampling : 28.11.2017
4. Date of analysis : 29.11.2017 to 04.12.2017
5. Sample collected by : VCSPL Representative in presence of TATA Representative

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS -10500:1991	Analysis Results
					GW-1
1	Iron (as Fe)	APHA 3500Fe, B	mg/l	**0.3**	0.22
2	Copper (as Cu)	APHA 3111 B,C	mg/l	**0.05**	< 0.05
3	Manganese (as Mn)	APHA 3500Mn B	mg/l	**0.1**	0.012
4	Chromium (as Cr^{+6})	APHA 3500Cr B	mg/l	**0.05**	< 0.05
5	Mercury (as Hg)	APHA 3500 Hg	mg/l	**0.001**	< 0.001
6	Cadmium (as Cd)	APHA 3111 B,C	mg/l	**0.01**	< 0.01
7	Selenium (as Se)	APHA 3114 B	mg/l	**0.01**	< 0.001
8	Arsenic (as As)	APHA 3114 B	mg/l	**0.05**	< 0.001
9	Lead (as Pb)	APHA 3111 B,C	mg/l	**0.05**	< 0.01
10	Zinc (as Zn)	APHA 3111 B,C	mg/l	**5**	<0.05

*For **Visiontek Consultancy Services Pvt. Ltd.***

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

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"Committed For The Better Environment"

Visiontek Consultancy Services Pvt. Ltd.

(An Enviro Engineering Consulting Cell)

ISO 9001 : 2008
ISO 14001 : 2004
OHSAS 18001 : 2007

Ref.: Env lab/18/R-506 *Date:* 03.03.2018

GROUND WATER (TRACE METAL) QUALITY ANALYSIS REPORT FOR THE MONTH OF FEB-2018

1. Name of Industry : **Tiringpahar Manganese Mines (M/s TATA Steel Limited)**
2. Sampling Location : **GW-1: Borewell at Sandhy Guta**
3. Date of sampling : 15.02.2018
4. Date of analysis : 16.02.2018 to 23.02.2018
5. Sample collected by : VCSPL Representative in presence of TATA Representative

Sl. No	Parameter	Testing Methods	Unit	Standard as per IS -10500:1991	Analysis Results
					GW-1
1	Iron (as Fe)	APHA 3500Fe, B	mg/l	**0.3**	0.29
2	Copper (as Cu)	APHA 3111 B,C	mg/l	**0.05**	< 0.05
3	Manganese (as Mn)	APHA 3500Mn B	mg/l	**0.1**	0.013
4	Chromium (as Cr^{+6})	APHA 3500Cr B	mg/l	**0.05**	< 0.05
5	Mercury (as Hg)	APHA 3500 Hg	mg/l	**0.001**	< 0.001
6	Cadmium (as Cd)	APHA 3111 B,C	mg/l	**0.01**	< 0.01
7	Selenium (as Se)	APHA 3114 B	mg/l	**0.01**	< 0.001
8	Arsenic (as As)	APHA 3114 B	mg/l	**0.05**	< 0.001
9	Lead (as Pb)	APHA 3111 B,C	mg/l	**0.05**	< 0.01
10	Zinc (as Zn)	APHA 3111 B,C	mg/l	**5**	<0.05

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

For Visiontek Consultancy Services Pvt. Ltd.

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Annexure – VI : Surface Water Analysis

SURFACE WATER QUALITY ANALYSIS REPORT OCT 17 TO MARCH 18										
Sampling Location:SW-1: Kundra Nallah entering Tiringpahar										
Sl. No	**Parameter**	**Unit**	**Standard as per IS:2296:1992, Class'C'**	Oct		Nov	Dec	Jan	Feb	March
1	Dissolved Oxygen (minimum)	mg/l	**4**	5.8	6.1	5.8	5.5	5.1	4.7	4.8
2	BOD (3) days at 270C (max)	mg/l	**3**	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
3	Total Coli form	MPN/100 ml	**5000**	450	510	510	370	350	170	90
4	pH Value		**6.0-9.0**	7.18	7.16	7.22	7.28	7.34	7.38	7.34
5	Colour (max)	Hazen	**300**	5	6	1	CL	CL	CL	CL
6	Total Dissolved Solids	mg/l	**1500**	114	108	113	116	120	122	125.0
7	Copper as Cu (max)	mg/l	**1.5**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8	Iron as Fe (max)	mg/l	**0.5**	0.48	0.54	0.42	0.44	0.47	0.49	0.44
9	Chloride (max)	mg/l	**600**	21	19	21	23	25	24	28.0
10	Sulphates (SO4) (max)	mg/l	**400**	4.3	4.5	4.3	4.5	4.2	4.1	4.4
11	Nitrate as NO3 (max)	mg/l	**50**	1.6	1.7	1.5	1.6	1.5	1.44	1.56
12	Fluoride as F (max)	mg/l	**1.5**	0.013	0.016	0.018	0.016	0.018	0.016	0.012
13	Phenolic Compounds as C6H5OH (max)	mg/l	**0.005**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Cadmium as Cd (max)	mg/l	**0.01**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
15	Selenium as Se (max)	mg/l	**0.05**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
16	Arsenic as As	mg/l	**0.2**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
17	Cyanide as CN (max)	mg/l	**0.05**	ND	ND	ND	ND	ND	ND	ND
18	Lead as Pb(max)	mg/l	**0.1**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Zinc as Zn(max)	mg/l	**15**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
20	Hexa Chromium as Cr +6	mg/l	**0.05**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
21	Anionic Detergents (max)	mg/l	**1**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

SURFACE WATER QUALITY ANALYSIS REPORT OCT-17										
Sampling Location:SW-2 : Intake point at Tindharia SW-2:Kundra Nallah leaving Tiringpahar										
Sl. No	**Parameter**	**Unit**	**Standard as per IS:2296:1992, Class'C'**	Oct		Nov	Dec	Jan	Feb	March
1	Dissolved Oxygen (minimum)	mg/l	**4**	5.9	6.2	6.1	5.7	4.9	5.1	4.9
2	BOD (3) days at 270C (max)	mg/l	**3**	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
3	Total Coli form	MPN/100 ml	**5000**	510	900	510	410	310	210	170
4	pH Value		**6.0-9.0**	7.14	7.2	7.25	7.26	7.28	7.34	7.28
5	Colour (max)	Hazen	**300**	6	8	1	CL	CL	CL	CL
6	Total Dissolved Solids	mg/l	**1500**	118	114	119	124	125	128	133.0
7	Copper as Cu (max)	mg/l	**1.5**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8	Iron as Fe (max)	mg/l	**0.5**	0.5	0.52	0.45	0.48	0.5	0.46	0.48
9	Chloride (max)	mg/l	**600**	22	21	23	24	27	28	30.0
10	Sulphates (SO4) (max)	mg/l	**400**	4.6	4.4	4.8	4.7	4.6	4.4	4.6
11	Nitrate as NO3 (max)	mg/l	**50**	1.7	1.5	1.7	1.8	1.9	1.78	1.68
12	Fluoride as F (max)	mg/l	**1.5**	0.014	0.018	0.02	0.019	0.021	0.019	0.018
13	Phenolic Compounds as C6H5OH (max)	mg/l	**0.005**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
14	Cadmium as Cd (max)	mg/l	**0.01**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
15	Selenium as Se (max)	mg/l	**0.05**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
16	Arsenic as As	mg/l	**0.2**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
17	Cyanide as CN (max)	mg/l	**0.05**	ND	ND	ND	ND	ND	ND	ND
18	Lead as Pb(max)	mg/l	**0.1**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Zinc as Zn(max)	mg/l	**15**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
20	Hexa Chromium as Cr +6	mg/l	**0.05**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
21	Anionic Detergents (max)	mg/l	**1**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Annexure VII

Purunapani													
Monthly Average	**PM_{10} (µg/m³)**	**$PM_{2.5}$ (µg/m³)**	**SO_2 (µg/m³)**	**NOx (µg/m³)**	**O_3 (µg/m³)**	**CO (mg/m³)**	**NH_3 (µg/m³)**	**Pb (µg/m³)**	**Ni (ng/m³)**	**As (ng/m³)**	**Benzene (µg/m³)**	**Benzo(a) pyrene (ng/m³)**	**Mn (µg/m3)**
Oct-17	38.5	18.2	<4.0	<9.2	<4.0	0.14	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Nov-17	46.7	22.8	<4.2	<10.0	<4.0	0.21	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Dec-17	53.29	26.78	4.33	10.87	5.17	0.28	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Jan-18	56.3	27.9	<4.2	10.8	5.8	0.3	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Feb-18	57	28	<4.1	10.9	5.9	0.32	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Mar-18	58.82	29	4.24	10.92	5.93	0.33	< 20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
AVERAGE	**51.77**	**25.45**	**4.29**	**10.87**	**5.70**	**0.26**	**<20.0**	**< 0.001**	**< 0.01**	**< 0.001**	**< 0.001**	**< 0.002**	**<0.001**

(Guruda)													
Monthly Average	**PM_{10} (µg/m³)**	**$PM_{2.5}$ (µg/m³)**	**SO_2 (µg/m³)**	**NOx (µg/m³)**	**O_3 (µg/m³)**	**CO (mg/m³)**	**NH_3 (µg/m³)**	**Pb (µg/m³)**	**Ni (ng/m³)**	**As (ng/m³)**	**Benzene (µg/m³)**	**Benzo(a) pyrene (ng/m³)**	**Mn (µg/m3)**
Oct-17	40.3	19	<4.0	<9.3	<4.0	0.14	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Nov-17	49.8	24.3	<4.23	<10.3	<4.0	0.23	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Dec-17	57.14	29.16	4.57	11.68	5.8	0.31	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Jan-18	60.8	30.2	4.4	11.7	6.8	0.34	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Feb-18	61.7	30.6	4.4	12.4	7.3	0.36	<20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
Mar-18	63.04	31.33	4.44	13.01	7.23	0.39	< 20.0	< 0.001	< 0.01	< 0.001	< 0.001	< 0.002	<0.001
AVERAGE	**55.46**	**27.43**	**4.45**	**12.20**	**6.78**	**0.30**	**<20.0**	**< 0.001**	**< 0.01**	**< 0.001**	**< 0.001**	**< 0.002**	**<0.001**

Annexure VIII

Visiontek Consultancy Services Pvt.Ltd.
(An Enviro Engineering Consulting Cell)
ISO 14001:2004
ISO 9001: 2008
OHSAS 18001:2007

Ref.: VCSPL/17/R-3144 Date: 04.12.17

NOISE MONITORING REPORT FOR THE MONTH OF NOV-2017

1. Name of Industry : **Tiringpahar Manganese Mines (M/s TATA Steel Limited)**
2. Recorded By : VCSPL Representative in presence of TATA Representative

AAQ				Day Time	Night Time
Sl. No	Date	Name of Location	Unit	Result	
1	27.11.2017	Mines Area	db	65.4	44
CPCB Standard				75	70

For *Visiontek Consultancy Services Pvt. Ltd.*

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"Committed For The Better Environment"

Ref.: Env lab/18/R-508 *Date:* 03.03.2018

NOISE MONITORING REPORT FOR THE MONTH OF FEB-2018

1. Name of Industry : **Tiringpahar Manganese Mines (M/s TATA Steel Limited)**
2. Recorded By : VCSPL Representative in presence of TATA Representative

AAQ				Day Time	Night Time
Sl. No	Date	Name of Location	Unit	Result	
1	15.02.2018	Mines Area	db	62.9	40.0
CPCB Standard				75	70

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

For Visiontek Consultancy Services Pvt. Ltd.

Annexure IX LIST OF ENVIRONMENTAL MONITORING EQUIPMENT

LIST OF ENVIRONMENTAL MONITORING EQUIPMENT		
Ambient Air Quality		
Sl.No.	**Name of the Instrument**	**Parameter**
1	Respirable Dust sampler	PM_{10}
2	Fine Particulate Sampler	$PM_{2.5}$
3	Spectrophotometer UV-Visible range	SO_2,NO_x,NH_3,O_3,
4	NDIR	CO
5	AAS	As, Ni, Pb ,Mn
6	GC	C_6H_6,Bap
Other Paraphernalia for analysis of air quality are also available in the laboratory.		
Water Quality		
Sl.No.	**Name of the Instrument**	**Parameter**
1	Analytical weighing Balance	Used for weighing the chemicals
2	Micro Balance	Used for weighing CRMs
3	AAS with VGA and Hallow cathode lamps	All Heavy metals (Arsenic, Mercury, Selenium, Cadmium, Copper,Lead,Zinc, Aluminium, etc..)
4	Spectrophotometer UV-Visible range	Nitrate,Nitrite,Sulphate, Chromium(VI),Fluoride, Cyanide,Boron,Iron, Phenolic compounds
5	Gas Chromatography	PAH,Pesticide
6	Flame Photometer	Sodium ,Potassium
7	BOD Incubator	BOD
8	COD Digester	COD
9	Muffle Furnace	Total volatile solids, Fixed solids
10	Hot Air Oven	Total Suspended Solids, Total Dissolved Solids
11	pH meter	pH
12	Conductivity meter	Conductivity
13	Turbidity Meter	Turbidity
14	Bacteriological Incubator	Total coli form and fecal coli form
15	Autoclave	sterilization
16	Microscope	Bacteriological colony count
17	Magnetic stirrer	Stirring purpose
18	Vacuum filtration unit	Rapid filtration
19	Water Bath	Boiling and evaporation purpose
20	Cadmium reduction column	Nitrate
21	Kjeldal Equipment	Ammonia and Organic Nitrogen
22	Hot Plate	Digestion
23	Pizometer	Water level monitoring
24	Aquarium	Bio assay test
Other Paraphernalia for analysis of Water quality are also available in the laboratory.		

Annexure – X

Organizational Structure