

Date: 25/05/2016

Ref: SMCL/ENV/2016/46

To

Additional Director (South)
Ministry of Environment & Forest
Regional Office (Southern Zone)
Kandriya Sadan, IVth Floor, E & F Wings,
17th Main Road, II Block Koramangala,
Bangalore-560034

Subject: 'Six Monthly Compliance Report of Bicholim Iron Ore Mine, Goa'

Respected Sir,

We are herewith submitting the condition wise compliance report as per the conditions laid down in the Environmental Clearance **J-11015/45/2005-IA.II(M)** dtd **17.09.2007** for "Bicholim Iron Ore Mine (T.C.No. 11/1941, 12/1941, 13/1941, 14/1941 and 15/1941)" for the period **October 2015 to March 2016**.

Thanking You

Yours faithfully,



Santosh C. Mandrekar
Mines Manager
Sesa Mining Corporation Ltd.,
Bicholim Iron Ore Mine
Bicholim, Goa.

Enclosures: A/A

C.C – Member Secretary, Goa State Pollution Control Board

**Compliance to conditions of Environment Clearance issued by
Ministry of Environment & Forest for Bicholim Iron Ore Mine**

Letter No. J-11015/45/2005-IA.II(M) dtd 17.09.2007

Period: October 2015 to March 2016

Sr.No	EC Condition	Status of compliance	Remarks
A.	Specific Conditions		
(i)	Prior approval of the Chief Wild Life Warden, Govt. of Goa shall be obtained for mining within 10 km of the buffer zone of Dr. Salim Ali Bird Sanctuary.	The eco sensitive zones for the state of Goa have been notified by MoEF and Bicholim mines is out of the zone. As such the provision of Wild Life Protection Act is not applicable.	
(ii)	No dumping of overburden where natural slope is already exceeding 28° angle.	No dumping of overburden is carried out where natural slope is already exceeding 28° angle.	
(iii)	Top soil should be stacked properly with adequate measures at earmarked dump sites. It should be used for green belt development & for reclamation & 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 would be no generation of top soil.	
(iv)	OB and other wastes should be stacked at earmarked sites and should not be kept active for long periods of time.	Dumping of waste is carried out at ear marked sites as per the approved mining plan. Most of the Overburden is	

	<p>Plantation should be taken up for soil stabilization along the slopes of the dumps and terraced after every 5-6 m of height and overall slope angle shall be maintained at 25-26°. Sedimentation pits shall be constructed at the corners of the garland drains. Retention/Toe walls shall be provided at the base of the dumps.</p>	<p>backfilled into pits and are stabilized with geotextile & plantation. Water is been channelized into the settling pit. Series of sedimentation pits are constructed at the corners of the garland drains and same are desilted before the onset of monsoon every year.</p>	
(v)	<p>Use of geotextile for dump stabilization shall be taken up in critical areas.</p>	<p>Geotextile are extensively used for covering dump slopes to prevent soil erosion.</p>	<p>1683.08m² of dump area was covered with geotextile</p>
(vi)	<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 every monsoon. Garland drain (size, gradient and length) shall be constructed for both mine pit and for waste dump. Sump capacity should be designed keeping 50% safety margin</p>	<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.</p>	<p>Following measures were taken: Desilting: 1182.6m³ Boulderwall: 521.25m³</p>

	<p>over and above 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. Desilted operations shall be undertaken after every monsoon.</p>		
(vii)	<p>No drilling and blasting shall be undertaken without approval of the competent authorities.</p>	<p>No drilling and blasting is carried out in the mine. Hard material is broken by means of high capacity ripper dozer</p>	
(viii)	<p>Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral ore. The vehicles should be covered with tarpaulin and should not be overloaded.</p>	<p>Regular maintenance of vehicles and mining machineries are carried out by Company's own maintenance Department to ensure that the emissions are within prescribed norms. Also PUC certificates for Transportation vehicles are obtained & maintained.</p>	

(ix)	<p>Plantation shall be done which includes a green belt of adequate width around the ML area, along roads, OB dumps (38.558 Ha), plant area by planting suitable native species in consultation with the local DFO / Agriculture Department. The density of the trees should be around 2500 plants per ha. Details of allocation of funds shall be made for afforestation and reclamation and details furnished to the ministry and to the MoEF RO, Bangalore.</p>	<p>Plantation of native species is been carried out on dump.</p>	
(x)	<p>A Progressive Mine Closure Plan to reclaim an area of 220.22 Ha with plantation shall be prepared and implemented. The balance excavated void of 8.93 Ha shall be converted into a water reservoir and the sides shall be made gently sloping and plantation developed with peripheral fencing.</p>	<p>Progressive mine closure plan has been prepared and approved by IBM, wherein the details of backfilling and reclamation are covered.</p>	

(xi)	Wastewater from Mineral Beneficiation Plant and mine water shall not be discharged out of the ML and to agricultural fields unless it is treated to conform to prescribed norms. Regular monitoring of mine water discharged from all outlets of the mine into nearby water bodies - Bicholim River, water courses such as nallahs, tributaries, rivulets and to agricultural fields, shall be undertaken and proper records maintained thereof.	Waste water from Mineral Beneficiation Plant is discharged into tailing ponds. The beneficiation plant as well as the tailing ponds are located out side mine lease. Run off water from all parts of mine is channelized into mine pit, and suspended particles are allowed to settle through addition of flocculent and after treatment, water is pumped out. Regular monitoring of mine water discharge from all outlets of the mine into nearby water bodies is carried out and records of monitoring are maintained	Wet beneficiation plant was not in use during this period
(xii)	Water harvesting measures should be taken up in and around mine site. Further, desiltation of water harvesting structures such as check dams, water reservoirs and water channels within the lease area shall be carried out every year before the onset of monsoon.	Rain water is harvested by channelizing runoff water from dumps into mine pit, through garland drains and trenches. The same water is used for activities like dust suppression and vehicle washing. The settling ponds constructed at the toe of the dumps also act as means for harvesting rain water and for	

		ground water recharge. The same are desilted every year before onset of monsoon.	
(xiii)	No groundwater shall be used for mining operations. Prior approval of the MOEF and CGWA shall be obtained for using groundwater for mining/processing operations. Additional water requirement, if any shall be met from recycling of water from mining operations and from rainwater harvesting measures.	No ground water is drawn for the mining/ beneficiation operations. Rainwater harvested in the mining pits is used for dust suppression and agriculture. Water treated in tailing ponds/thickener is reused for beneficiation and additional water requirement for beneficiation is met through river water.	Permission from Ground Water cell of Water Resource Department have been taken vide letter no. MIN/9/2015 dated 11/08/2015
(xiv)	Regular monitoring of ground water level and quality should be carried out by establishing a network of existing wells and construction of new piezometers at suitable locations in project area. The frequency of monitoring should be minimum four times in 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	Regular monitoring of ground water level and quality is carried out .	Water monitoring reports are attached as annexure I

	heavy metals. Data generated from groundwater regime monitoring will be submitted CGWB, Regional Office on an annual basis. The monitoring shall include levels of heavy metals including iron.		
(xv)	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 closure plan approved by IBM will be submitted to MoEF in accordance with Rule 23 (c) of MCDR 1988 in due course of time.	
(xvi)	A Consent to operate should be obtained from GSPCB for expansion of mining operations.	Obtained consent to operate numbered 5/2569/15-PCB/CI-554 dated 07/09/2015 with validity upto 20/05/2017	

B. General Conditions:

B.	General Conditions:		
(i)	No change in mining technology and scope of working should be made without prior approval of the Ministry of Environment & Forest.	Mining is carried out as per mining plan approved by Indian Bureau of Mines	
(ii)	No change in the calendar plan including excavation, quantum of iron ore and waste dumps should be made.	Production & waste generation was carried in accordance with mining plan/ scheme by IBM.	
(iii)	Four ambient air quality - monitoring stations should be established in core zone as well as buffer zone for monitoring RPM, SPM, SO ₂ , NOX. Location of the ambient air quality stations should be decided on the meteorological data, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring should be	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 MoEF accredited lab. Reports are submitted to State Pollution Control Board.	Graphical Representation of the Air Monitoring results are attached as Annexure II

	undertaken in consultation with the State Pollution Control Board.		
(iv)	Data on environmental quality should be regularly submitted to the Ministry including its Regional office located at Bangalore and the State Pollution Control Board / Central Pollution Control Board once in six months.	Environment report on water & air quality analysis is submitted to MoEF on six monthly bases with a copy to GSPCB.	
(v)	Adequate measures for control of fugitive emissions should be taken during drilling & blasting operations, loading & transportation of mineral, etc. Fugitive dust emission from all the sources should be regularly monitored and data recorded properly. Water spraying arrangements on haul road, loading and unloading points, and at	<p>The following measures are taken for control of fugitive dust emission</p> <p>(1) Water sprinkling on mine haulage roads</p> <p>(2) Dumps are covered with geo-textiles and afforested with plants/ grasses which helps in minimizing the fugitive dust.</p> <p>(3) No Drilling & blasting is carried out</p> <p>(4) Ore carrying trucks plying on roads are covered with tarpaulin & free board is</p>	

	transportation of minerals, etc. should be provided and properly maintained.	provided to prevent spillage.	
(vi)	Adequate measures should be taken for control of noise levels below 85 dBA in work environment. Workers engaged in blasting and drilling operations, operations of HEMM, etc. should be provided with ear plugs / muffs.	Dumpers & Heavy Earth Moving Machinery are provided with A/C cabins which minimize the impact of noise on operator. Regular maintenance of Heavy Earth Moving Machinery is carried out, which helps in minimizing noise levels. All the employees working at mines are provided with personnel protective equipments like ear plugs / ear muffs	
(vii)	Industrial waste water (workshop, mineral processing plant and waste water 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 greases trap should be installed in the mine for	water from mine is properly channelized into settling ponds and treated before discharge if any, outside the mine lease. Oil and grease trap is installed in the mine for treatment before discharge of effluents from workshop.	

	<p>treatment before discharge of workshop effluents. There shall be no discharge of waste water from the mine site even during peak monsoon season.</p>		
(viii)	<p>Personal 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 workers should be undertaken periodically and take corrective measures, if required.</p>	<p>Regular monitoring of workers health is being carried out. However, for the safety of workers at site, engaged at strategic locations/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. Various awareness programmes are organized for the workers related to occupational health and safety issues.</p>	
(ix)	<p>The data on environmental quality should be collected and analyzed either through an in-house</p>	<p>Data on environmental quality is analyzed by a MoEF approved Laboratory. The reports are submitted to MoEF and GSPCB on a regular basis.</p>	

	environmental laboratory established with adequate number and type of pollution monitoring and analysis equipment or got analyzed through an approved laboratory under the Environment (Protection) Rules, 1986 in consultation with the State Pollution Control Board.		
(x)	A separate environmental management cell with suitable qualified personnel should be set - up under the control of 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.	<p>Chief Operating Officer (CEO)</p> <p>↓</p> <p>Krishna Kulkarni (Head, HSE)</p> <p>↓</p> <p>Jagdish Desai</p> <p>↙ ↘</p> <p>Vandita Sneha</p>
(xi)	The funds earmarked for environmental protection measures should be kept in separate account and not diverted for 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. with proper tracking.</p> <p>The environmental expenditure for FY: 2015-16 for Bicholim Mine is:</p>	

		<table><tr><th>Purpose</th><th>Amount in Rs</th></tr><tr><td>Dust Suppression</td><td>9,95,624</td></tr><tr><td>Erosion Control</td><td>4,04,115</td></tr><tr><td>General Environment Expenditure</td><td>93,041</td></tr><tr><td>Mine Reclamation</td><td>94,692</td></tr><tr><td>Statutory Requirement</td><td>6,02,471</td></tr><tr><td>Water Treatment</td><td>16,05,19</td></tr><tr><td>Total Expenditure</td><td>37,95,137</td></tr></table>	Purpose	Amount in Rs	Dust Suppression	9,95,624	Erosion Control	4,04,115	General Environment Expenditure	93,041	Mine Reclamation	94,692	Statutory Requirement	6,02,471	Water Treatment	16,05,19	Total Expenditure	37,95,137	
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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 the Ministry located at Bangalore shall monitor compliance of the stipulated conditions. The project authorities should extend full co-operation to the officer (s) of the Regional Office by furnishing the requisite	Full co-operation and all necessary support will be provided during the visit and data will be furnished as per the requirements.																	

	and a copy of the clearance letter is available with the State Pollution Control Board and also at web site of the Ministry of Environment and Forest at http://envfor.nic.in .		
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M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Codli Mines, P.O. Kiripale, 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 March 2016

Mine Name: Bicholim Mine
Date of Sample collection : 24.03.2016
Standard method used for analysis: APHA Standard

Date of Receipt of sample: 24.03.2016
Analysis completion date: 31.03.2016

Parameter	Unit	Permissible limits	Location						
			1Top settling pond (Vagachiper lease Discharge)	2Top settling pond (Lam gao lease Discharge)	3Top settling pond (Totichomordongor lease Discharge)	Upstream River Assanora	Downstream River Assanora	Upstream River Bicholim	Downstream River Bicholim
			4	4	8	5	6	12	7
Colour	Hazen	----	4	4	6.56	7.19	6.94	6.97	6.92
pH	----	5.5 to 9.0	6.70	6.25	2.26	0.77	0.85	1.53	0.94
Turbidity	NTU	----	1.20	1.26	17.5	51.8	56.2	2090	2640
Dissolved Solids	mg/lit	----	55.2	21	35.1	103.6	124.5	4190	5260
Conductivity	µS/cm	----	110.4	41.9	2	2	3	3	3
Suspended Solids	mg/lit	50	2	2	2	43.4	49.2	1195.7	1581.4
Chlorides	mg/lit	----	15.4	5.8	5.8	32	38	460	560
Total Hardness as CaCO ₃	mg/lit	----	36	14	12	10	11	48	48
Calcium as Ca ⁺⁺	mg/lit	----	10	4	3	1.5	2.4	82.6	106.9
Magnesium as Mg ⁺⁺	mg/lit	----	2.9	1.0	1.0	1.7	2.6	2.5	2.8
Sulphate as SO ₄	mg/lit	----	1.5	1	1.5	0.08	0.10	0.13	0.14
Phosphate as PO ₄	mg/lit	5	0.08	BDL	BDL	0.3	0.3	0.5	0.7
Nitrate as NO ₃	mg/lit	10	0.2	0.2	0.3	0.3	0.3	0.3	0.3
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	20	20	29	39
C.O.D	mg/lit	250	10	10	10	0.04	0.02	0.01	0.02
Total Iron	mg/lit	3	0.03	0.02	0.14	BDL	BDL	BDL	BDL
Manganese as Mn	mg/lit	2	BDL	BDL	BDL	7	7	6	6
D.O	mg/lit	----	6	6	7	1.1	1.1	1.2	1.4
Oil & Grease	mg/lit	10	Nil	Nil	Nil				

BDL- Below Detection Limit

Govt. Analyst



for Laboratory Incharge

ANNEXURE I

M/s Sesa Environment Laboratory

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

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Surface Water Analysis Report for the Month of February 2016

Mine Name: Bicholim Mine

Date of Sample collection : 09.02.2016

Standard method used for analysis: APHA Standard

Date of Receipt of sample: 09.02.2016

Analysis completion date: 15.02.2016

Parameter	Unit	Permissible limits	Location						
			1Top settling pond (Vagachiper lease Discharge)	2Top settling pond (Lam gao lease Discharge)	3Top settling pond (Totichomordongor lease Discharge)	Upstream River Assanora	Downstream River Assanora	Upstream River Bicholim	Downstream River Bicholim
Colour	Hazen	----	3	5	2	5	24	23	3
pH	----	5.5 to 9.0	6.97	6.4	6.58	6.75	6.86	6.9	7.06
Turbidity	NTU	----	1.24	1.65	1.73	1	0.9	1.01	1.14
Dissolved Solids	mg/lit	----	54.1	19.5	18	238	237	161	180
Conductivity	µS/cm	----	108.2	38.9	36.1	475	474	322	360
Suspended Solids	mg/lit	100	2	2	2	4	3	3	3
Chlorides	mg/lit	----	14.5	5.8	5.8	49.2	109.9	61.7	70.4
Total Hardness as CaCO ₃	mg/lit	----	34	10	10	38	70	64	68
Calcium as Ca ⁺⁺	mg/lit	----	8.8	2.4	1.6	6.4	8	12	12
Magnesium as Mg ⁺⁺	mg/lit	----	2.9	1.0	1.5	5.3	12.2	8.3	9.2
Sulphate as SO ₄	mg/lit	----	1.8	1.3	1.7	1.7	2.9	2.1	2.4
Phosphate as PO ₄	mg/lit	5	0.03	0.01	0.03	0.01	0.01	0.02	0.06
Nitrate as NO ₃	mg/lit	10	0.43	0.42	0.65	0.33	0.35	0.51	0.67
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	<3	<3	<3	<3
C.O.D	mg/lit	250	77.8	<10	35	35	17	52	43
Total Iron	mg/lit	3	0.04	0.02	0.15	0.07	0.02	0.01	0.02
Manganese as Mn	mg/lit	2	BDL	BDL	BDL	BDL	BDL	BDL	BDL
D.O	mg/lit	----	6	7	7	7	7	6	6
Oil & Grease	mg/lit	10	<1	<1	<1	1.2	1	1	1.4

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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Surface Water Analysis Report for the Month of January 2015

Mine Name: Bicholim Mine

Date of Sample collection : 21.01.2016

Standard method used for analysis: APHA Standard

Date of Receipt of sample: 21.01.2016

Analysis completion date: 27.01.2016

Parameter	Unit	Permissible limits	Location					
			2Top settling pond (Lam gao lease Discharge)	3Top settling pond (Totichomordongor lease Discharge)	Upstream River Assanora	Downstream River Assanora	Upstream River Bicholim	Downstream River Bicholim
Colour	Hazen	----	4	2	33	34	2	5
pH	----	5.5 to 9.0	5.5	5.12	6.43	6.44	6.44	6.47
Turbidity	NTU	----	1.21	1.15	1.89	2.34	0.95	0.89
Dissolved Solids	mg/lit	----	18	19	69.5	57.7	124	167
Conductivity	µS/cm	----	36	38.1	138.8	115.3	249	333
Suspended Solids	mg/lit	100	3	2	2	3	3	2
Chlorides	mg/lit	----	5.8	7.7	20.3	19.3	43.4	61.7
Total Hardness as CaCO ₃	mg/lit	----	16	8	160	26	64	72
Calcium as Ca ⁺⁺	mg/lit	----	1.6	1.6	36	4.80	11.2	12.80
Magnesium as Mg	mg/lit	----	2.92	0.97	17.01	3.40	8.75	9.72
Sulphate as SO ₄	mg/lit	----	2.8	4.3	4.6	5	3.8	3.7
Phosphate as PO ₄	mg/lit	5	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO ₃	mg/lit	10	0.26	0.1	0.4	0.03	0.31	0.2
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	<3	<3	4
C.O.D	mg/lit	250	<10	<10	30	20	20	20
Total Iron	mg/lit	3	0.26	0.15	0.23	0.25	0.12	0.13
Manganese as Mn	mg/lit	2	0.01	BDL	0.06	BDL	BDL	BDL
D.O	mg/lit	----	7	7	3	7	7	6
Oil & Grease	mg/lit	10	<1	<1	1	1	1	1.4

BDL- Below Detection Limit

Note :- No water discharge from 1Top settling pond

[Signature]
Govt Analyst



[Signature]
Laboratory Incharge

1/s Sesa Environment Laboratory

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

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Surface water Analysis Report for the month of December 2015

Mine Name: Bicholim 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	2Top settling pond (Lam gao lease Discharge)	5Top settling pond (Totichomordong or lease Discharge)	Upstream Assanora River	Downstream Assanora River	Upstream Bicholim River	Downstream Bicholim River
Colour	Hazen	----	8	14	5	14	10	12
pH	----	5.5 to 9.0	5.5	5.5	6.36	6.23	6.71	6.85
Turbidity	NTU	----	1.83	1.18	3.15	3.71	3.7	3.91
Dissolved Solids	mg/lit	----	19.6	21.8	430	466	62.4	63.2
Conductivity	µS/cm	----	39.2	43.6	861	929	124.8	126.1
Suspended Solids	mg/lit	100	3	2	4	3	4	3
Chlorides	mg/lit	----	8.55	7.60	215.7	226.1	11.40	10.45
Total Hardness as CaCO ₃	mg/lit	----	9.17	7.34	89.87	95.37	44.02	42.18
Calcium as Ca ⁺⁺	mg/lit	----	2.93	2.20	12.47	11.74	11.00	11.74
Magnesium as Mg ⁺⁺	mg/lit	----	0.45	0.45	14.26	16.04	4.01	3.12
Sulphate as SO ₄	mg/lit	----	0.1	0.24	4.1	4.6	5.3	4.1
Phosphate as PO ₄	mg/lit	5	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO ₃	mg/lit	10	0.14	0.21	0.1	0.1	0.02	0.1
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	<3	<3	<3
C.O.D	mg/lit	250	<10	<10	20	24	20	20
Total Iron	mg/lit	3	0.09	0.21	0.39	0.27	0.15	0.16
Manganese as Mn	mg/lit	2	0.01	0.02	0.11	0.18	0.007	0.01
D.O	mg/lit	----	4.3	4.3	4.5	4.3	4.5	4.2
Oil & Grease	mg/lit	10	<1	Nil	1.1	1.2	1	1.2

Note:- No discharge from 1 Top settling pond

BDL- Below Detection Limit


Govt. Analyst




Laboratory Incharge

M/s Sesa Environment Laboratory

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

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Surface Water Analysis Report for the Month of November 2015

Mine Name: Bicholim Mine

Date of Sample collection :23.11.2015

Standard method used for analysis: APHA Standard

Permissible limits - Applicable only for Mine Discharge

Date of Receipt of sample: 23/11/2015

Analysis completion date: 28/11/2015

Parameter	Unit	Permissible limits	Location						
			1Top settling pond (Vagachiper lease Discharge)	2Top settling pond (Lam gao lease Discharge)	5Top settling pond (Totichomordon gor lease Discharge)	Upstream River Assanora	Downstream River Assanora	Upstream River Bicholim	Downstream River Bicholim
Colour	Hazen	----	17	17	48	18	19	27	24
pH	----	5.5 to 9.0	6.52	5.54	5.58	5.10	5.05	6.5	6.58
Turbidity	NTU	----	1.70	1.86	1.88	1.61	1.72	1.22	1.20
Dissolved Solids	mg/lit	----	49.9	18.5	21.8	28	22.5	55.3	74
Conductivity	uS/cm	----	99.8	37.1	43.8	42	45.2	109.8	108
Suspended Solids	mg/lit	100	3	3	2	3	3	4	2
Chlorides	mg/lit	----	16.15	6.65	8.55	3.80	4.75	8.55	7.60
Total Hardness as CaCO ₃	mg/lit	----	32.64	12.24	12.24	12.24	12.24	42.84	40.8
Calcium as Ca ⁺⁺	mg/lit	----	8.16	1.63	3.26	2.45	2.45	10.61	9.79
Magnesium as Mg ⁺⁺	mg/lit	----	2.97	1.98	0.99	1.49	1.49	3.97	3.97
Sulphate as SO ₄	mg/lit	----	0.2	0.34	0.14	4.8	4.8	3.1	2.8
Phosphate as PO ₄	mg/lit	5	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO ₃	mg/lit	10	0.14	0.1	1.6	0.1	1.62	0.18	0.18
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	<3	<3	<3	3.8
C.O.D	mg/lit	250	<10	<10	16	12	20	19	20
Total Iron	mg/lit	3	0.12	0.10	0.09	0.09	0.10	0.12	0.11
Manganese as Mn	mg/lit	2	0.03	0.04	0.04	0.03	0.03	0.03	0.02
D.O	mg/lit	----	4.4	4.1	4.3	4.3	4.4	4.2	4.1
Oil & Grease	mg/lit	10	Nil	Nil	Nil	<1	1.2	1	1.2

BDL- Below Detection Limit

[Signature]
Analyst



[Signature]
Laboratory Incharge

M/s Sesa Environment Laboratory

Vedanta Limited, Mining Division, Godli Mines, P.O. Kiriapale, 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: Bicholim Mine

Date of Sample collection : 06.10.2015

Standard method used for analysis: APHA Standard


Permissible limits - Applicable only for Mine Discharge

Date of Receipt of sample: 07.10.2015


Analysis completion date: 12.10.2015

Parameter	Unit	Permissible limits	Location						
			1Top settling pond (Vagachiper lease Discharge)	2Top settling pond (Lam gao lease Discharge)	3Top settling pond (Totichomordo ngor lease Discharge)	Upstream River Assanora	Downstream River Assanora *	Upstream River Bicholim	Downstream River Bicholim
Colour	Hazen	----	7	10	27	35	33	34	36
pH	----	5.5 to 9.0	6.37	5.84	5.79	6.5	6.54	6.81	6.76
Turbidity	NTU	----	2.22	1.83	1.83	2.1	2	2.73	2.5
Dissolved Solids	mg/lit	----	43.9	17.6	19.3	124	126	39.7	39
Conductivity	µS/cm	----	88.1	35.2	39.2	249	252	79.5	79
Suspended Solids	mg/lit	100	4	3	3	3	3	3	2
Chlorides	mg/lit	----	12.35	5.7	5.7	55.1	55.10	7.6	6.65
Total Hardness as CaCO ₃	mg/lit	----	30.6	12.24	12.24	40.8	42.84	32.64	32.64
Calcium as Ca ⁺⁺	mg/lit	----	6.53	1.63	3.26	6.53	7.34	6.53	7.34
Magnesium as Mg ⁺⁺	mg/lit	----	3.47	1.98	0.99	5.95	5.95	3.97	3.47
Sulphate as SO ₄	mg/lit	----	0.1	0.24	4.1	4.6	5.3	4.1	3.7
Phosphate as PO ₄	mg/lit	5	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO ₃	mg/lit	10	0.1	0.31	0.12	0.1	0.02	0.1	0.1
B.O.D (3days, 27°C)	mg/lit	30	<3	<3	<3	<3	<3	<3	3.8
C.O.D	mg/lit	250	<10	<10	20	14	20	20	16
Total Iron	mg/lit	3	0.11	0.09	0.10	0.1	0.09	0.11	0.16
Manganese as Mn	mg/lit	2	0.03	0.05	0.03	0.03	0.02	0.02	0.01
D.O	mg/lit	----	4.10	4.2	4.4	4.3	4.5	4.20	4.9
Oil & Grease	mg/lit	10	<1	<1	<1	1.2	1.5	<1	<1

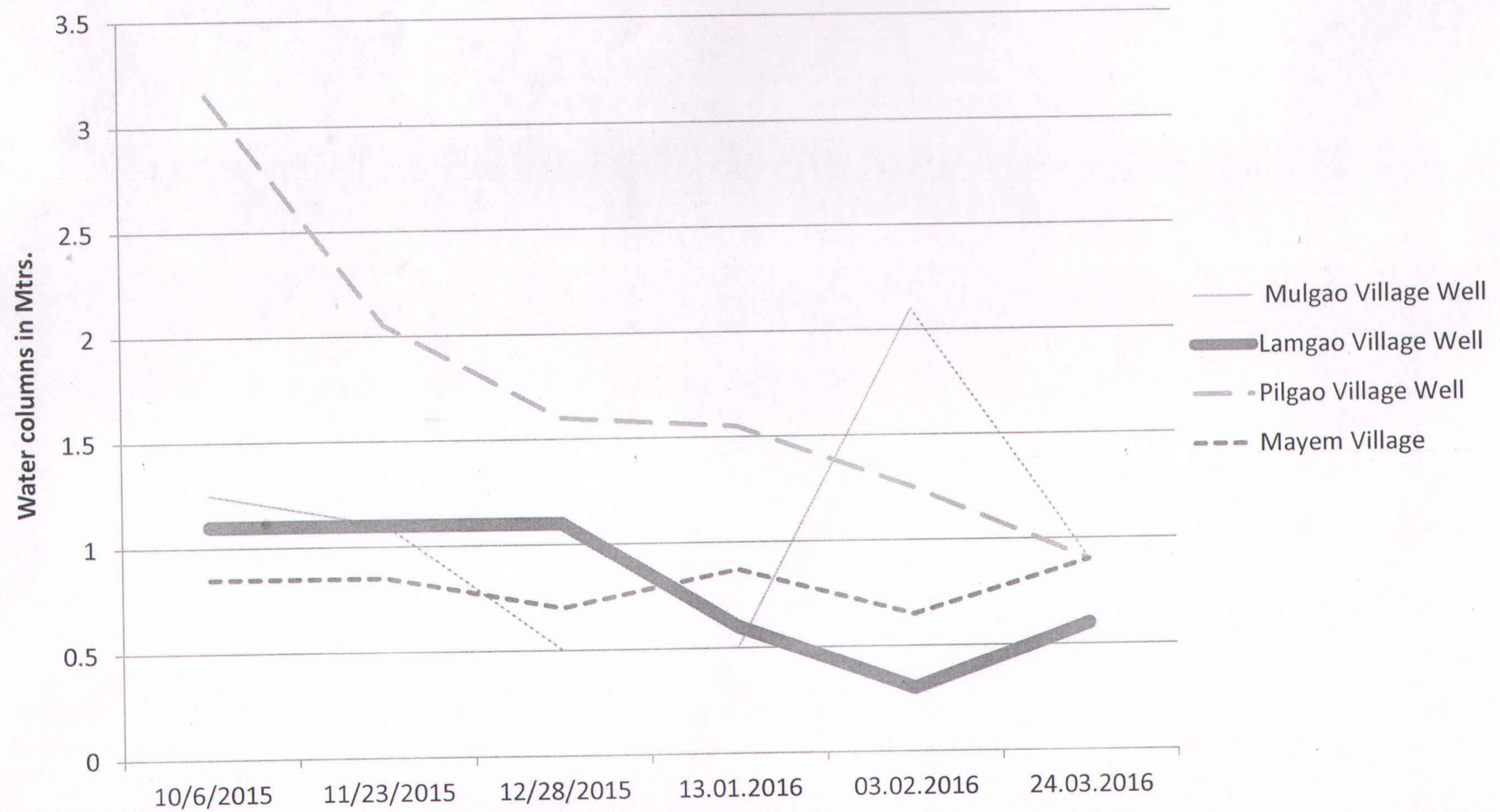
BDL- Below Detection Limit


Govt. Analyst




Laboratory Incharge

Well Level Water Report Bicholim Mines



Ambient Air Quality Monitoring report

Bicholim Iron Ore Mine

