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

Ref No: MGM/P&E/758/2016
Date: 30.11.2016

Sub: **Submission of Six monthly compliance report on implementation of environmental safeguards of Bamebari Manganese Mine, for the period from April' 16 to September'16.**

Ref: Ministry of Environment and Forests Letter No: J-11015/85/2003-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 Bamebari Manganese Mine for the period from April' 16 to September'16 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, Bamebari Mn.Mine &

Head (Manganese Group of Mines), Joda

Encl: As above

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

COMPLIANCE REPORT PERIOD : April'16 to September'16

ENVIRONMENTAL CLEARANCE TO BAMEBARI MANGANESE MINE OF TATA STEEL LIMITED VIDE MoEF's LETTER NO. J-11015/85/2003-1A.II(M) DATED 17.11.2005 COMMENTS SUBMITTED TO THE MINISTRY OF ENVIRONMENT & FORESTS, GOVERNMENT OF INDIA

Present Status of the Project:-

The Scheme of Mining and Progressive Mine Closure Plan for Bamebari Manganese Mine over an area 1150.55 ha. (RML – 464 ha & ML – 686.550 ha.) was submitted under Rule No.12, MCDR 1988 for the period 2015-16 to 2019-20 and has been approved by IBM vide letter no. MS/OTFM/32 -ORI/BHU/2014-15, dated 26.03.2015

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 the Forest Clearance vide MoEF's letter No 8-72/2004-FC dt 25.01.2007 over an area of 145.329 ha of forest land. 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) 66.126ha within the mining lease of 464 ha is now termed as forest land. Hence, fresh forest diversion proposal over an area of 303.066 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.	No top soil has been generated during the year 2016-17(till September'16). The top soil generated prior to this period has already been utilized for plantation in the inactive dump slopes.
3	OB and other wastes should be stacked at earmarked sites only and should not be kept active for long periods of time. Plantation should be taken up for soil stabilisation along the slopes of the dump and terraced after every 5-6 m of height and	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

	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.	stabilized by plantation of fast growing species. 25710 nos. of sapling of local species (Gambhari, Chakunda, Mahanimba, Kala Sirs, Sisu etc) were planted during 2015-16 over an area of 1.1 ha. The survival rate for this period was 76%. During the year 2016-17 (till September'16), 13650 nos. of sapling was planted over an area of 1.2 ha Apart from this we have distributed 2290 nos. saplings were distributed during 2015-16 (fruit and timber) free of cost to our surrounding communities including, school children, villagers, clubs and SHGs under guidance of State Pollution Control Board, Odisha . We have also planted around 1,00,000 of Vetiver slips in inactive dump slopes of Bamebari quarry dump and Joribar quarry dump for stabilization of dump slopes during the year 2016-17 (till September'16). The retaining wall and garland drain with sedimentation pit at corners near toe of OB dump at maximum places has been constructed & in remaining area it is under construction. 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 Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The drains should be regularly desilted and maintained properly. Garland drains (size, gradient & length) and sump capacity should be designed keeping 50% safety margin over and above the peak sudden rainfall and maximum discharge in the area adjoining the mine site. Sump capacity should also provide adequate retention period to allow proper settling of	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. A series of check dams and settling pits have been provided for proper settlement of suspended solid in surface runoff.

	silt material. 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.	
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 during the month of April'16 and September'16. 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 being covered with tarpaulin during dispatch of manganese ore from mine to Ferro Alloys Plant and Railway Siding at Joda. OB is being transported by shovel – dumper combination from mine face to dumps located near the quarry itself within 1.5 Km. So, it is not in practice to cover the OB transportation trucks with tarpaulin. 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. The processed manganese ore is being transferred manually; hence there is less fugitive emission during transfer of ore. The Ambient Air Quality monitoring done around quarry during the period April'16 to September'16 is being enclosed as **Annexure-III**.

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 programs have been drawn. We have planted around 4 lakh nos. of sapling over an area of around 31 ha till 2015-16. • During the year 2015-16, 25710 nos. of tree were planted covering an area of 1.1 ha with survival rate of 76%. • Tree density is maintained at the rate of 6157 saplings per ha. • During the year 2016-17, 13650 nos of saplings were planted covering an area of 1.2 ha in inactive dumps. • Beside this around 1 lakh vetiver sapling were also planted in inactive dumps of Bamebari and Joribar pit during the year 2016-17. • The plantation includes the local species (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.	Ground water use permission has been obtained from CGWA vide letter no. 21-4(297)/CGWA/SER/2010-168, Dt.15.02.2011 for 500 m^3 per day. The ground water is not being used for mining and its allied activities.
11	Mining will not intersect groundwater. Prior permission 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 MoEF & CGWA 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 are being monitored. The ground water level and quality monitoring results are enclosed as **Annexure IV & V** 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 pennissible	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

<table>
<tr><td></td><td>limits.</td><td>water and surface water with standards are enclosed as Annexure – VI & VII respectively.</td></tr>
<tr><td>14</td><td>"Consent to Operate" should be obtained from SPCB before expanding mining activities.</td><td>“Consent to operate” order no.117 No.1486/ IND-I-CON-189 dated 19.01.2016 & valid up to 31.03.2021.</td></tr>
<tr><td>15</td><td>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/taslcs 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.</td><td>We have deposited Rs.45,05,554/- 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. 47,74,446 and Rs 1,06,72,000 with DFO, Keonjhar, Orissa towards differential payment for implementation of regional Wildlife Management Plan prepared for Bonai & Keonjhar division.

Further, Site Specific wildlife management plan has been approved by PCCF, Bhubaneswar, Odisha and Chief Wildlife Warden Odisha.</td></tr>
<tr><td>16</td><td>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.</td><td>Progressive Mine Closure Plan for the period 2015-16 to 2019-20 has been approved by 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.</td></tr>
<tr><td>Sl.No</td><td>B : General Conditions</td><td>Compliance Status</td></tr>
<tr><td>1</td><td>No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.</td><td>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.</td></tr>
<tr><td>2</td><td>No change in the calendar plan including excavation, quantum of manganese ore and waste should be made.</td><td>Plan for production of Manganese Ore and excavation of waste has been prepared and is being strictly adhered to;
Plan Vs. Actual (2016-17)<table><tr><td>2016-17</td><td>Plan</td><td>Actual</td></tr><tr><td>OB (cum)</td><td>245716</td><td>52271</td></tr></table></td></tr>
</table>

		Production (MT)	83200	36217
		Total Excavation (cum)	285000	69315
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 3 nos. in core zone (Near Manager's Office close proximity to residential, near weigh bridge and near mining area) and 3 nos. in buffer zone at Jagannathpur, Bandhuabeda, Raikera 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 $PM_{10,}$ $PM_{2.5}$, So2 & NOx, CO & Mn. Data on ambient air quality monitoring for every month is being submitted to State Pollution Control Board. Abstract of the monthly monitoring data on ambient air quality for period April'16 to September'16 is enclosed as **Annexure – III**.		
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 in practice.Beside this green belt has been developed along mining.		
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 monitoring done during the period April'16 to September'16 is enclosed as **Annexure – III.**		
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. Rests of operations are below the noise levels of 80 dBA. The details of noise monitoring for the period April'16 to September'16 are enclosed as **Annexure-VIII.**		
7	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	The oil separation system has been provided at workshop and working effectively. This is being centrally used for maintenance of all the equipments running at Bamebari & Tiringpahar Mn.Mine.		

	discharge of workshop effluents.	
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.and Mitra S.K Pvt Ltd. (Recognized as "A" category consultant as by State Pollution Control Board, Orissa). The type of pollution monitoring and analysis equipment used by Mitra S.K Pvt Ltd India 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. 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.	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 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 hematology, blood pressure, detailed cardiovascular assessment, neurological examination etc. All chest radiographs are being classified for detection of pneumoconiosis, diagnosis and documentation made in accordance to ILO classifications. During 2011-12, 219 nos. of employees were examined while during 2012-13, a total no. of 240 employees (both Departmental and Contractual) were examined. During 2013-14 a total no. of 72 employees (Departmental-9 and contractor employees-63) & during 2014-15 a total of 78 no(Departmental-4 and Contractor-74) were examined. During the calendar year 2015, 13 nos. of employees were examined under PME and 66 nos. of employees were examined under IME. 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. The utilization of environment management for the 2015-16 was Rs. 20,22,121 (Monitoring – Rs 12,43,779/- & Plantation- Rs. 7,78,342/-) against the budget of Rs 6,87,000/- (Monitoring - Rs, 15,00,000/- & Plantation - Rs. 1,25,000/-) for Bamebari Manganese Mines. For the year 2016-17, Rs 1625000 is kept for environment management (Environment Monitoring – Rs. 15,00,000/- and Plantation Rs. 1,25,000/-) for Bamebari Manganese Mines.
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 are extending full co-operation to the officers of the Regional Office by furnishing the requisite data / information / monitoring reports.
13	A copy of clearance letter will be marked to the concerned Panchayat/local NGO, if any, from whom suggestion/ representation has been received while processing the proposal.	Copy of the clearance letter marked to Sarpanch, Gram Panchayat, Palasa 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	A detail of Environmental Clearance with regard to Bamebari Manganese Mine was published in Oriya News Papers Anupam Bharat & Aam Khabar dated 10.01.2006.

	clearance and a copy of the clearance letter is available with the State Pollution Control Board and may also be seen at Web Site of the Ministry of Environment & Forests at http://envfor.nic.in. and a copy of the same should be forwarded to the Regional Office of this Ministry located at Bhubaneswar.	
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, Bamebari Mn.Mine &
Head (Manganese Group of Mines), Joda

Annexure – I

Mitra S. K. Private Limited

At/P.O.:BARBIL Ward No:6
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CIN: U51909WB1958PTC023037

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E : barbil@mitrask.co.in
W : www.mitrask.com

MSK
TESTING • INSPECTION

Ref. No.BBL/ENV/1316 Date:04/05/2016

DUST FALL ANALYSIS REPORT

Name of the Mines: Bamebari Manganese Mines

Period of Sampling: April' 2016

Sl.No.	Parameters	Location	
		Bamebari Pit	Joribar Pit
1	Nickel (as Ni) in %	<0.0002	0.0008
2	Cobalt (as Co) in %	<0.0002	0.0006
3	Mercury (as Hg) in %	<0.00001	<0.00001
4	Arsenic (as As) in %	<0.00003	<0.00003

For Mitra S. K. Private Limited

Authorised Signatory

Checked by:-

MITRA S. K. (P) LTD. BARBIL

H. O.: Shrachi Centre (5th Floor), 74B, Acharya Jagadish Chandra Bose Road, Kolkata – 700 016, West Bengal, India
T: 91 33 22172249 / 4014 3000 / 2265 0006 / 2265 0007 F: 91 33 2265 0008 E:info@mitrask.com W: www.mitrask.com

Ref.: VCSPL/16/R-1043

Date.: 05.10.2016

DUST FALL MONITORING REPORT FOR THE MONTH OF SEPTEMBER-2016

1. Name of Industry : **Bamebari 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 September-2016=0.320 t/km^2/month

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

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

Annexure –II

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

Ref.: VCSPL/16/R-1075 Date.: 05.10.2016

SOIL QUALITY ANALYSIS REPORT FOR THE MONTH OF SEPTEMBER-2016

1. Name of Industry : **Bamebari Manganese Mines (M/s TATA Steel Limited)**
2. Sampling Location : **S-1:** Near Bamebari Quarry
3. Date of Sampling : 22.09.2016
4. Date of Analysis : 23.09.2016 to 26.09.2016
5. Sample collected by : VCSPL Representative in presence of TATA Representative

Sl No.	Parameters	Unit	Analysis Results
			S-1
1.	Cobalt as Co	%	0.0022
2.	Nickel as Ni	%	0.046
3.	Mercury as Hg	%	<0.000002
4.	Arsenic as As	%	<0.000002

For Visiontek Consultancy Services Pvt. Ltd.

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

Plot No-108,District Centre,Chandrasekharpur,Bhubaneswar-16,Tel-91-674-2744594, 3250790
Email:visiontekin@gmail.com,visiontekin@yahoo.co.in,visiontek@vcspl.org, Visit us at: www.vcspl.org
"Committed For The Better Environment"

Annexure – III Ambient Air Quality Report Bamebari Mine April'15 to September'16

(Bamebari Camp)

Monthly Average	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	NH_3 (µg/m³)	O_3 (µg/m³)	CO (mg/m³)	Pb (µg/m³)	Ni (ng/m³)	Mn (µg/m3)	As (ng/m³)	Benzene (µg/m³)	Benzo(a) pyrene (ng/m³)
Apr-16	64.4	32.2	5.1	18.9	10.4	20.1	0.17	<0.02	<4	0.11	<1	<2.08	<0.4
May-16	53.0	25.0	5.0	20.8	10.3	19.8	0.16	<0.02	<4	0.11	<1	<2.08	<0.4
Jun-16	51.0	25.0	4.8	19.5	10.30	19.80	0.19	<0.02	<4	0.09	<1	<2.08	<0.4
Jul-16	32.3	15.2	4.0	9.0	<20	<4	0.12	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
Aug-16	32.4	15.4	4.0	9.1	<20	<4	0.11	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
Sep-16	31.7	14.7	4.0	9.0	<20	<4	0.11	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
ANNUAL AVERAGE	44.14	21.25	4.48	14.39	10.33	19.90	0.14	--	--	0.05	--	--	--

Near Bamebari Mine Pit

Monthly Average	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	NH_3 (µg/m³)	O_3 (µg/m³)	CO (mg/m³)	Pb (µg/m³)	Ni (ng/m³)	Mn (µg/m3)	As (ng/m³)	Benzene (µg/m³)	Benzo(a) pyrene (ng/m³)
Apr-16	64.8	32.8	4.7	17.6	<10	<19.62	0.17	<0.02	<4	0.14	<1	<2.08	<0.4
May-16	52.0	24.0	4.4	17.5	<10	<19.62	0.18	<0.02	<4	0.08	<1	<2.08	<0.4
Jun-16	51.0	25.0	4.7	18.4	<10	<19.62	0.17	<0.02	<4	0.09	<1	<2.08	<0.4
Jul-16	33.2	15.4	4.0	9.0	<20	<4	0.12	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
Aug-16	34.0	16.3	4.1	9.2	<20	<4	0.13	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
Sep-16	34.3	16.2	4.3	10.0	<20	<4	0.14	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
ANNUAL AVERAGE	**44.88**	**21.62**	**4.36**	**13.62**	**--**	**--**	**0.15**	**--**	**--**	**0.10**	**--**	**--**	**--**

BMM(Weigh Bridge)

Monthly Average	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	NH_3 (µg/m³)	O_3 (µg/m³)	CO (mg/m³)	Pb (µg/m³)	Ni (ng/m³)	Mn (µg/m3)	As (ng/m³)	Benzene (µg/m³)	Benzo(a) pyrene (ng/m³)
Apr-16	67.2	34.0	5.6	21.3	<10	20.9	0.2	<0.02	<4	0.16	<1.0	<2.08	<0.4
May-16	57.0	27.0	5.3	21.6	<10	20.8	0.19	<0.02	<4	0.12	<1.0	<2.08	<0.4
Jun-16	56.0	28.0	5.1	21.2	<10	20.80	0.19	<0.02	<4	0.13	<1.0	<2.08	<0.4
Jul-16	34.5	16.0	4.0	9.0	<20	<4	0.12	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
Aug-16	33.0	15.3	4.0	9.1	<20	<4	0.11	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
Sep-16	34.8	16.5	4.2	9.7	<20	<4	0.13	<0.001	<0.01	<0.001	<0.001	<0.001	<0.002
ANNUAL AVERAGE	**47.10**	**22.81**	**4.71**	**15.33**	**--**	**20.83**	**0.16**	**--**	**--**	**0.14**	**--**	**--**	**--**

Annexure-IV: Ground Water Level Monitoring

Mitra S. K. Private Limited

AtP O :BARBIL Ward No-6
Dist :Keonjhar, Odisha 758035
CIN :U51909WB1956PTC023037

T +91 9437009615,9437009820 9437076209
E barbil@mitrask.co.in
W www.mitrask.com

MSK TESTING • INSPECTION

Ref. No.BBL/ENV/1396 **DATE: 31/05/2016**

CERTIFICATE OF ANALYSIS

This is to certify that a sample of **"Ground Water Level Monitoring "** reading taken by our representative at **M/s. Bamebari Manganese Mines; P.O: Bamebari, Dist: Keonjhar, Odisha**, in the Presence of a representative of and on account of **M/s.Tata Steel Ltd.**,has been analysed with the following results:-

Date of Monitoring	Location	Water Level (Below Ground level, in mtrs)
06.05.2016	Well at Nimera Village	2.0
06.05.2016	Peizometric test Point at Bamebari	7.0

Checked by:-

For Mitra S. K. Private Limited

Authorised Signatory

H. O : Shrachi Centre (5th Floor), 74B, Acharya Jagadish Chandra Bose Road, Kolkata – 700 016, West Bengal, India
T. 91 33 22172249 / 4014 3000 / 2265 0006 / 2265 0007 F. 91 33 2265 0008 E.info@mitrask.com W. www.mitrask.com

Ref.: VCSPL/16/R-866

Date.: 05.09.2016

GROUND WATER (LABEL) QUALITY ANALYSIS REPORT FOR THE MONTH OF AUGUST-2016

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

Sl. No	Name of Village	Date	Unit	Result
1	Nimera Village	04.08.2016	Mt./bgl	3.2
2	Bababari	20.08.2016	Mt./bgl	3.4

For Visiontek Consultancy Services Pvt. Ltd.

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

Annexure – V: Ground Water Quality

Mitra S. K. Private Limited

At/P.O: BARBIL Ward No-6
Dist: Keonjhar, Odisha - 758035
CIN: U51909WB1966PTC023037

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E: barbil@mitrask.co.in
W: www.mitrask.com

MSK TESTING • INSPECTION

Ref. No.BBL/ENV/1304 **DATE:04/05/2016**

CERTIFICATE OF ANALYSIS

This is to certify that a sample of "**Ground Water** " drawn by our representative on 08/04/2016 at **Bamebari Manganeses Mines ; P.O: Bamebari, Dist: Keonjhar, Odisha** in the Presence of a representative of and on account of **M/s. Tata Steel Ltd.**, has been analyzed with the following results -

MICROBIOLOGICAL ANALYSIS OF WATER AS PER IS: 10500 - 1991

Sl No.	Test Parameters	Norms as per IS:10500-1991	Results
1	Total Coliform Organism MPN/100ml	10 (MAX)	5.6
2	Faecal Coliforms	Absent	Absent
3	E. Coli	Absent	Absent

CHEMICAL ANALYSIS OF WATER AS PER IS: 10500 - 1991

Sl No.	Test Parameters	Norms as per IS: 10500-1991		Results
		Desirable Limit	Permissible Limit	
1	Colour (Hazen Unit)	5	25	<1.0
2	Odour	Unobjectionable	--	Unobjectionable
3	Taste	Agreeable	--	Agreeable
4	Turbidity in NTU	5	10	2
5	pH value (26^0C)	6.5 - 8.5	No Relaxation	7.76
6	Total Hardness(as $CaCO_3$) in mg/l	300	600	27.2
7	Iron (as Fe) in mg/l	0.3	1	<0.05
8	Chloride (as Cl) in mg/l	250	1000	12.24
9	Fluoride (as F) in mg/l	1	1.5	<0.10
10	Residual Free Chlorine in mg/l	0.2(Min.)	---	<0.10
11	Total Dissolved Solids in mg/l	500	2000	42
12	Calcium (as Ca) in mg/l	75	200	3.1
13	Magnesium (as Mg) in mg/l	30	100	4.66
14	Copper (asCu) in mg/l	0.05	1.5	<0.02
15	Manganese (as Mn) in mg/l	0.1	0.3	0.06
16	Sulphate (as SO_4) in mg/l	200	400	6.85
17	Nitrate (as NO_3) in mg/l	45	100	10.2
18	Phenolic Compounds (as C_6H_5OH) in mg/l	0.001	0.002	<0.001
19	Mercury (as Hg) in mg/l	0.001	No Relaxation	<0.001
20	Cadmium (as Cd) in mg/l	0.01	No Relaxation	<0.002
21	Selenium (as Se) in mg/l	0.01	No Relaxation	<0.005
22	Arsenic (as As) in mg/l	0.05	No Relaxation	<0.01
23	Cyanide (as CN) in mg/l	0.05	No Relaxation	<0.01
24	Lead (as Pb) in mg/l	0.05	No Relaxation	<0.005
25	Zinc (as Zn) in mg/l	5	15	<0.02
26	Anionic Detergents (as MBAS) in mg/l	0.2	1	<0.02
27	Chromium (as Cr^{+6}) in mg/l	0.1	No Relaxation	<0.01
28	Mineral Oil mg/l	---	---	<0.01
29	Alkalinity (as $CaCO_3$) in mg/l	200	600	20.4
30	Aluminium (as Al) in mg/l	0.03	0.2	<0.01
31	Boron (as B) in mg/l	1	5	<0.5
32	PAH mg/l	---	---	<0.0001
33	Pesticide mg/l	---	---	<0.00001

SAMPLING LOCATION : Bore well at Panchayet Office

Checked by:-

For Mitra S. K. Private Limited
Authorised Signatory

H. O. : Shrachi Centre (5th Floor), 74B, Acharya Jagadish Chandra Bose Road, Kolkata – 700 016, West Bengal, India
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MITRA S. K. (P) LTD. BARBIL

Ref.: VCSPL/16/R-864

Date.: 05.09.2016

GROUND WATER QUALITY ANALYSIS REPORT FOR THE MONTH OF AUGUST-2016

1. Name of Industry : **Bamebari Manganese Mines (M/s TATA Steel Limited)**
2. Sampling Location : **GW-1: Borewell at Panchayat Office**
   GW-2: Open Well at Nimera Village
3. Date of sampling : 20.08.2016
4. Date of analysis : 22.08.2016 to 26.08.2016
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**	AL	AL
4	Turbidity	APHA 2130 B	NTU	**5**	<2	<2
5	pH Value	APHA 4500H^+ B	--	**6.5-8.5**	7.24	7.20
6	Total Hardness (as $CaCO_3$)	APHA 2340 C	mg/l	**300**	144	142
7	Iron (as Fe)	APHA 3500Fe, B	mg/l	**0.3**	0.19	0.16
8	Chloride (as Cl)	APHA 4500Cl^- B	mg/l	**250**	38.0	32.0
9	Residual, free Chlorine	APHA 4500Cl, B	mg/l	**0.2**	ND	ND
Desirable Characteristics						
10	Dissolved Solids	APHA 2540 C	mg/l	**500**	222	207
11	Calcium (as Ca)	APHA 3500Ca B	mg/l	**75**	38.9	39.3
12	Magnesium (as Mg)	APHA 3500Mg B	mg/l	**30**	11.4	10.7
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**	<0.005	0.01
15	Sulphate (as SO_4)	APHA 4500 SO_4^{2-} E	mg/l	**200**	5.4	4.7
16	Nitrate (as NO_3)	APHA 4500 NO_3^- E	mg/l	**45**	2.5	2.2
17	Fluoride (as F)	APHA 4500F^- C	mg/l	**1.0**	0.014	0.012
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**	BDL	BDL
26	Anionic Detergents (as MBAS)	APHA 5540 C	mg/l	**0.2**	ND	ND
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**	ND	ND
29	Alkalinity	APHA 2320 B	mg/l	**200**	130	127
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	**--**	<0.0001	<0.0001
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.

Annexure – VI: Trace Metal Analysis in Ground Water

Mitra S. K. Private Limited

At/P.O :BARBIL Ward No-5
Dist. Keonjhar, Odisha - 758035
CIN: U51909WB1956PTC023037

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MSK TESTING • INSPECTION

Ref. No.BBL/ENV/1309 **DATE:04/05/2016**

CERTIFICATE OF ANALYSIS

This is to certify that a sample of "**Ground Water** " drawn by our representative on 08/04/2016 at **Bamebari Manganeses Mines ; P.O: Bamebari, Dist: Keonjhar, Odisha** in the Presence of a representative of and on account of **M/s. Tata Steel Ltd.**, has been analyzed with the following results:-

CHEMICAL ANALYSIS OF WATER AS PER IS: 10500 - 1991

Sl No.	Test Parameters	Norms as per IS: 10500-1991		Results
		Desirable Limit	Permissible Limit	
1	Iron (as Fe) in mg/l	0.3	1	<0.05
2	Chromium (as Cr^{+6}) in mg/l	0.1	No Relaxation	<0.01
3	Copper (asCu) in mg/l	0.05	1.5	<0.02
4	Selenium (as Se) in mg/l	0.01	No Relaxation	<0.005
5	Arsenic (as As) in mg/l	0.05	No Relaxation	<0.01
6	Cadmium (as Cd) in mg/l	0.01	No Relaxation	<0.002
7	Mercury (as Hg) in mg/l	0.001	No Relaxation	<0.001
8	Lead (as Pb) in mg/l	0.05	No Relaxation	<0.005
9	Zinc (as Zn) in mg/l	5	15	<0.02
10	Manganese (as Mn) in mg/l	0.1	0.3	0.03

SAMPLING LOCATION :- Tube well at Joribahal

For Mitra S. K. Private Limited

Checked by:- **Authorised Signatory**

H. O.: Shrachi Centre (5th Floor), 74B, Acharya Jagadish Chandra Bose Road, Kolkata – 700 016, West Bengal, India
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MITRA S. K. (P) LTD. BARBIL

Ref:: VCSPL/161R – 865

Date:: 05.09.2016

GROUND WATER (TRESS METAL) QUALITY ANALYSIS REPORT FOR THE MONTH OF AUGUST-2016

1. Name of Industry : **Bamebari Manganese Mines (M/s TATA Steel Limited)**
2. Sampling Location : **GW-1: Borewell at Panchayat Office**
3. Date of sampling : 20.08.2016
4. Date of analysis : 22.08.2016 to 24.08.2016
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**	0.19
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**	<0.005
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.

Annexure – VII(Surface Water Quality Analysis Report)

BAMEBARI Upstream (Before the Confluence point of Kassia Nalla and Baitarani River)				April'15	May'15	June'15	
Sl.	Parameters	Unit	Standards as per	1st Report	1st Report	1st Report	2nd Report
1	Colour	Hazen	5	<1.0	<1.0	<1.0	<1.0
2	Odour	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	pH at 26^{0}C	-	5.5-9.0	7.3	6.4	7.16	7.9
4	Total Dissolved Solids	mg/l	-	57	60	66	112
5	Copper as Cu	mg/l	3.0	<0.02	<0.02	<0.02	<0.02
6	Fluoride as F	mg/l	2.0	0.23	0.46	0.16	0.21
7	Total Residual Chlorine	mg/l	1.0	<0.1	<0.1	<0.1	<0.1
8	Iron as Fe	mg/l	3.0	0.69	0.59	1.70	1.2
9	Manganese as Mn	mg/l	2.0	<0.02	0.06	0.10	0.09
10	Nitrate as NO3	mg/l	10.0	<0.5	1.6	<0.5	<0.5
11	Phenolic Compounds as C6H5OH	mg/l	1.0	<0.001	<0.001	<0.001	<0.001
12	Selenium as Se	mg/l	0.05	<0.005	<0.005	<0.005	<0.005
13	Cadmium as Cd	mg/l	2.0	<0.001	<0.001	<0.001	<0.001
14	Cyanide as CN	mg/l	0.2	<0.01	<0.01	<0.01	<0.01
15	Lead as Pb	mg/l	0.1	<0.005	<0.005	<0.005	<0.005
16	Mercury as Hg	mg/l	0.01	<0.001	<0.001	<0.001	<0.001
17	Nickel as Ni	mg/l	3.0	<0.02	<0.02	<0.02	<0.02
18	Arsenic as As	mg/l	0.2	<0.01	<0.01	<0.01	<0.01
19	Total Chromium as Cr	mg/l	2.0	<0.01	<0.01	<0.01	<0.01
20	Zinc as Zn	mg/l	5.0	<0.02	0.07	0.04	<0.02
21	Hexavalent Chromium as Cr^{+6}	mg/l	0.1	<0.01	<0.01	<0.01	<0.01
22	Vanadium as V	mg/l	0.2	<0.2	<0.2	<0.2	<0.2
23	Total Suspended Solids	mg/l	50 / 100	<2.5	45.0	13.2	12.7
24	Temperature	^{0}C	-	28	28	28	28
25	Dissolved Oxygen	mg/l	-	6.2	4.2	6.0	5.9
26	BOD	mg/l	30	<2.0	6.3	<2.0	<2.0
27	COD	mg/l	250	<4.0	28.2	<4.0	<4.0
28	Oil & Grease	mg/l	10	<1.4	<1.4	<1.4	<1.4
29	Ammonical Nitrogen as N	mg/l	50	<0.1	<0.1	<0.1	<0.1
30	Total Kjedahl Nitrogen as N	mg/l	100	<0.3	<0.3	<0.3	<0.3
31	Sulphide as S	mg/l	2.0	<0.1	<0.1	<0.1	<0.1
32	Free Ammonia as NH_3	mg/l	5.0	<0.1	<0.1	<0.1	<0.1
33	Particulate Size of Suspended Solids	mg/l	Passes through 850 um IS sieve	Passes through 850 um IS sieve	Passes through 850 um IS sieve	Passes through 850 um IS sieve	Passes through 850 um IS sieve
34	Bio-assay	mg/l	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent
35	Dissolved Phosphates as PO_4	mg/l	5.0	<0.05	<0.05	<0.05	<0.05

BAMEBARI Downstream (Intake Point at Tindharia)				April'16	May'16	June'16	
Sl.	Parameters	Unit	Standards as per	1st Report	1st Report	1st Report	2nd Report
1	Colour	Hazen	5	<1.0	<1.0	<1.0	<1.0
2	Odour	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	pH at 26^{0}C	-	5.5-9.0	6.81	6.63	7.02	8.3
4	Total Dissolved Solids	mg/l	-	55	55	68	125
5	Copper as Cu	mg/l	3.0	<0.02	<0.02	<0.02	<0.02
6	Fluoride as F	mg/l	2.0	0.43	0.29	0.21	0.25
7	Total Residual Chlorine	mg/l	1.0	<0.1	<0.1	<0.1	<0.1
8	Iron as Fe	mg/l	3.0	0.43	0.82	1.5	0.98
9	Manganese as Mn	mg/l	2.0	<0.02	0.04	0.07	0.13
10	Nitrate as NO3	mg/l	10.0	<0.5	1.07	<0.5	<0.5
11	Phenolic Compounds as C6H5OH	mg/l	1.0	<0.001	<0.001	<0.001	<0.001
12	Selenium as Se	mg/l	0.05	<0.005	<0.005	<0.005	<0.005
13	Cadmium as Cd	mg/l	2.0	<0.001	<0.001	<0.001	<0.001
14	Cyanide as CN	mg/l	0.2	<0.01	<0.01	<0.01	<0.01
15	Lead as Pb	mg/l	0.1	<0.005	<0.005	<0.005	<0.005
16	Mercury as Hg	mg/l	0.01	<0.001	<0.001	<0.001	<0.001
17	Nickel as Ni	mg/l	3.0	<0.02	<0.02	<0.02	<0.02
18	Arsenic as As	mg/l	0.2	<0.01	<0.01	<0.01	<0.01
19	Total Chromium as Cr	mg/l	2.0	<0.01	<0.01	<0.01	<0.01
20	Zinc as Zn	mg/l	5.0	<0.02	0.03	<0.02	<0.02
21	Hexavalent Chromium as Cr^{+6}	mg/l	0.1	<0.01	<0.01	<0.01	<0.01
22	Vanadium as V	mg/l	0.2	<0.2	<0.2	<0.2	<0.2
23	Total Suspended Solids	mg/l	50 / 100	3.7	47.0	13.7	14.5
24	Temperature	^{0}C	-	28	28	28	28
25	Dissolved Oxygen	mg/l	-	5.9	5.2	6.1	6.4
26	BOD	mg/l	30	<2.0	3.2	<2.0	<2.0
27	COD	mg/l	250	10.8	16.1	<4.0	<4.0
28	Oil & Grease	mg/l	10	<1.4	<1.4	<1.4	<1.4
29	Ammonical Nitrogen as N	mg/l	50	<0.1	<0.1	<0.1	<0.1
30	Total Kjedahl Nitrogen as N	mg/l	100	<0.3	<0.3	<0.3	<0.3
31	Sulphide as S	mg/l	2.0	<0.1	<0.1	<0.1	<0.1
32	Free Ammonia as NH_3	mg/l	5.0	<0.1	<0.1	<0.1	<0.1
33	Particulate Size of Suspended Solids	mg/l	Passes through 850 um IS sieve	Passes through 850 um IS sieve	Passes through 850 um IS sieve	Passes through 850 um IS sieve	Passes through 850 um IS sieve
34	Bio-assay	mg/l	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent	All fishes survive after 96 hrs in 100% effluent
35	Dissolved Phosphates as PO_4	mg/l	5.0	<0.05	<0.05	<0.05	<0.05

BAMEBARI Upstream (Before the Confluence point of Kassia Nalla and Baitarani River)			**July'16**		**Aug '16**		**Sept '16**		**Oct '16**	
Parameter	**Standards as per IS-2296:1992 Class 'C'**	**Unit**	**1st Report**	**2nd Report**	**1st Report**	**2nd Report**	**1st Report**	**2nd Report**	**1st Report**	**2nd Report**
Dissolved Oxygen (minimum)	**4**	mg/l	6.1	6.2	6.1	5.9	5.9	5.6	5.6	5.4
BOD (3) days at 27^0C (max)	**3**	mg/l	<2	2.1	<2	<2	< 1.8	< 1.8	< 1.8	< 1.8
Total Coli form	**5000**	MPN/100 ml	350	240	350	280	280	410	350	320
pH Value	**6.0-9.0**		7.2	7.2	7.2	7.1	7.22	7.18	7.16	7.22
Colour (max)	**300**	Hazen	26	28	24	22	17	15	6	4
Total Dissolved Solids	**1500**	mg/l	120	122	125	118	118	120	124	122
Copper as Cu (max)	**1.5**	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron as Fe (max)	**0.5**	mg/l	0.48	0.44	0.42	0.48	0.72	0.74	0.68	0.72
Chloride (max)	**600**	mg/l	18	18	20	19	22	24	20	22
Sulphates (SO_4) (max)	**400**	mg/l	4.8	4.4	5.2	4.9	4.9	5.1	4.6	4.8
Nitrate as NO_3 (max)	**50**	mg/l	1.8	1.7	2.1	1.7	2.2	1.8	1.8	1.9
Fluoride as F (max)	**1.5**	mg/l	0.021	0.018	0.016	0.014	0.017	0.016	0.019	0.018
Phenolic Compounds as C_6H_5OH (max)	**0.005**	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd (max)	**0.01**	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium as Se (max)	**0.05**	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic as As	**0.2**	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cyanide as CN (max)	**0.05**	mg/l	ND	ND	ND	ND	ND	ND	ND	ND
Lead as Pb(max)	**0.1**	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc as Zn(max)	**15**	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexa Chromium as Cr^{+6}	**0.05**	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anionic Detergents (max)	**1**	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Suspended Solids		mg/l			140	90	85	78	45	44
Turbidity in		NTU			160	150	90	80	44	60
E. coli		MPN/100ml			Absent	Absent	Absent	Absent	Absent	Absent

BAMEBARI Downstream (Intake Point at Tindharia)			**July'16**		**Aug '16**		**Sept '16**		**Oct '16**	
Parameter	**Standards as per IS-2296:1992 Class 'C'**	**Unit**	**1st Report**	**2nd Report**	**1st Report**	**2nd Report**	**1st Report**	**2nd Report**	**1st Report**	**2nd Report**
Dissolved Oxygen (minimum)	**4**	mg/l	5.8	6	5.7	5.6	5.8	5.9	5.5	5.6
BOD (3) days at 27^0C (max)	**3**	mg/l	<2	2.2	<2	<2	< 1.8	< 1.8	< 1.8	< 1.8
Total Coli form	**5000**	MPN/100 ml	280	350	220	240	370	450	410	270
pH Value	**6.0-9.0**		7.1	7.1	7	6.9	6.84	6.94	6.94	6.9
Colour (max)	**300**	Hazen	20	27	28	25	14	12	5	3
Total Dissolved Solids	**1500**	mg/l	118	116	112	118	108	114	112	118
Copper as Cu (max)	**1.5**	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron as Fe (max)	**0.5**	mg/l	0.46	0.41	0.44	0.5	0.68	0.71	0.64	0.66
Chloride (max)	**600**	mg/l	20	18	16	19	18	17	19	18
Sulphates (SO_4) (max)	**400**	mg/l	5.1	4.9	4.6	4.2	4.4	4.1	4.5	4.3
Nitrate as NO_3 (max)	**50**	mg/l	1.9	2	1.6	1.4	1.4	1.3	1.9	1.5
Fluoride as F (max)	**1.5**	mg/l	0.018	0.017	0.012	0.01	0.01	0.008	0.015	0.012
Phenolic Compounds as C_6H_5OH (max)	**0.005**	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium as Cd (max)	**0.01**	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium as Se (max)	**0.05**	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic as As	**0.2**	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cyanide as CN (max)	**0.05**	mg/l	ND	ND	ND	ND	ND	ND	ND	ND
Lead as Pb(max)	**0.1**	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc as Zn(max)	**15**	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexa Chromium as Cr^{+6}	**0.05**	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anionic Detergents (max)	**1**	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Suspended Solids		mg/l			88	68	62	50	49	49
Turbidity in		NTU			220	180	75	70	40	26
E. coli		MPN/100ml			Absent	Absent	Absent	Absent	Absent	Absent

Annexure – VIII :Noise Report

Bamebari Mn Mine			May'16			Aug16
Sl.No.	**Sampling Location**	**Parameter**	**Max**	**Min**	**Avg.**	**Avg.**
1	Township	dB (A) in Day Time	54.3	37.3	48.9	53
2	Hospital	dB (A) in Day Time	47.8	36.8	41.6	39
3	Mines Area	dB (A) in Day Time	61.4	38.6	49.6	60

Bamebari Mn Mine			May'16			Aug16
Sl.No.	**Sampling Location**	**Parameter**	**Max**	**Min**	**Avg.**	**Avg.**
1	Township	dB (A) in Night Time	42.4	34.3	40.9	38
2	Hospital	dB (A) in Night Time	39.4	33.9	36.5	26
3	Mines Area	dB (A) in Night Time	51.6	37.4	41.6	40

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
4	NDIR	CO
5	AAS	Manganese
Other Paraphernalia for analysis of air quality are also available in the laboratory.		
Water Quality		
Sl.No.	**Name of the Instrument**	**Parameter**
1	Analytical weighing Balance	Used for weighing the chemicals
2	Micro Balance	Used for weighing CRMs
3	AAS with VGA and Hallow cathode lamps	All Heavy metals (Arsenic, Mercury, Selenium, Cadmium, Chromium, Cobalt, Iron, Lead, Manganese, Zinc, Aluminium, etc..)
4	Spectrophotometer UV-Visible range	Nitrate, Nitrite, Sulphate, Chromium(VI),Fluoride, Cyanide, Phenolic compounds
5	Flame Photometer	Sodium ,Potassium
6	Ion Analyzer	Fluoride
7	BOD Incubator	BOD
8	COD Digester	COD
9	Furnace	Total volatile solids, Fixed solids
10	Hot Air Oven	Total Suspended Solids, Total Dissolved Solids
11	pH meter	pH
12	Conductivity meter	Conductivity
13	Turbidity Meter	Turbidity
14	Bacteriological Incubator	Total coli form and fecal coli form
15	Autoclave	sterilization
16	Microscope	Bacteriological colony count
17	Magnetic stirrer	Stirring purpose
18	Vacuum filtration unit	Rapid filtration
19	Water Bath	Boiling and evaporation purpose
20	Cadmium reduction column	Nitrate
21	Fluoride distillation unit	Fluoride
22	Kjeldal flask	Ammonia and Organic Nitrogen
23	Hot Plate	Digestion
24	Pizometer	Water level monitoring
25	Aquarium	Bio assay test

Annexure – X
Organizational Structure