

Ref: SRL/2016/SU-ECC-3

Date: 26.05.2016

To,
The Additional Director (South)
Ministry of Environment and Forest
Regional Office (Southern Zone)
Kendriya Sadan, IVth Floor, E & F Wings
17th Main Road, II Block, Kormangala
Bangalore – 560 034

Sub: Six monthly compliance report of Surla- Sonshi Iron Ore Mine, Village Surla, Kudnem & Sonshi Onvoliem, Bicholim and Sattari Talukas, North- Goa (T.C No 21/1954, 5/1954, 20/1954) for the period October 2015 to March 2016.

Respected Sir,

We are herewith submitting the condition wise compliance report as per the conditions laid down in the Environmental Clearance Letter No: J-11015/44/2004-IA.II(M) dated 01/01/2008 for the period **October 2015 to March 2016**.

Yours faithfully,
For Sesa Resources Ltd.



Joseph Coelho
Head Operation - IOG

Enclosed: Six monthly compliance report of Curpem Iron Ore Mine for the period October 2015 to March 2016.

C.C: 1. Member Secretary, Goa State Pollution Control Board
2. CGWB

Sesa Resources Ltd.

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CIN No.: U13209GA1965PLC000030

Compliance To Conditions of Environmental Clearance Issued By
Ministry of Environment and Forests For
SURLA-SONSHI IRON ORE MINE

T.C. No. 21/1954, T.C. No. 5/1954 and T.C No.20/1954

Letter No: J-11015/44/2004-IA.II(M)

Production: 1.1 MTPA as per Environment clearance, however the current production limit is 0.496 MTPA as per capping imposed by State Government

Period –October 2015 –March 2016

A. SPECIFIC CONDITIONS:-

Sl. No.	Conditions of Environmental Clearance	Status of Compliance	Remarks
(i)	The environmental clearance is accorded only for two years during which period detailed hydrogeological study (quality and quantity) on impact of mining on hydrogeology (pre-monsoon, monsoon and post-monsoon) shall be carried out and the report submitted to Ministry. (Stands deleted as per MoEF letter no. J-11015/44/2004-IA.II(M) dated January 1, 2008).	Hydrogeological study is carried out and report was submitted to the Ministry of Environment & Forests. Ministry extended the period of environmental clearance vide MoEF letter no. J-11015/44/2004-IA.II (M) dated January 1, 2008).	
(ii)	Mining shall not be undertaken in forestland within the lease area for which forestry clearance/permission has not been obtained.	Is being complied. (Forest clearance has been obtained for diversion of 24.9810 ha forest area under TC No 21/1954 (letter no. F. No. 8-490/1989-FC dated 28th Jan 2009))	
(iii)	No dumping of OB where natural slopes already exceeding 28° angle.	No dumping is carried out where the natural slope exceeds 28° angle.	
(iv)	Top soil should be stacked properly with adequate measures at earmarked sites. It should be used for reclamation and rehabilitation of the mined out areas.	The mine is in operation for last 50 years and Most of the areas within the mining lease are broken up for mining. Hence there is no generation of top soil.	
(v)	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	Plantation is undertaken along the dead dump slopes. Protective walls are provided. Overburden is stacked properly and the dumps are also stabilized with the geotextile and fast growing native species. The unfinalized dumps are covered with Silpaulin. Garland drains are being constructed at the toe wall of the dump.	

	dumps.		
(vi)	Use of geotextiles for dump stabilisation shall be taken up in the critical areas.	Geotextile are extensively used for covering dump slopes to prevent soil erosion.	
(vii)	<p>Catch drains, and siltation ponds of appropriate size, gully plugs and check dams should be constructed to arrest silt and sediment flows from the mining operations, Desilting operations shall be undertaken regularly and particularly after very monsoon.</p> <p>Garland drain (size, gradient & length) shall be constructed for both mine pit and for the waste dump. 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. Sedimentation pits should be constructed at the corners of the garland drains. Desilting operations shall be undertaken after very monsoon.</p>	All the runoff water is channelized into mining pits. Additionally garland drains and series of settling ponds of appropriate size and check dams are constructed to arrest silt and to ensure no sediment flow from the mining operations. Desilting of the settling ponds to increase their capacity is carried out before the onset of monsoon every year.	
(viii)	Drills should be wet operated or with dust extractors.	Wet drilling method is practiced with dust extractors.	
(ix)	Controlled Blasting should be practiced and only during daytime. The mitigative measures for control of ground vibrations to arrest the fly rocks and boulders should be implemented.	Controlled blasting with Nonel technology is adopted wherever hard rock is encounter and adequate precaution are taken. Blasting if any is carried out only during the day time. Necessary safety measures are taken during blasting.	
(x)	Water sprinkling system should be provided to check fugitive emissions from ancillary operations such as crushing, screening plant, etc.	Regular water sprinkling is done to check fugitive emission.	
(xi)	Measures shall be taken for proper maintenance of vehicles used in mining operations and in transportation of mineral ore and in ensuring that emissions are within prescribed norms. The vehicles should be covered with tarpaulin and should not be overloaded.	Proper maintenance of vehicles and mining machinery is done to ensure that emissions are within prescribed norms. Utmost care is taken to ensure that all trucks are covered with tarpaulin and not overloaded. Also PUC certificates for transportation vehicles are maintained.	
(xii)	Plantation shall be done which includes a green belt of adequate width around the ML area, along roads, OB dumps and non mineralised areas identified for plantation by planting suitable native species in consultation with the local DFO/Agriculture Department. The density	Plantation is done by planting native species like cashew, karanj, suru. etc. Total plantation carried for the year 2015-2016 is 200 Nos within mining lease and 300 saplings outside mining lease in an area of 0.08 ha	

	of trees should be around 2500 plants per hectare. Substantial allocation of funds shall be made for afforestation and reclamation and details furnished to the Ministry and to the MOEF RO, Bangalore.	and 0.12 ha respectively.	
(xiii)	A Progressive Mine closure plan clearly indicating the year of backfilling, area to be backfilled, quantum of OB to be backfilled and are to be reclaimed with plantation shall be prepared and implemented.	Progressive Mine Closure Plan is prepared and approved by IBM wherein details of reclamation are covered.	
(xiv)	Water harvesting measures should be taken up in and around mine site. Further, desiltation shall be done every year before the onset of monsoon.	The rain water falling within the lease area is channelized into mining pits through trenches and garland drains. The water thus harvested is used for activities like beneficiation and dust supersession.	
(xv)	Prior approval of the MOEF and CGWA shall be obtained for using groundwater for mining operations. Additional water requirement, if any, shall be met from recycling of water from mining/processing operations and from water harvesting measures.	Permission from competent authority obtained. Permission from WRD for pumping water from Mine pit is obtained for Surla Mine via registration certificate No. MIN/04/2015 dated 11/08/2015.	
(xvi)	Regular monitoring of ground water level and quality should be carried out by establishing a network of existing wells and constructing new piezometers at suitable locations in project area. The frequency of monitoring should be minimum four times a year – January, pre monsoon (April/May), monsoon (August), post monsoon (November), and winter (January) seasons for groundwater level and in May for quality, particularly for heavy metals. Data generated from groundwater regime monitoring will be submitted to CGWB, Regional office on an annual basis. The monitoring shall include levels of heavy metals including iron.	Regular monitoring of Ground water level and quality is carried out and the reports are submitted to CGWB and MoEF. Settling ponds are constructed at suitable places in the mine, The settling ponds, are desilted every year.	Graphical Representation of Ground water Level and Quality monitoring results are attached as Annexure 2.
(xvii)	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.	Final mine closure plan approved by IBM would be submitted to MOEF in due course of time in accordance with Rule 23(c) of MCDR 1988.	
(xviii)	Consent to Operate shall be obtained from the SPCB for expansion of mining operations.	Consent to operate and authorization under Water Act 1974, Air Act 1981 and Hazardous Waste Rules, 2008 from Goa State Pollution Control Board (letter No. 5/5009/15-PCB/CI-572 dated 7th September 2015) is obtained.	
(xix)	Environmental Clearance is subject to final order of the Hon'ble Supreme Court of India in	Complied.	

	the matter of Goa Foundation vs Union of India in Civil Writ Petition No. 460 of 2004, as may be applicable to this project.		
(xx)	Adequate measures for soil erosion, prevention and control shall be undertaken. Details of implementation on the same shall be submitted to the regional Office of the Ministry within 6 months.	Environmental protection measure is being taken before the onset of monsoon season every year. Proposed environmental protective measures for the year 2016-17 are: 1. Silpaulin Laying: 16500 m ² 2. Plantation: 2000 no's 3. Desilting: 700 m ³	

B. GENERAL CONDITIONS:-

Sl. No.	Conditions	Compliance	Remarks
(i)	No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.	There is, no change in mining technology. All the workings are carried out as per the approval granted by Indian Bureau of Mines.	
(ii)	No change in the calendar plan including excavation, quantum of iron ore, waste dumps should be made.	There won't be any changes in the plan including excavation, quantum of mineral iron ore and waste is been made.	
(iii)	Four ambient air quality monitoring stations should be established in the core zone as well as in the buffer zone for monitoring RPM, SPM, NOX and SO ₂ . Location of the ambient air quality stations should be decided based on meteorological data, topographical features and environmentally and ecologically sensitive targets and the frequency of monitoring should be undertaken in consultation with the State Pollution Control Board.	Ambient air monitoring is conducted as per NAAQS in buffer zone (four locations) and Mine Specific Standard in core zone (four locations). Monitoring is carried out by an in-house MoEF accredited laboratory. Reports submitted to State Pollution Control Board.	Graphical Representation of Air Monitoring Results are attached as Annexure-1
(iv)	Data on environmental quality should be regularly submitted to the Ministry including its Regional Office at Bangalore and the State Pollution Control Board/Central Pollution Control Board once in six months.	Regular monitoring for water and Air quality is carried out and the reports are submitted to MoEF regional office and Goa State Pollution Control Board. Graphical Representation of Air and Water Monitoring Results are attached as Annexure-1 and Annexure-2 respectively.	

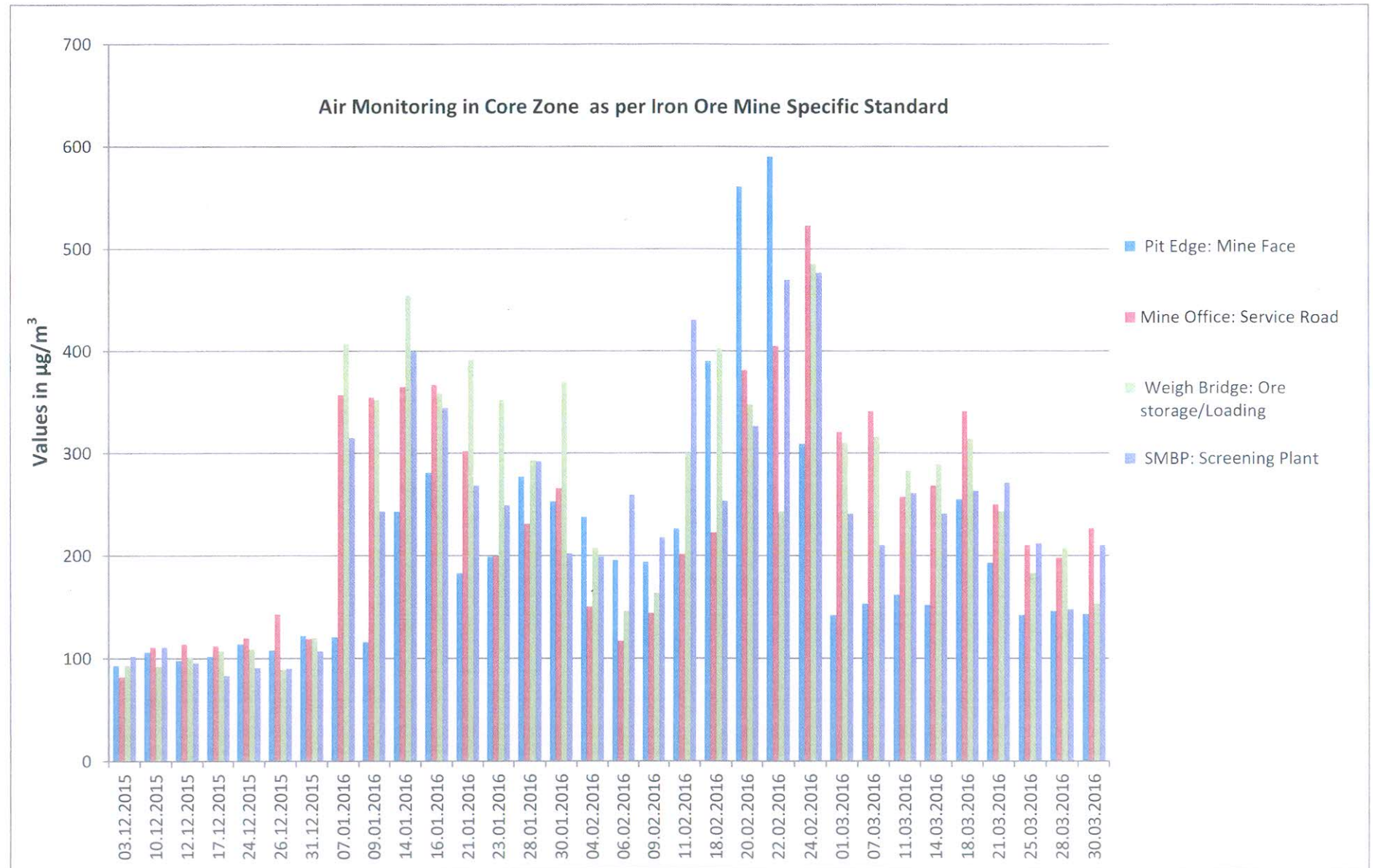
(v)	Adequate measures for control of fugitive emissions should be taken during drilling & blasting operations, loading and transportation of mineral, etc. Fugitive dust emission should be regularly monitored and data recorded properly. Water spraying arrangement over haul roads, loading and unloading points and transportation of minerals, etc. should be provided and properly maintained.	Adequate measures for control of fugitive emissions are being taken during drilling & blasting operations, loading and transportation of mineral, etc.	
(vi)	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.	Adequate measures are being taken for control of noise levels below 85 dB(A) in work environment. Workers engaged in blasting and drilling operations, operations of HEMM, etc. are provided with ear plugs / muffs.	
(vii)	Industrial waste water (workshop and wastewater from the mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19 th May 1993 and 31 st December 1993 or as amended from time to time. Oil and grease trap should be installed in the mine for treatment before discharge of effluents from the workshop. There shall be no discharge of wastewater from the mine site even during peak monsoon season.	Waste water generated by vehicle washing is properly collected, treated and reused. Oil and grease trap is installed in the mine for treatment of the waste water from workshop and reused.	
(viii)	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 programme of the workers should be undertaken periodically and corrective measures taken, if required.	Regular monitoring of workers health is being carried out. However, for the safety of workers at site, engaged at strategic location/dust generation points like loading and unloading points, dust masks are provided. Company has employed doctor who is trained in occupational health. Periodic personal dust monitoring is carried out for the employees for the exposure to dust and health records are maintained.	
(ix)	The data on environmental quality should be collected and analysed either through an in-house environmental laboratory established with adequate number and type of pollution monitoring and analysis equipment or got analysed through an approved laboratory under the Environment (Protection) Rules, 1986 in consultation with the State Pollution Control Board.	Regular Monitoring is carried out for environmental quality parameters through an in-house MoEF accredited Laboratory situated in Codli Mines, Kirlapal- Dabal, Goa.	

(x)	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.	Environment management cell consists of multidisciplinary qualified personnel. The department reports to the head of the organization.																									
(xi)	The funds earmarked for environmental protection measures should be kept in separate account and not diverted for any other purpose. Year-wise expenditure should be reported to the Ministry of Environment & Forests.	<p>Separate funds are earmarked in the revenue * budget for various environment activities like Reclamation, Dust suppression, Erosion control measures, water treatment etc. and are properly tracked. Year wise expenditure earmarked for environmental protection is regularly reported to MoEF.</p> <p>The total Expenditure towards Environmental protective measures for the year 2015-16 is :</p> <table><tr><td>1</td><td>Water Treatment</td><td>11468</td></tr><tr><td>2</td><td>Erosion Control Measures</td><td>1052165</td></tr><tr><td>3</td><td>Statutory Requirement</td><td>56905</td></tr><tr><td>4</td><td>Dust Suppression</td><td>118516</td></tr><tr><td>5</td><td>General Expenses</td><td>27480</td></tr><tr><td>6</td><td>Mine Reclamation</td><td>1368</td></tr><tr><td>7</td><td>Environmental Monitoring</td><td>236735</td></tr><tr><td></td><td>Total expenditure (in Rs.)</td><td>1504637</td></tr></table>	1	Water Treatment	11468	2	Erosion Control Measures	1052165	3	Statutory Requirement	56905	4	Dust Suppression	118516	5	General Expenses	27480	6	Mine Reclamation	1368	7	Environmental Monitoring	236735		Total expenditure (in Rs.)	1504637	
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(xii)	The project authorities should inform to the Regional Office located at Bangalore regarding date of financial closures and final approval of the project by the concerned authorities, and the date of start of land development work.	Regional office, Bangalore is kept informed regarding date of final closure and final approval of the project by the concerned authorities.																									
(xiii)	The Regional Office of this Ministry located at Bangalore shall monitor compliance of the stipulated environmental conditions. The project authorities should extend full cooperation to the officer(s) of the Regional Office by furnishing the requisite data/information/ monitoring reports.	All necessary support is provided during the visit and data will be furnished as per the requirements.																									
(xiv)	A copy of the clearance letter should be marked to concerned Panchayat/local NGO, if any, from whom any suggestion/ representation has been received while processing the proposal.	A copy of the clearance letter is marked to concern Panchayat.																									
(xv)	The State Pollution Control Board should display a copy of the clearance letter at the Regional office, District Industry Centre and the collector's/ Tehsildar's Office for 30 days.	Complied.																									

(xvi)	The project authorities should advertise at least in two local newspapers widely circulated around the project, one of which shall be in the vernacular language of the locality concerned within 7 days of issuance 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 Control Board and may also be seen at web site of the Ministry of Environment and forests at http://envfor.nic.in .	Advertisement in two local newspapers widely circulated was published. A copy of the same was submitted to your good office.	
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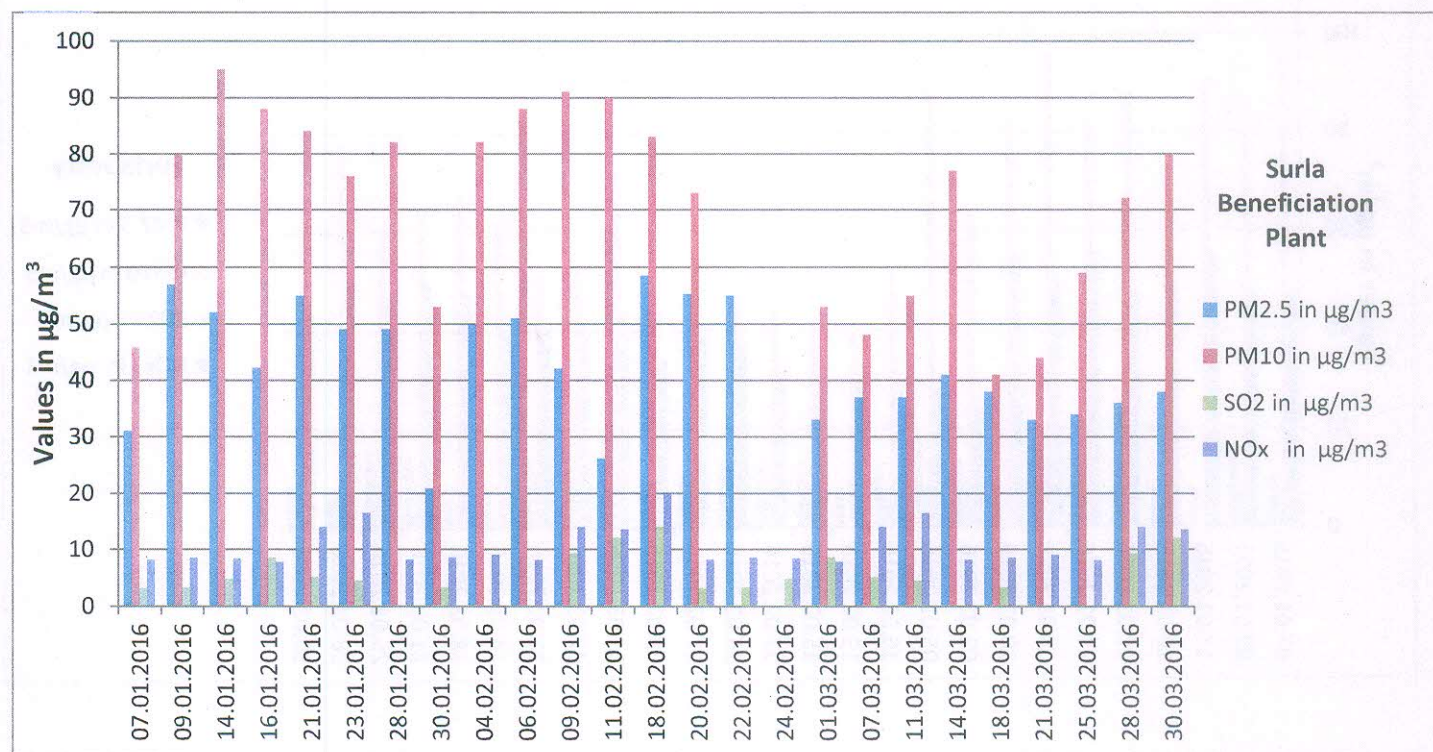
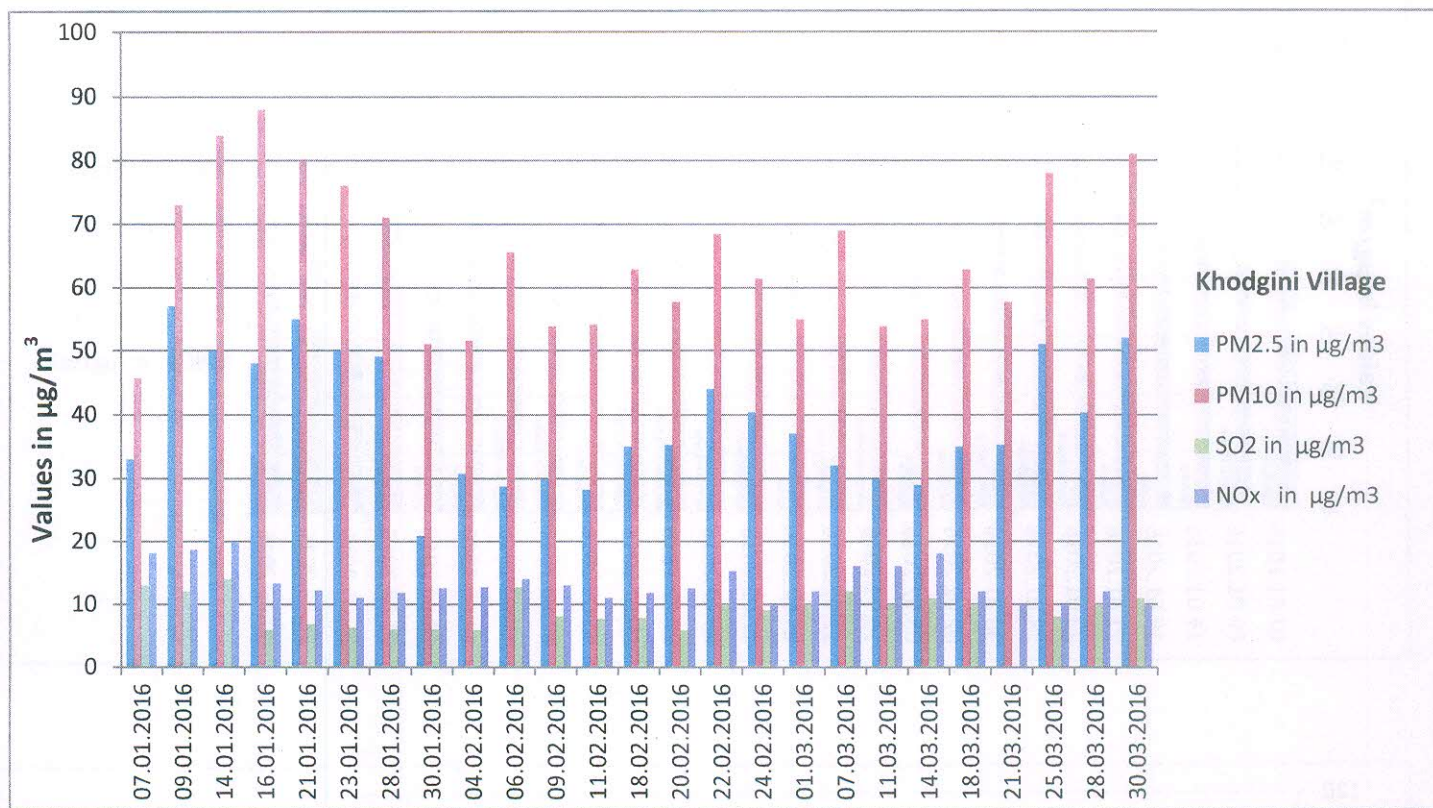
Ambient Air Quality Monitoring Report

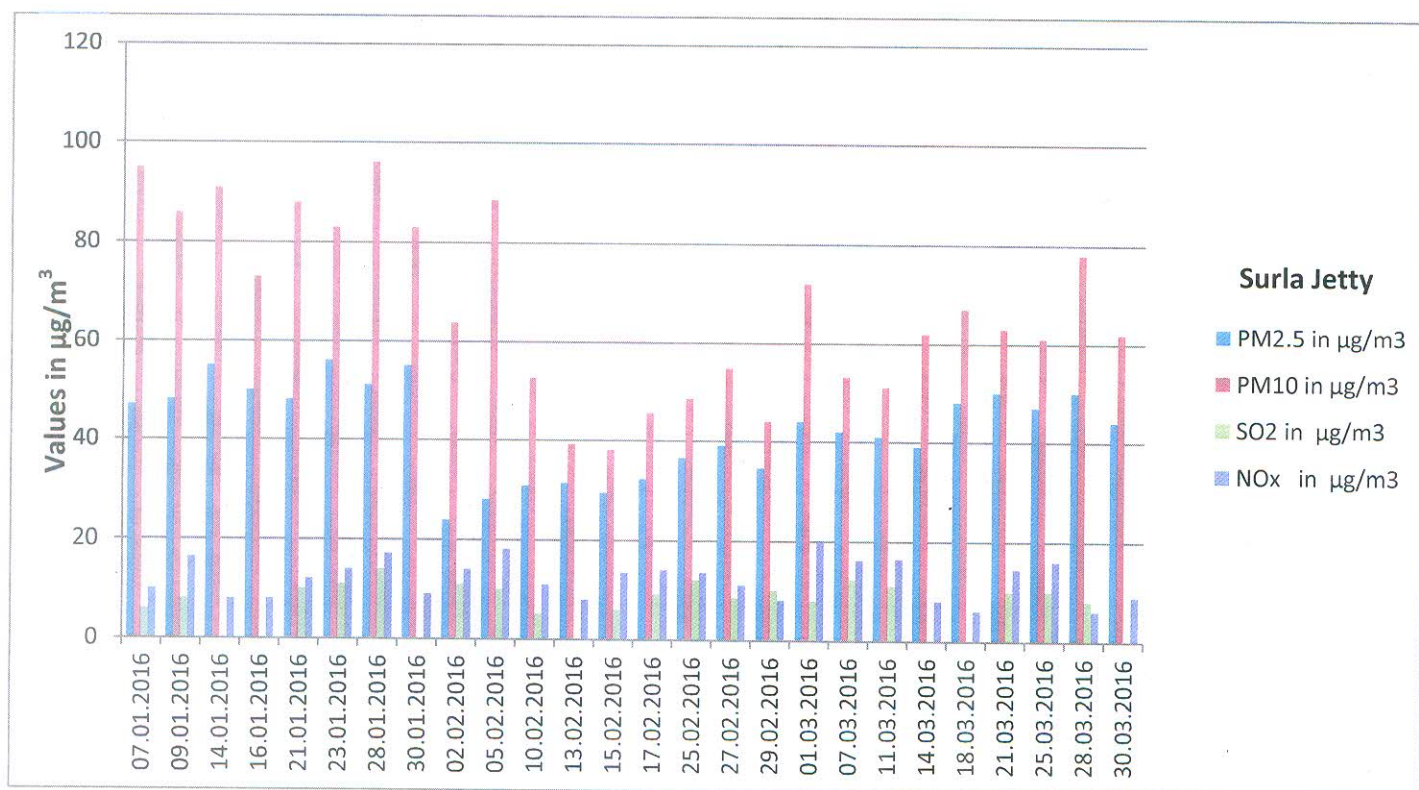
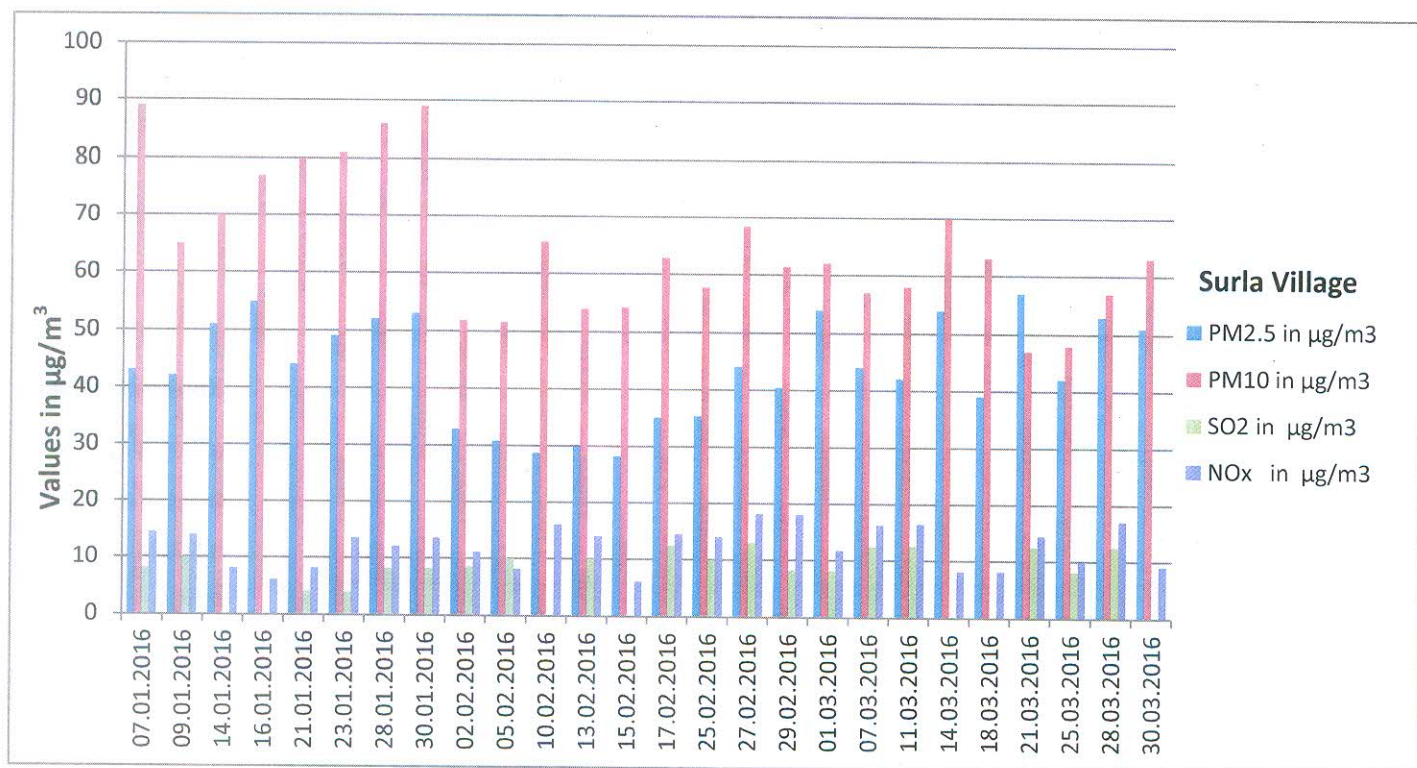
Surla- Sonshi Iron Ore Mine



Ambient Air Quality Monitoring Report

Surla- Sonshi Iron Ore Mine





Well Level Water Report Surla-Sonshi Iron Ore Mine



M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Codli Mines, P.O. Kirlapale, Goa-403727

Recognised by Ministry of Environment, Forests and Climate change, Govt. of India Vide Notification .S.O.137(E).

Dated 12th January 2015, Valid up to 11.01.2020

* Certified by ISO 9001:2008, ISO 14001 :2004 and OHSAS 18001:2007

Surface water Analysis Report for the month of October 2015

Mine Name: Surla Mine

Date of Sample collection: 24.10.2015

Standard method used for analysis: APHA Standard

Permissible limits - Applicable only for Mine Discharge

Date of Receipt of sample: 26.10.2015

Analysis completion date : 31.10.2015

Parameter	Unit	Location			
		Permissible limits	Nallah water- Bhillem	Sonshi Nallah Water- Entry to Mine	Sonshi Nallah water- Exit from Mine
Colour	Hazen	----	34	9	10
pH	----	5.5 to 9.0	6.81	6.58	6.61
Turbidity	NTU	----	3.1	0.97	1.03
Dissolved Solids	mg/lit	----	47.5	26	26.4
Conductivity	μ S/cm	----	95.2	52	52.7
Suspended Solids	mg/lit	100	3	2	3
Chlorides	mg/lit	----	5.7	4.75	3.8
Total Hardness as CaCO ₃	mg/lit	----	38.76	20.4	20.4
Calcium as Ca ⁺⁺	mg/lit	----	10.61	4.90	4.08
Magnesium as Mg ⁺⁺	mg/lit	----	2.97	1.98	2.48
Sulphate as SO ₄	mg/lit	----	1.1	0.2	2.3
Phosphate as PO ₄	mg/lit	5	BDL	BDL	BDL
Nitrate as NO ₃	mg/lit	10	0.18	0.01	0.1
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3
C.O.D	mg/lit	250	<10	20	<10
Total Iron	mg/lit	3	0.20	0.10	0.12
Manganese as Mn	mg/lit	2	0.04	0.03	0.04
D.O	mg/lit	----	4.3	4	4.10
Oil & Grease	mg/lit	10	1.2	1.5	<1

Note :- No water discharge from tailing pond discharge SMBP, Water from SBP tailing Pond & Mine discharge to Paddy
BDL: Below Detection Limit

Govt. Analyst

Laboratory Incharge



M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Godli Mines, P.O. Kirlapale, Goa-403727

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Well Water Analysis Report

Mine Name: Surla Mine


Date of Sample collection :24.10.2015

Standard method used for analysis: APHA Standard

Date of Receipt of sample:26.10.2015

Analysis completion date:31.10.2015

Parameter	Unit	Permissible Limit	Location				
			Mine Garage Well	Behind New Admin Office Well	Surla jetty Well	Surla Village Well	Khodgini Well
Colour	Hazen	<5.0	3	4	<5	3	4
pH	-	6.5-8.5	6	6.27	5.60	5.97	6.24
Turbidity	NTU	5	0.91	1.15	1.1	0.92	3.08
Conductivity	µs/cm	-	41	73.7	61.3	84.8	227
Dissolved Solids	mg/lit	500	20.5	37	30.7	42.4	113
Suspended Solids	mg/lit	-	2	2	2	2	2
Chloride	mg/lit	250	4.75	6.65	8.55	14.25	7.6
Total Hardness as CaCO3	mg/lit	200	12.24	26.52	12.24	14.28	77.52
Calcium as Ca++	mg/lit	75	3.26	7.34	4.08	4.08	18.77
Magnesium as mg++	mg/lit	30	0.99	1.98	0.5	0.99	7.44
Sulphate as SO4	mg/lit	200	1	0.31	0.22	0.24	0.9
Nitrate as NO3	mg/lit	45	0.08	1.1	1.3	0.18	0.5
Alkalinity	mg/lit	200	1.0	3.0	2.1	2.2	1.5
Iron as Fe	mg/lit	0.3	0.16	0.09	0.11	0.09	0.11
Manganese as Mn	mg/lit	0.1	0.03	0.04	0.04	0.05	0.03
MPN/100ml	mg/lit	Absent	18	17	25	8	10


Govt. Analyst


Laboratory Incharge



M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Corli Mines, P.O. Kiriapale, Goa-493727

Recognised by Ministry of Environment, Forests and Climate Change, Govt. of India Vide Notification S.O.137(E).

Dated 12th January 2015, Valid up to 11.01.2020

* Certified by ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007

Surface water Analysis Report for the month of November 2015

Mine Name: Surla Mine

Date of Sample collection : 27.11.2015

Standard method used for analysis: APHA Standard

Permissible limits - Not applicable

Date of Receipt of sample: 27.11.2015

Analysis completion date : 05.12.2015

Parameter	Unit	Location				
		Permissible limits	Mine discharge to paddy fields	Nallah water- Bhillem	Sonshi Nallah Water- Entry to Mine	Sonshi Nallah water- Exit from Mine
Colour	Hazen	----	20	107	2	<5
pH	----	5.5 to 9.0	6.52	6.75	6.36	6.4
Turbidity	NTU	----	6.97	18.31	1.26	1.31
Dissolved Solids	mg/lit	----	28.9	50.7	21	22
Conductivity	µS/cm	----	57.7	101.4	42	43.9
Suspended Solids	mg/lit	100	3	3	2	2
Chlorides	mg/lit	----	6	8	3.80	4
Total Hardness as CaCO ₃	mg/lit	----	27	45	16.32	18
Calcium as Ca ⁺⁺	mg/lit	----	6.53	10.61	4.08	4.9
Magnesium as Mg ⁺⁺	mg/lit	----	2.48	4.46	1.49	1.49
Sulphate as SO ₄	mg/lit	----	2.4	4.21	4	3.3
Phosphate as PO ₄	mg/lit	5	BDL	BDL	BDL	BDL
Nitrate as NO ₃	mg/lit	10	0.1	0.1	0.02	0.1
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	<3
C.O.D	mg/lit	250	<10	12	20	19.4
Total Iron	mg/lit	3	0.08	0.19	0.1	0.11
Manganese as Mn	mg/lit	2	0.03	0.04	0.02	0.02
D.O	mg/lit	----	4.3	4.4	4.2	4.1
Oil & Grease	mg/lit	10	<1	<1	<1	1

Note :- No water discharge from Tailing Pond discharge, water from SBP tailing Pond

BDL- Below Detection Limit


Govt. Analyst




Laboratory Incharge

M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Cadiz Mines, P.O. Kiriapale, Goa-403727

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Well Water Analysis Report

Mine Name: Surla Mine


Date of Sample collection :27.11.2015

Standard method used for analysis: APHA Standard

Date of Receipt of sample:27.11.2015

Analysis completion date:05.02.2015

Parameter	Unit	Permissible Limit	Location				
			Mine Garage Well	Behind New Admin Office Well	Surla jetty Well	Surla Village Well	Khodgini Well
Colour	Hazen	<5.0	4	3	3	4	4
pH		6.5-8.5	6.58	6.54	6.59	6.60	6.65
Turbidity	NTU	5	0.95	1.08	0.99	0.89	2.19
Conductivity	µs/cm	-	38	68	62	56	183
Dissolved Solids	mg/lit	500	19	39	31	24	121
Suspended Solids	mg/lit	-	2	2	2	2	3
Chloride	mg/lit	250	4.75	6.65	9.5	5.7	14.25
Total Hardness as CaCO ₃	mg/lit	200	10.2	24.48	12.24	10.2	69.36
Calcium as Ca++	mg/lit	75	2.45	6.53	4.08	2.45	17.14
Magnesium as mg++	mg/lit	30	0.99	1.98	0.5	0.99	6.44
Sulphate as SO ₄	mg/lit	200	0.31	0.3	0.2	0.3	0.31
Nitrate as NO ₃	mg/lit	45	0.12	0.17	0.11	0.22	0.08
Alkalinity	mg/lit	200	1.0	3.0	2.1	2.2	2.4
Iron as Fe	mg/lit	0.3	1.01	0.10	0.11	0.08	0.12
Manganese as Mn	mg/lit	0.1	0.03	0.03	0.04	0.05	0.04
MPN/100ml	mg/lit	Absent	11	17	16	8	10


Govt. Analyst




Laboratory Incharge

M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Codli Mines, P.O. Kirlapale, Goa-403727

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Surface water Analysis Report for the Month of December 2015

Mine Name: Surla Mine

Date of Sample collection : 28.12.2015

Standard method used for analysis: APHA Standard

Permissible limits - Applicable only for Mine Discharge


Date of Receipt of sample: 29.12.2015

Analysis completion date: 04.01.2016

Parameter	Unit	Location				
		Permissible limits	Mine discharge to paddy fields	Nallah water- Bhillem	Sonshi Nallah Water- Entry to Mine	Sonshi Nallah water- Exit from Mine
Colour	Hazen	---	12	12	8	6
pH	----	5.5 to 9.0	6.66	6.6	6.56	6.56
Turbidity	NTU	----	5.25	5.32	1.3	1.31
Dissolved Solids	mg/lit	----	36.6	56	21	20
Conductivity	μS/cm	----	73	112	42	40
Suspended Solids	mg/lit	100	2	2	2	2
Chlorides	mg/lit	----	5.70	6.65	5.70	8.6
Total Hardness as CaCO ₃	mg/lit	----	27.51	40.35	18.36	14.3
Calcium as Ca ⁺⁺	mg/lit	----	6.60	10.27	4.08	3.26
Magnesium as Mg ⁺⁺	mg/lit	----	2.67	3.57	1.98	1.49
Sulphate as SO ₄	mg/lit	----	4.2	4.8	1.9	2.8
Phosphate as PO ₄	mg/lit	5	BDL	BDL	BDL	BDL
Nitrate as NO ₃	mg/lit	10	0.1	0.1	0.1	0.14
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	<3
C.O.D	mg/lit	250	<10	<10	<10	<10
Total Iron	mg/lit	3	0.18	0.18	0.09	0.12
Manganese as Mn	mg/lit	2	0.02	0.01	0.04	0.04
D.O	mg/lit	----	5.1	4.4	4.2	4.7
Oil & Grease	mg/lit	10	Nil	<1	Nil	<1

Note:- No water discharge from Tailing Pond SMBP, SBP tailing pond

BDL Below Detection Limit


Govt. Analyst




Laboratory Incharge

M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Codli Mines, P.O. Kirlapale, Goa-403727

Recognised by Ministry of Environment, Forests and Climate change, Govt. of India Vide Notification S.O.137(E). Dated 12th January 2015, valid up to 11.01.2020

* Certified by ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007

Well Water Analysis Report

Mine Name: Surla Mine

Date of Sample collection :28.12.2015


Standard method used for analysis: APHA Standard

Date of Receipt of sample:29.12.2015

Analysis completion date:04.01.2016

Parameter	Unit	Permissible Limit	Location				
			Mine Garage Well	Behind New Admin Office Well	Surla jetty Well	Surla Village Well	Khodgini Well
Colour	Hazen	<5.0	3	3	4	3	2
pH	-	6.5-8.5	6.2	6.18	5.77	5.27	6.25
Turbidity	NTU	5	1.08	1.19	1.42	1.28	0.96
Conductivity	µs/cm	-	40	76	90.5	93.1	205
Dissolved Solids	mg/lit	500	20	38	45.1	46.6	101
Suspended Solids	mg/lit	-	2	2	2	2	2
Chloride	mg/lit	250	3.80	6.65	18.05	19	13.3
Total Hardness as CaCO ₃	mg/lit	200	10.2	28.56	16.51	14.67	66.02
Calcium as Ca ⁺⁺	mg/lit	75	2.45	8.16	3.67	4.4	16.14
Magnesium as mg ⁺⁺	mg/lit	30	0.99	1.98	1.78	0.89	6.24
Sulphate as SO ₄	mg/lit	200	0.31	3.74	0.2	0.3	0.31
Nitrate as NO ₃	mg/lit	45	0.12	0.17	0.11	0.22	0.08
Alkalinity	mg/lit	200	1.0	3.0	2.1	2.2	2.4
Iron as Fe	mg/lit	0.3	0.15	0.09	0.15	0.09	0.11
Manganese as Mn	mg/lit	0.1	0.03	BDL	BDL	0.03	0.01
MPN/100ml	mg/lit	Absent	14	Absent	8	11	Absent

BDL- Below Detection Limit


Govt. Analyst
Laboratory Incharge

M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Cadu Mines, P.O. Kiriapale, Goa-403727

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Surface water Analysis Report for the month of January 2016

Mine Name: Surla Mine

Date of Sample collection: 25.01.2016

Standard method used for analysis: APHA Standard

Permissible limits - Applicable only for Mine Discharge


Date of Receipt of sample: 25.01.2016

Analysis completion date : 30.01.2016

Parameter	Unit	Location						
		Permissible limits	Mine discharge to paddy fields	Nallah water- Bhilleem	Sonshi Nallah Water- Entry to Mine	Sonshi Nallah water- Exit from Mine	Upstream river Mandovi	Downstream river Mandovi
Colour	Hazen	---	17	35	10	15	4	5
pH	---	5.5 to 9.0	6.5	6.5	6.39	6.24	6.67	6.81
Turbidity	NTU	---	2.61	2.85	2.48	2.51	1.08	1.79
Dissolved Solids	mg/lit	---	36.4	64.5	19	17.4	11000	11100
Conductivity	μ S/cm	---	72.8	129	38	34.8	21900	22000
Suspended Solids	mg/lit	100	2	2	2	3	3	3
Chlorides	mg/lit	---	6.8	7.7	5.8	4.8	8215.3	8244.3
Total Hardness as CaCO ₃	mg/lit	---	32	50	14	12	2390	2400
Calcium as Ca ⁺⁺	mg/lit	---	7.2	12	4	3.2	168	172
Magnesium as Mg ⁺⁺	mg/lit	---	3.4	4.86	0.97	0.97	478.7	478.7
Sulphate as SO ₄	mg/lit	---	2.3	2.1	2.3	2.8	312	411
Phosphate as PO ₄	mg/lit	5	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO ₃	mg/lit	10	0.1	0.2	0.4	0.2	3	2.5
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	<3	<3	<3
C.O.D	mg/lit	250	<10	<10	<10	<10	<10	<10
Total Iron	mg/lit	3	0.14	0.15	0.69	0.36	0.12	0.11
Manganese as Mn	mg/lit	2	BDL	BDL	0.42	0.02	0.01	0.02
D.O	mg/lit	---	5	5	6	7	7	4.4
Oil & Grease	mg/lit	10	<1	1	<1	1	3	4

Note :- No water discharge from tailing pond discharge SMBP, Water from SBP tailing Pond

BDL- Below Detection Limit


Govt Analyst




Laboratory Incharge

M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Codli Mines, P.O. Kirlapale, Goa-403727

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Well Water Analysis Report

Mine Name: Surla Mine

Date of Sample collection :25.01.2016

Standard method used for analysis: APHA Standard

Date of Receipt of sample:25.01.2016

Analysis completion date:30.01.2016

Parameter	Unit	Permissible Limit	Location				
			Mine Garage Well	Behind New Admin Office Well	Surla jetty Well	Surla Village Well	Khodgini Well
Colour	Hazen	<5.0	<5	<5	<5	<5	<5
pH	-	6.5-8.5	5.21	5.65	5.33	5.50	5.43
Turbidity	NTU	5	0.56	0.69	0.7	1	0.65
Conductivity	µs/cm	-	29.9	28.9	28.6	29.4	29.2
Dissolved Solids	mg/lit	500	15	14.5	14.4	14.7	14.6
Suspended Solids	mg/lit	-	2	2	2	2	2
Chloride	mg/lit	250	6.8	5.8	5.8	4.8	4.8
Total Hardness as CaCO ₃	mg/lit	200	12	10	8	10	12
Calcium as Ca ⁺⁺	mg/lit	75	2.4	2.4	3.2	3.2	2.4
Magnesium as mg ⁺⁺	mg/lit	30	1.46	0.97	Nil	0.49	1.46
Sulphate as SO ₄	mg/lit	200	0.3	3	2.36	0.31	0.32
Nitrate as NO ₃	mg/lit	45	0.12	0.18	0.10	0.23	0.10
Alkalinity	mg/lit	200	11	10	9	10	10
Iron as Fe	mg/lit	0.3	0.07	0.15	0.20	0.15	0.17
Manganese as Mn	mg/lit	0.1	0.03	0.02	0.01	0.03	0.02
MPN/100ml	mg/lit	Absent	Absent	12	11	12	10

BDL- Below Detection Limit

Govt. Analyst

Laboratory Incharge



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Surface water Analysis Report for the month of February 2016

Mine Name: Surla Mine

Date of Sample collection: 27.02.2016

Standard method used for analysis: APHA Standard

Permissible limits - Applicable only for Mine Discharge


Date of Receipt of sample: 27.02.2016

Analysis completion date : 03.03.2016

Parameter	Unit	Location						
		Permissible limits	Mine discharge to paddy fields	Nallah water- Bhillem	Sonshi Nallah Water- Entry to Mine	Sonshi Nallah water- Exit from Mine	Upstream river Mandovi	Downstream river Mandovi
Colour	Hazen	---	32	55	10	5	10	5
pH	---	5.5 to 9.0	6.91	7.02	6.39	6.41	7.17	6.81
Turbidity	NTU	---	4.06	2.31	2.48	1.87	3.18	1.79
Dissolved Solids	mg/lit	---	36.6	66.4	19	18	15200	15000
Conductivity	μ S/cm	---	73.2	132.9	38	39	30400	30000
Suspended Solids	mg/lit	100	2	2	2	2	3	3
Chlorides	mg/lit	---	5.8	5.8	5.8	6.8	10028	9264
Total Hardness as CaCO ₃	mg/lit	---	26	52	14	12.0	3400	3200
Calcium as Ca ⁺⁺	mg/lit	---	6.4	13.6	4	3.2	240	224
Magnesium as Mg ⁺⁺	mg/lit	---	2.43	4.374	0.97	1.0	680.4	641.5
Sulphate as SO ₄	mg/lit	---	1.7	2.1	1.6	2.0	302	457
Phosphate as PO ₄	mg/lit	5	BDL	BDL	BDL	BDL	0.1	0.1
Nitrate as NO ₃	mg/lit	10	0.14	0.22	0.26	0.2	3	3.4
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	<3	<3	<3
C.O.D	mg/lit	250	<10	<10	<10	<10	17	17
Total Iron	mg/lit	3	0.29	0.15	0.50	0.35	0.15	0.18
Manganese as Mn	mg/lit	2	0.01	0.02	BDL	BDL	0.01	BDL
D.O	mg/lit	---	5	5	6	6	4.8	4.6
Oil & Grease	mg/lit	10	<1	1.1	<1	1	3	3

Note :- No water discharge from SMBP tailing pond & SBP tailing Pond

BDL- Below Detection Limit


Govt. Analyst




Laboratory Incharge

M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Codli Mines, P.O. Kiriapale, Goa-403727

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Well Water Analysis Report

Mine Name: Surla Mine

Date of Sample collection :27.02.2016

Standard method used for analysis: APHA Standard

Date of Receipt of sample: 27.02.2016


Analysis completion date: 03.03.2016

Parameter	Unit	Permissible Limit	Location				
			Mine Garage Well	Behind New Admin Office Well	Surla jetty Well	Surla Village Well	Khodgini Well
Colour	Hazen	<5.0	<5	<5	<5	<5	<5
pH	-	6.5-8.5	6.07	6.44	5.81	6.13	7.36
Turbidity	NTU	5	0.61	2.4	1.14	2.38	2.06
Conductivity	µs/cm	-	30.8	73.4	64.3	85.9	73.8
Dissolved Solids	mg/lit	500	15.4	36.8	32.1	42.9	37
Suspended Solids	mg/lit	-	2	2	2	2	2
Chloride	mg/lit	250	6.8	5.8	8.7	8.7	17.4
Total Hardness as CaCO ₃	mg/lit	200	10	26	12	16	26
Calcium as Ca ⁺⁺	mg/lit	75	3.2	6.4	3.2	5.6	8.8
Magnesium as mg ⁺⁺	mg/lit	30	0.486	2.43	0.972	0.486	0.972
Sulphate as SO ₄	mg/lit	200	1.3	1.26	1.1	1.01	0.32
Nitrate as NO ₃	mg/lit	45	0.15	0.17	0.09	0.11	0.10
Alkalinity	mg/lit	200	6	22	11	12	31
Iron as Fe	mg/lit	0.3	0.63	0.04	0.71	0.28	0.20
Manganese as Mn	mg/lit	0.1	BDL	0.03	0.02	BDL	BDL
MPN/100ml	mg/lit	Absent	Absent	10	14	15	13

BDL- Below Detection Limit


Govt. Analyst




Laboratory Incharge

* Certified by ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007

Surface water Analysis Report for the month of March 2016

Mine Name: Surla Mine
Date of Sample collection: 26.03.2016
Standard method used for analysis: APHA Standard
Permissible limits - Applicable only for Mine Discharge

Date of Receipt of sample: 26.03.2016
Analysis completion date : 31.03.2016

Parameter	Unit	Location				
		Permissible limits	Mine discharge to paddy fields	Nallah water- Bhillem	Upstream river Mandovi	Downstream river Mandovi
Colour	Hazen	----	8	16	8	5
pH	----	5.5 to 9.0	6.89	6.93	6.96	6.83
Turbidity	NTU	----	0.98	1.63	2.1	2.28
Dissolved Solids	mg/lit	----	38.1	65	14900	14200
Conductivity	µS/cm	----	76.2	130	29800	28400
Suspended Solids	mg/lit	50	2	2	5	6
Chlorides	mg/lit	----	5.8	5.8	9806	9613
Total Hardness as CaCO ₃	mg/lit	----	28	48	3000	2800
Calcium as Ca ⁺⁺	mg/lit	----	6.4	12.0	232.5	216.4
Magnesium as Mg ⁺⁺	mg/lit	----	2.92	4.37	588.1	549.2
Sulphate as SO ₄	mg/lit	----	1.4	2	210	196
Phosphate as PO ₄	mg/lit	5	BDL	BDL	0.3	0.3
Nitrate as NO ₃	mg/lit	10	0.1	0.22	3	3.3
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	<3
C.O.D	mg/lit	250	10	10	20	20
Total Iron	mg/lit	3	0.28	0.14	0.15	0.14
Manganese as Mn	mg/lit	2	0.01	0.01	0.01	BDL
D.O	mg/lit	----	5	5	5	5
Oil & Grease	mg/lit	10	<1	1.2	2	3

Note :- No water discharge from SMBP tailing pond, SBP tailing Pond, Sonshi Nallah Water- Entry to Mine & Sonshi Nallah water- Exit from Mine

BDL- Below Detection Limit

Govt. Analyst



for Laboratory Incharge

M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Codli Mines, P.O. Kirlapale, Goa-403727

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Well Water Analysis Report

Mine Name: Surla Mine

Date of Sample collection :26.03.2016

Standard method used for analysis: APHA Standard

Date of Receipt of sample: 26.03.2016

Analysis completion date: 31.03.2016

Parameter	Unit	Permissible Limit	Location				
			Mine Garage Well	Behind New Admin Office Well	Surla jetty Well	Surla Village Well	Khodgini Well
Colour	Hazen	<5.0	<5	<5	<5	<5	<5
pH	-	6.5-8.5	6.15	6.39	6.01	6.16	7.17
Turbidity	NTU	5	0.63	1.99	1.1	2.13	1.98
Conductivity	µs/cm	-	34	72	52.2	56.6	96
Dissolved Solids	mg/lit	500	17	36	26.1	28.3	48
Suspended Solids	mg/lit	-	1	2	2	1	2
Chloride	mg/lit	250	6.7	10.6	7.7	7.7	15.4
Total Hardness as CaCO3	mg/lit	200	10	22	14	18	30
Calcium as Ca++	mg/lit	75	3.2	4.8	4.0	4.8	9.6
Magnesium as mg++	mg/lit	30	0.5	2.4	1.0	1.5	1.5
Sulphate as SO4	mg/lit	200	1.2	1.2	1.1	1	0.4
Nitrate as NO3	mg/lit	45	0.10	0.14	0.09	0.10	0.10
Alkalinity	mg/lit	200	10	20	10	12	28
Iron as Fe	mg/lit	0.3	0.11	0.03	0.16	0.20	0.18
Manganese as Mn	mg/lit	0.1	BDL	BDL	0.02	BDL	BDL
MPN/100ml	mg/lit	Absent	Absent	6	11	15	17

BDL- Below Detection Limit

Govt. Analyst

Laboratory Incharge