

# **EXECUTIVE SUMMARY**

**OF**

**ENVIRONMENTAL IMPACT**

**ASSESSMENT REPORT**

**FOR**

**PUBLIC HEARING**

**OF**

**Bodai Daldali Bauxite Mine**

**(M. L. Area 626.117 ha)**

**Enhancement in Bauxite Production Capacity  
from 1.25 Million TPA to 3.00 Million TPA (Dispatchable)**

**At**

**Villages : Mundadadar, Keshmarda, Rabda  
and Semsata, Post : Daldali, Tehsil : Bodla,  
District : "Kabirdharm (Erstwhile Kawardha)"  
(Chhattisgarh)**

**APPLICANT**

**M/s. Bharat Aluminium Company Ltd.**

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## **1.0 PROJECT DESCRIPTION**

### **1.1 INTRODUCTION**

Bharat Aluminium Co. Ltd. (BALCO) since its inception in the year 1965 as a Public Sector Undertaking (PSU), with commencement of production at a capacity of 1.0 Lac TPA of Aluminium, in the year 1973, has been closely associated with the Indian Aluminium Industry, in a pivotal role and is playing a crucial role in introducing Aluminium as a potential alternative to other metals like Steel in construction, and Copper in power transmission industry with an aim to be a world class Integrated Aluminium and Power producer generating sustainable value for all stakeholders.

Over the years, to meet the domestic requirement of aluminium, BALCO has been gradually ramping up its production capacity and currently it stands at 5.70 lakh tons per annum.

Government of India (GoI), in the year 2001, divested 51% equity of BALCO in favour of Vedanta Limited and remaining 49% stake is still with Government of India (GoI).

BALCO has an integrated aluminium plant at Korba in the state of Chhattisgarh with a smelter capacity of 5.70 Lac TPA with capabilities to produce ingots, wire-rods, billets, busbars and rolled products. The major operations of BALCO in Korba are as given below:

- Smelter of capacity 5.70 Lac TPA
- Captive Power Plant of capacity 270 MW
- Captive Power Plant of capacity 540 MW
- New power plant with rated capacity of 1,200 MW (600 MW IPP and 600 MW CPP)

The Company has two captive Bauxite mines in Chhattisgarh state Viz. Mainpat Bauxite Mine with production capacity 0.75 Million TPA at District- Surguja and Bodai Daldali Bauxite Mine with production capacity of 1.25 Million TPA at District- Kabirdham.

### **1.2 TYPE OF PROJECT**

BALCO has now proposed expansion in Bauxite production capacity from 1.25 Million TPA to 3.00 Million TPA (dispatchable) of Bodai Daldali Bauxite Mine (ML Area: 626.117 ha) located at villages Mundadadar, Keshmarda, Rabda and Semsata, Post- Daldali, Tehsil- Bodla, District Kabirdham (Chhattisgarh).

As per EIA Notification, dated 14<sup>th</sup> September, 2006 and amended as on date, the mining project falls under Category “A”, Project or Activity (1a) - (3).

### **1.3 NEED FOR THE PROJECT**

BALCO has an existing Integrated Aluminium Plant of capacity 5.70 Lac TPA located at Korba (Chhattisgarh), requiring about 4.56 Million TPA of Bauxite. Out of 4.56 Million TPA of Bauxite presently 2.0 Million TPA of bauxite requirement is being met from its two captive mines in Chhattisgarh and shortfall of equivalent Alumina is being imported.

BALCO has now proposed expansion in Bauxite production capacity from 1.25 Million TPA to 3.00 Million TPA (dispatchable) of Bodai Daldali Bauxite Mine (ML Area:626.117 ha) located at villages Mundadadar, Keshmarda, Rabda and Semsata, Post- Daldali, Tehsil- Bodla, District Kabirdham (Chhattisgarh).

**1.4 BRIEF DESCRIPTION OF THE PROJECT**

**Table – 1**

**Brief Description of the Project**

S. No.	Particulars	Details												
<b>A.</b>	<b>Nature of project</b>	Bauxite Mining Project												
<b>B.</b>	<b>Size of project</b>													
(i)	Mining Lease area	Total lease area: 626.117 ha ➤ Revenue Forest Land: 33.566 ha. ➤ Govt. Land: 276.784 ha ➤ Private Land : 315.767 ha												
(ii)	Proposed Bauxite ore Production capacity	Existing: 1.25 Million TPA dispatchable bauxite Proposed: 3.00 Million TPA dispatchable bauxite (after processing of ROM)												
<b>C.</b>	<b>Project location</b> (Location Map showing general and specific location of Mine site has been given as Figure- 1)													
(i)	Villages	Mundadadar, Keshmarda, Rabda & Semsata												
(ii)	Tehsil	Bodla												
(iii)	State	Chhattisgarh												
(iv)	Coordinates	Latitude: 22°24' 49.084" N to 22°29'12.033" Longitude: 81°10'15.856"E to 81°11'47.414" E												
(vi)	Toposheet No.	64F/2, 64F/3, 64F/6, 64F/7												
<b>D.</b>	<b>Environmental Setting Details (with approx. aerial distance and direction from the mining lease boundary)</b>													
(i)	Nearest Town	Kabirdham (~ 45.0 Km South direction)												
(ii)	Nearest Highway	N.H. - 12A (~23 km in South direction)												
(iii)	Nearest Railway Station	Bilaspur (~ 109 km in SSE direction)												
(iv)	Nearest Airport	Swami Vivekanand Airport, Raipur (~ 127 km in SSE direction)												
(v)	National Parks, Wild Life Sanctuaries, Biosphere Reserves, Tiger Reserves, Ramsar Site, Wildlife Corridors etc.	Phen Wildlife Sanctuary falls at a distance of ~ 9 km in South-west direction.												
(vi)	Protected Forests within 10km radius	The study area comprises of 4 Reserve Forests and 8 Protected Forests named as follows: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>S. No.</th> <th>RF/PF</th> <th>Distance &amp; Direction (from lease boundary)</th> </tr> </thead> <tbody> <tr> <td>I.</td> <td>Dhaba RF</td> <td>~ 2 km in East direction</td> </tr> <tr> <td>II.</td> <td>Daldali RF</td> <td>~ 1.5 km in West direction</td> </tr> <tr> <td>III.</td> <td>South Phen RF</td> <td>~ 8.0 km in WSW direction</td> </tr> </tbody> </table>	S. No.	RF/PF	Distance & Direction (from lease boundary)	I.	Dhaba RF	~ 2 km in East direction	II.	Daldali RF	~ 1.5 km in West direction	III.	South Phen RF	~ 8.0 km in WSW direction
S. No.	RF/PF	Distance & Direction (from lease boundary)												
I.	Dhaba RF	~ 2 km in East direction												
II.	Daldali RF	~ 1.5 km in West direction												
III.	South Phen RF	~ 8.0 km in WSW direction												

		IV.	Marpha RF	~ 2.0 km in WNW direction
		V.	PF	~ 0.05 km in West direction
		VI.	Diyabar PF	~ 6.0 km in WSW direction
		VII.	Litari PF	~ 5.0 km in West direction
		VIII.	Nunsarai PF	~ 3.0 km in West direction
		IX.	PF	~ 0.05 km in SSW direction
		X.	Neur PF	~ 1.0 km in ESE direction
		XI.	Labda PF	~ 9.0 km in South direction
		XII.	PF	~ 0.05 km in North direction
		Other than the above various dense mixed Jungle are also there within the study area.		
(vii)	Nearest Water Body	<b>S. No.</b>	<b>Water Body</b>	<b>Distance &amp; Direction (from lease boundary)</b>
		I.	Burhner Nadi	~ 9.0 km in North direction
		II.	Katai Nadi	~ 3.5 Km in WNW direction
		III.	Manai Nadi	~ 4 Km in WNW direction
		IV.	Haphin Nala	~ 1.0 km in North direction
		V.	Ghoghra Nala	~ 8.5 km in WSW direction
		VI.	Lilari Nadi	~4.5 Km in West direction
		VII.	Chhipani Nala	~ 7.5 km in NE direction
		VIII.	Dhamna Nala	~ 2.5 in ENE direction
		IX.	Datilha Nala	~6.5 km in SSE direction
		X.	Kuwari Nala	~ 8.5 km in SSE direction
		XI.	Nira Nala	~ 9.5 km in SSE direction
(viii)	Seismic Zone	Zone – II as per IS: 1893 (Part-I) : 2002 Which means area comes under low seismicity zone		
<b>E.</b>	<b>Cost Details</b>	Zone – II as per IS: 1893 (Part-I) : 2002 Which means area comes under low seismicity zone		
(i)	Total Project Cost	Rs. 38 Crores/-		
(ii)	Cost for Environmental Protection Measures	Capital Cost: Rs. 22.5 lac/- Recurring Cost – Rs. 213.22 lac /annum		
(ii)	Cost for Environmental Protection Measures	Capital Cost: Rs. 22.5 lac/- Recurring Cost – Rs. 213.22 lac /annum		

Note- All distances and direction measured are aerial distances

Source: Toposheet, Site Visit and Pre- Feasibility Report

1.5 Location Map

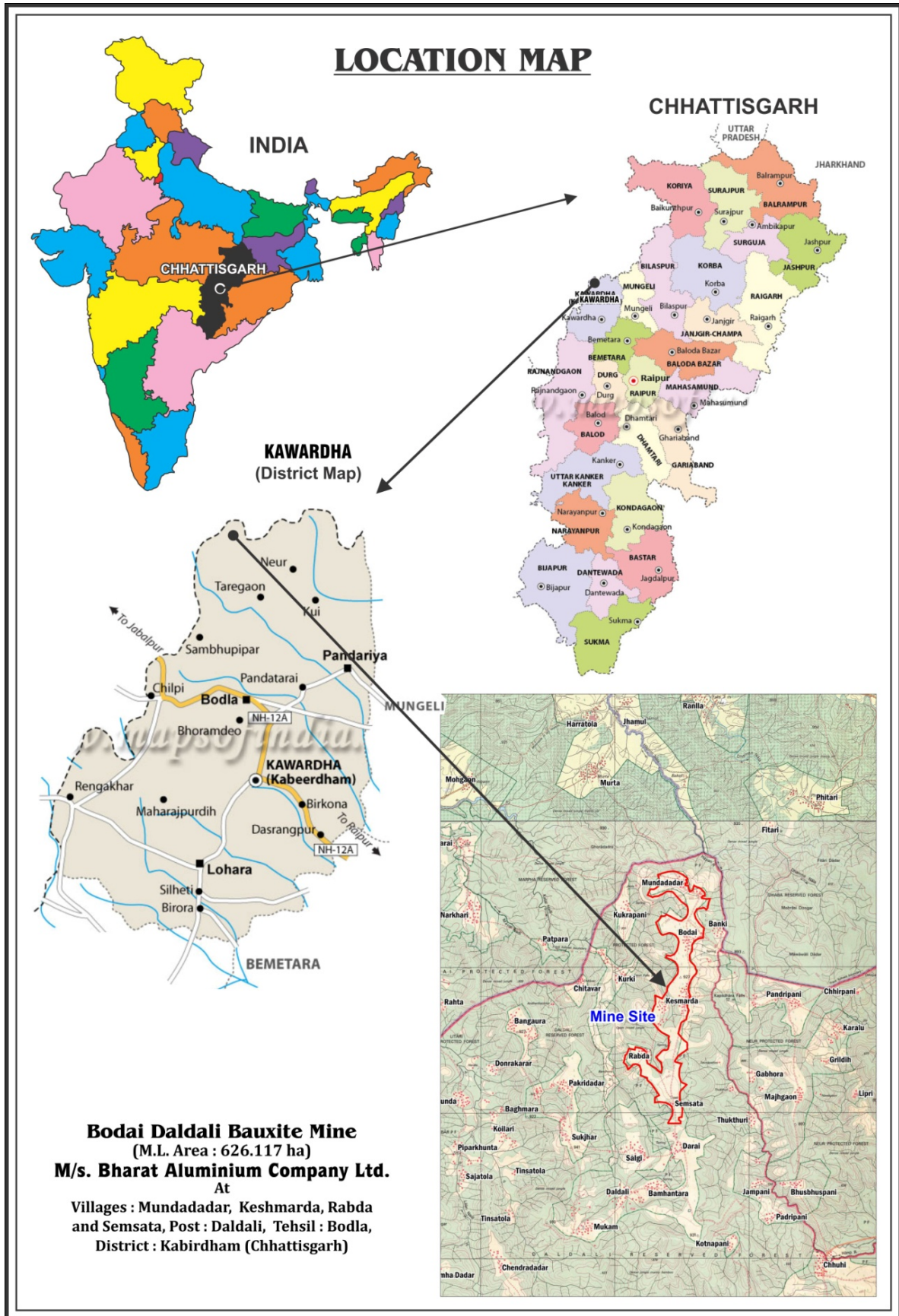


Fig. 1 Location Map

## 1.6 MINE DESCRIPTION

### 1.6.1 Mining Lease Status

Mining lease over an area of (626.117 ha) was granted to M/s. BALCO by State Government vide letter No.3-71/92/12/5, dated 07.10.1996 and the mining lease deed was executed on 27.03.1997 for a period of 20 years and the mining operations commenced on 01.04.2004. Now Mining Lease is deemed to be extended for further 30 years period as per the provisions of MMDR Amendment Act 2015, and is valid up to 26.03.2047. The supplementary lease agreement between Govt. of Chhattisgarh and BALCO has been signed dated 25.03.2017.

### 1.6.2 Mining Details

**Table – 2  
Mining Details**

S. No.	Particulars	Details
1.	Method of Mining	Opencast Mechanized Method including screening and crushing.
2.	Expansion in Production Capacity	From 1.25 Million TPA to 3.00 Million TPA (dispatchable)
3.	Mineable reserves	6.395 Million Tonnes
4.	Life of mine	~3 years
5.	Bench Height	➤ O.B. Benches: 6 m ➤ Ore bench: 1 to 4 m
6.	Elevation Range	900 mRL to 940 mRL
7.	Ground Water Table	25-30 m from surface level
8.	Ultimate Working Depth	Maximum upto 10 m
9.	Overall Pit Slope	27°
10.	Stripping Ratio (Ore: O.B)	1:1.19
11.	Number of Working Days per year	300
12.	Number of shifts per day	Three
13.	Top Soil Generation	620680 CuM till end of life of mine
14.	Waste Generation (SOB + HOB + rejects)	11.11 Million tonnes till end of life of mine

**Reference:** Approved Modified Mining Plan with Progressive Mine Closure Plan

### 1.6.3 Method of Mining

Opencast mechanized method of mining using HEMM with concurrent backfilling will continued to be adopted along with drilling and blasting to remove O.B/Ore. The sizing, sorting and quality improvement of Bauxite will be carried out by crushing and screening (crushing and screening unit to be installed within lease area). Mechanized sorting by Vibrating grizzly screen (25 mm size) will be used for segregating the soil and murrum from ROM, after which size reduction will be done by crushing and screening in three shift working.

Dry beneficiation for quality improvement is proposed by sorting the Laterite chunks and segregating the fines below 10 mm. This will upgrade the quality of alumina (40.29 to 41.25%), and reduction in silica content (7.01 % to 5%) to make it suitable for the alumina refinery plant. The bauxite for dispatch, top soil and waste generated will be loaded by loader/excavator and transported to respective destinations. OB and top soil will be transported to mined out pits for concurrent backfilling and plantation, respectively. Transportation of Ore from mine face to proposed crusher (to be located within lease area) and from Mine site to Hathbath ( 151 km) and Silyari railway siding ( 164 km) will be done with a combination of 20 and 35 tonner dumpers. The ore will be further transported via rail to Alumina refinery located in Lanjigarh, Odisha. From Lanjigarh refinery, the alumina will be transported via rail to the company's Aluminium Plant at Korba.

## **2.0 DESCRIPTION OF THE ENVIRONMENT**

### **2.1 PRESENTATION OF RESULTS (AIR, NOISE, WATER and SOIL)**

The Baseline study of the study area has been conducted during Post Monsoon Season, October to December 2016. The concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> for all the 8 AAQM stations were found between 44.7 to 61.7 µg/m<sup>3</sup> and 21.4 to 35.9 µg/m<sup>3</sup>, respectively. SO<sub>2</sub> ranges between 7.2 to 16.8 µg/m<sup>3</sup> and NO<sub>2</sub> ranges between 9.4 to 18.5 µg/m<sup>3</sup>. All the parameters were found well within the prescribed limits.

Ambient noise levels were measured at 8 locations in and around the Mine site. Noise levels vary from 42.1 to 53.4 Leq dB(A) during day time and during night time noise levels ranged from 38.2 to 44.2 Leq dB (A).

The surface water analysis for the 11 sampling stations shows pH ranges from 6.62 to 7.36, Total Hardness ranges from 53.12 To 155.20 mg/l and Total Dissolved Solids ranges from 85 to 256.00 mg/l.

The ground water analysis for all the 7 sampling stations shows that pH varies from 6.83 to 7.65 Total Hardness varies from 72.84 to 196.40 mg/l and Total Dissolved Solid varies from 125.00 to 338.00 mg/l

The analysis results of soil shows that soil is slightly to moderately alkaline in nature as pH value ranges from 7.51 to 8.01 and soil texture is sandy loam at some places. The concentration of organic matter % ranges from 0.51 to 1.45 %. Nitrogen is found to be less or good at some places as it ranged from 76.0 kg/ha to 117.39 kg/ha and Phosphorous was found to be in very less amount i.e. from 2.58 to 12.09 kg/ha, whereas Potassium was found to be ranging from 107.14 to 216.04 kg/ha which is very less in quantity.

### **2.2 BIOLOGICAL ENVIRONMENT**

Flora: species which are most commonly found in the study area: *Acacia catechu* (Khair), *Aegle marmelos* (Bel), *Ficus racemosa* (Gular), *Ficus religiosa* (Pipal), *Syzigum cumini* (Jamum) *Mangifera indica* (Mango), *Pongamia pinnata* (Karanj), *Tecomella undulate* (Rohida), etc.



Fauna: species which are most commonly found in the study area: *Vulpes bengalensis* (Common fox), *Boselaphus tragocamelus* (Nilgai), *Canis aureus* (Jackal), *Presbytis entellus* (Common langur), *Cuon alpinus* (Wild Dog), *Herpestes edwardsii* (Common Mongoose), *Hemidactylus flaviviridis* (House Gecko/Chhipkali), *Rana tigrina* (Common Frog), etc.

Some schedule-I fauna are also present in study area for which BALCO has already prepared Wildlife Management Plan and requisite fund Rs. 81.40 Lakhs already deposited to State Forest Department and Plan has also been implemented. In addition to this Balco also proposes Rs. 25 lakhs in Chhattisgarh and Rs. 40 Lakhs in Madhya Pradesh for Conservation of Schedule-I fauna and wildlife.

### 2.3 SOCIO-ECONOMIC ENVIRONMENT

As per 2011 Census records, population of study area of mine site is 23490. Sex ratio is 989 females per 1000 males. Schedule Caste population is 925 (3.94%) and Schedule Tribe population is 16527 (70.36 %).

Literacy rate is 50.75 %. The percentage of total working population is 51.82 % (Out of which 34.95 % are main workers and 16.87 % are marginal workers). Remaining, 48.18 % of the total population is considered as non-workers.

### 3.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

- **Impact on Air Environment** - The key air emissions from the mining activities (drilling, blasting, loading, haulage, screening, crushing and transportation) are Particulate Matter, Oxides of Nitrogen (NOx) and Sulphur dioxide (SO<sub>2</sub>). Gaseous emissions will be generated from operation of HEMM, DG sets and transportation of vehicles. Air quality modeling has been carried out which indicates that the incremental GLCs will be negligible and resultant air quality will continue to be well within the stipulated limits. Nevertheless, additional mitigation measures will be taken like wet drilling, controlled blasting, regular water spraying on haul roads, loading- unloading points for dust suppression and development of green belt along the road sides to control fugitive emissions.
- **Impact on Water Environment** – The water requirement of the mine, even after expansion, will be quite low since there are no water-intensive operations involved. The required quantity of water will be drawn from the river/nallah within the study area and ground water for which necessary approvals are available. There is no surface water body/ streams flowing through ML area except few streamlets originating from the ML area which contain water during rainy season. The study area has various seasonal nallahs/ ponds and rivers. Check dams have been constructed on these streamlets in and around lease area to prevent sedimentation/ siltation of water courses downstream the mine site. Domestic waste water generated from mine office/rest shelter is treated in septic tank. No other waste water will be generated from the existing or proposed mining or related

activities. Therefore, no impact on surface water bodies is anticipated due to mining operations. This is also reflected in the analysis of surface and ground water which shows all values well within stipulated parameters. Also, mining operations will be carried out above ground water table. Mineral is non – toxic in nature. No waste water is generated during mining activities.

- **Impact of Noise** - Major noise generating sources of the proposed project are drilling, blasting, crushing, screening and HEMM movement including trucks used for transportation of Bauxite. The noise levels from blasting are high but occur only for an instant. Adequate measures like use of controlled blasting, use of rock breaker, maintenance of HEMM, use of PPEs are being taken to keep noise levels well below prescribed norms. The plantation and the green belt around the mining lease boundary also will help to check propagation of noise in the surrounding areas.

**Impact on Land Environment** – Opencast mining activities may alter the landscape of the lease area but will not have any impact on the surface features of the surrounding areas. At the conceptual stage, out of the total mining lease area (i.e. 626.117 ha), total mined-out area will be 503.08 ha; out of which, about 487.29 ha area will be backfilled and remaining 15.79 ha area will be developed as water recharge pits. About, 487.29 ha area will be under greenbelt and plantation at the conceptual stage. This area will either be planted as usual or may be developed as grasslands which can later (post-mine closure and surrender of land by BALCO to state govt) be used for agricultural purposes subject to State Government approval as required.

#### 4.0 POST PROJECT ENVIRONMENTAL MONITORING PROGRAMME

Table 4

S. No.	DESCRIPTION	FREQUENCY OF MONITORING
1.	Ambient Air Quality	Twice a Week
2.	Water Quality and Level	Quarterly
3.	Noise Level Monitoring	Monthly
4.	Vibration Monitoring	Monthly

#### 5.0 ADDITIONAL STUDIES

The Additional Studies (Land Use Study, Biological Study, Wildlife Management Plan, Ground Vibration Study, Slope Stability Study, Hydro Geological Study and Need Assessment study including R&R Plan) as per the Terms of References issued vide letter no. J-11015/167/2016 – IA-II (M) dated 17<sup>th</sup> August, 2016 and amended on 5<sup>th</sup> January, 2017 are covered in Draft EIA/EMP Report.

#### 6.0 PROJECT BENEFITS

Proposed Expansion of Bauxite mining project will result in growth of the surrounding areas by community development to be undertaken by the company. Direct and indirect

employment will be generated in nearby villages and surroundings. Several developmental activities in the surrounding areas will be done under Corporate Social Responsibility (CSR).

## **7.0 ENVIRONMENT MANAGEMENT PLAN**

### **7.1 Air Pollution Control Measures**

The following measures are being adopted to control air pollution from existing mining operations:

- Wet drilling system to prevent dust from getting air borne.
- Controlled Blasting technique to control and prevent fly rock and minimize ground vibrations.
- Use of Rock breaker to avoid secondary blasting.
- Black topping of Main haul road.
- Transportation vehicles are being maintained regularly and checked for Pollution under Control.
- Preventive maintenance of the mining equipment is being performed on regular basis to reduce generation of smoke.
- Green Belt and plantation is being / will be done around the lease boundary, reclaimed area, etc.
- Regular water sprinkling over haul roads for dust suppression.
- Overloading of mineral is not allowed.
- Workers are being / will be provided with PPEs like dust masks.

### **7.2 Water Quality Management**

- The water from garland drains is channelized to siltation pond and then to mine sump. Water thus collected is utilized for plantation, dust suppression etc.
- Check dams have been constructed in ML Area, retaining wall and garland drains around mine pits have been constructed to arrest surface run-offs.
- Ground water table will not be intersected during mining operations as maximum depth of mining will be 10 m.
- Dry beneficiation process will not generate any tailings.
- Domestic waste water generated from mine office/rest shelter is being disposed off in soak pit, septic tank and STP.

### **7.3 Noise Pollution Control**

- Controlled Blasting with proper delay is being done.
- Rock breaker is being used to avoid secondary blasting resulting in lesser noise.

- Proper preventive maintenance, oiling and greasing of machines at regular intervals is being done to reduce generation of noise.
- HEMMs are being equipped with closed cabins to reduce exposure of operators to high noise level.
- Workers operating in high noise level area being provided with PPEs like ear muffs and ear plugs.
- Greenbelt development and plantation has been and will continue to be carried out to attenuate noise level.

#### **7.4 Greenbelt Development And Plantation Program**

- Out of the total ML area i.e. 626.117 ha, about 487.29 ha area will be covered under green belt and plantation including, plantation on backfilled area, area under crushing and screening, un-worked area including statutory barrier etc till the conceptual stage. The trees will be planted @2500 saplings per hectare of land.
- Local plant species like Khechdi, babool, Pentaforum, Pinus, Kathal, Neem, Semal, Mahua, Sagon, Karanj, Arjun, Siras, Acacia, Peepal, Ashok, Jetropha, Teak, Khamar, Jacaranda, Shisham, Gulmohar Imli, Anwla, Jamun, Guava, Sitafal, Mango and other fruit bearing dplants are being planted in consultation with Forest department.

#### **7.5 Socio-Economic Environment**

The Bodai-Daldali Bauxite Mine project by Bharat Aluminium Company Ltd. (BALCO) has generated a fair amount of direct and indirect employment in the study region. The local economy has received a boost due to employees spending and services generated by BALCO. Some of the CSR activities done by BALCO are as follows:

- Set up of 4 solar based drinking water facilities
- Construction of new Community centers
- Maintenance of roads and other infrastructure
- Improvement in educational and medical facilities.

The overall effect had improved buying power of employees and thus a higher standard of living viz. better education, improved health and drinking and sanitation facilities. This is envisaged as a major positive benefit and will ultimately lead to the sustainable development of the region. The same will be continued for the proposed expansion project.

