

**MODIFICATION IN
APPROVED MINING PLAN**
PREPARED UNDER RULE - 17(3) OF MINERALS (OTHER THAN
ATOMIC AND HYDRO CARBONS ENERGY MINERALS)
CONCESSION RULES, 2016.

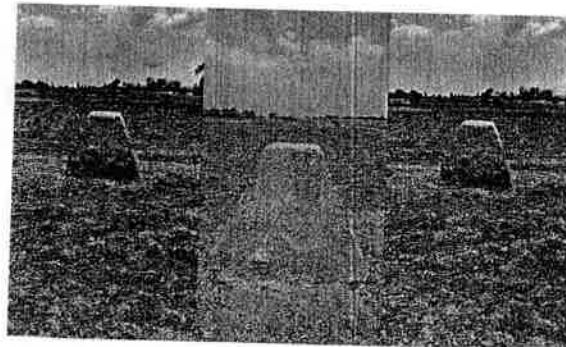
INCLUDING PROGRESSIVE MINE CLOSURE PLAN
(PREPARED UNDER RULE -23 OF MCDR, 2017)

IN RESPECT OF
ORSA BAUXITE MINE
LEASE AREA 196.27 HECTARES

Details of Land	Area in Hectares
GM land	35.32 ha
Raiyati land	160.95 ha
Total	196.27 ha



LEASE PERIOD: - 17.07.1986 TO 16.07.2006
NOW EXTENDED UP TO 16.07.2036
PLAN PERIOD: 2017-18 TO 2021-22
IN MOUZA ORSA, THANA MAHUADANR,
DISTRICT LATEHAR, STATE - JHARKHAND
CATEGORY - A (FULLY MECHANIZED)



17/08/2017
क्षेत्रीय खान नियंत्रक
Regional Controller of Mines
भारतीय खान ब्यूरो
Indian Bureau of Mines

LESSEE

M/s Hindalco Industries Limited

Address : Court Road
P.O. : Lohardaga
District : Lohardaga
State : Jharkhand
PIN : 835 302.

IBM Regn No. IBM/935/2011

E-mail id- bijesh.jha@adityabirla.com

PREPARED BY
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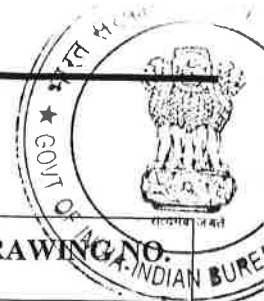
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T E X T & A N N E X U R E

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 Qualified Person



List of the Plans and Sections are submitted:

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2	AREA PLAN	1:3960	PLATE NO. 2
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22	AUTHENTICATED LEASE AREA PLAN	16"=1MILE	PLATE NO. 15


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INTRODUCTION

The mining lease was granted and executed to M/s Hindalco Industries Limited on 17th July 1986 for an area of 309.36 hectares / 764.00 Acres for a period of 20 years up to 16.07.2006. Then on 22.06.2005 lessee applied for renewal of mining lease to the State Govt. of Jharkhand for 485 acres or 196.27 hectares area for further 20 years.

Photocopy of grant letter is enclosed as annexure - 1

Photocopy of form J & form D is enclosed as annexure - 2

State Govt. of Jharkhand extended the mining lease period on 16.03.2017 for the extended period as per the MMDR Amendment Act 2015 up to 16.07.2036 for the lease area of 196.27 or 485 Acres. Photocopy of the lease deed is enclosed as annexure -3.

The mining plan in respect of Orsa bauxite mine over area of 309.19 hectares in mouza Orsa , Thana Mahuadanr, District Latehar was approved under Rule 11 of MCDR 1988 by the Regional controller of Mines Ranchi vide letter no RAN/LTH/BX/MP-166(11)/04-05 dated 11.05.2005. Photocopy of the approval letter is enclosed as annexure- 14.

Hindalco Industries Limited is a flagship company of Aditya Birla Group & is non ferrous power house. Hindalco Industries Limited is engaged in manufacturing of aluminium & its semis and copper smelting and manufacturing of copper rods. Its sources Bauxite from captive Mines located in Jharkhand and Chhatisgarh for its Muri & Renukoot plants and from Maharashtra for its Belgaum plant.

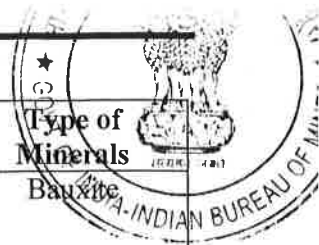
Jharkhand Bauxite Mines Division of Hindalco Industries Ltd. caters Bauxite requirement of its alumina refineries located at Muri in Jharkhand and Renukoot in Sonbhadra district of U.P. All Mines are well connected by road to its nearest Railway siding mainly Lohardaga, Tori and Richughuta & Miralgara. The capacities of Plants are as under:-

Sl. No.	Plant Location	Annual Capacity	Annual Requirement	Bauxite
1	Muri Plant (Jharkhand)	4.5 LTPA	13.5 LTPA	
2	Renukoot Plant (U.P.)	6.6 LTPA	19.8 LTPA	

Presently no PL is granted to the company. There are 16 mining lease hold areas within the State of Jharkhand and the details of the leasehold are appended below as per the format given.


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Regional Controller of Mines
भारतीय खान ब्यूरो
Indian Bureau of Mines



Sl. No.	Lease ref. No. & Date	Area in Ha.	Postal address/Location	Type of Minerals
1.	Pakhar Bauxite Mine	115.13	Vill. Pakhar, P.S. Kisko , Dist. Lohardaga	Bauxite
2.	Pakhar Bauxite Mine	35.12	Vill. Pakhar, P.S. Kisko , Dist. Lohardaga	Bauxite
3.	Pakhar Bauxite Mine	8.09	Vill. Pakhar, P.S. Kisko , Dist. Lohardaga	Bauxite
4.	Bagru Bauxite Mine	75.41	Vill. Bagru, P.S. Kisko , Dist. Lohardaga	Bauxite
5.	Bhusar Bauxite Mine	65.31	Vill. Bhusar & Ketrang , P.S. Kisko, Dist. Lohardaga	Bauxite
6.	Hisri(Old) Bauxite Mine	13.38	Vill. Hisri P.S. Kisko, Dist. Lohardaga	Bauxite
7.	Hisri(New) Bauxite Mine	14.55	Vill. Hisri P.S. Kisko, Dist. Lohardaga	Bauxite
8.	Shrengdag Bauxite Mine	155.81	Vill. Shrengdag , P.S. Ghaghra, Dist. Gumla	Bauxite
9.	Jalim Sanai Bauxite Mine	12.14	Vill. Jalim & Sanai P.S. Bishunpur, Dist. Gumla	Bauxite
10.	Shrengdag Bauxite Mine	140.07	Vill. Shrengdag , P.S. Ghaghra, Dist. Gumla	Bauxite
11.	Gurdari Bauxite Mine	584.19	Vill. Gurdari, P.S. Bishunpur, Dist. Gumla	Bauxite
12.	Amtipani Bauxite Mine	190.95	Vill. Amtipani , P.S. Bishunpur, Dist. Gumla	Bauxite
13.	Kujam-I Bauxite Mine	80.87	Vill. Kujam , P.S. Bishunpur, Dist. Gumla	Bauxite
14.	Amtipani Bauxite Mine	157.38	Vill. Kujam, P.S. Bishunpur, Dist. Gumla	Bauxite
15.	Chiro Kukud Bauxite Mine	152.57	Vill. Chiro & Kukud, P.S. Mahuadand, Dist. Latehar	Bauxite
16.	Orsa Bauxite Mine	196.36	Vill. Orsa, P.S. Mahuadand, Dist. Latehar	Bauxite

अनुमोदित
APPROVED


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Now the Modification of Approved Mining plan is prepared & submitted under Rule 17 (3) of (Other than Atomic and Hydro Carbons Energy) Minerals Concession Rule, 2016. The reason for this modification in approved mining plan is listed below:-

1. The mining plan was approved for the applied area of 309.19 hectares & lease period is extended for over an area of 196.27 hectares.
2. The lease period is now extended up to 16.07.2036 as per the MMDR Amendment Act 2015.

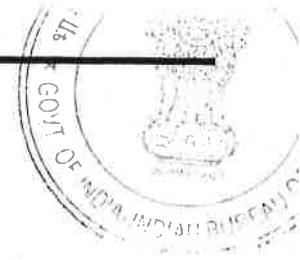
The Lease area of 130.21 Hectares is bounded by Latitude – 23°23'53.08" N to 23°25'24.91" N and Longitude – 83°59'13.23"E to 84°00'11.45"E and is featured in Survey of India Toposheet no. 73A/3 & 64M/15. Key Plan is prepared with 5Km buffer zone on Toposheet No. 73A/3 & 64M/15 (Scale 1:50000) is enclosed as Plate No.1.



अनुमोदित
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CHAPTER - I
GENERAL



अनुमोदित
APPROVED

a) **Name of Applicant/Lessee:-**

M/s HINDALCO INDUSTRIES LTD

Registered office:-

RENUKOOT 231217, DIST: SONEBHADRA

STATE: UTTAR PRADESH

PHONE (05446) 52077-79 FAX (05446) 52017.

Mines office :-

Address : Court Road

P.O. : Lohardaga

District : Lohardaga

State. : Jharkhand

PIN : 835 302.

Phone No. : 06526-224015, 224016, 224446.

Fax No. : 06526-24112

IBM Registration No : IBM/935/2011

Email - bijesh.jha@adityabirla.com

Nominated owner - K N Bhandari

b) **Status of Applicant/lessee:**

Hindalco industries limited is a public limited company registered under Indian Companies Act, 1956 having its Registered Office at Century Bhawan, Dr. Annie Besant Road, Mumbai - 400025, works at Renukoot, District - Sonbhadra (U.P.) and Mines Division at Lohardaga. The Company is engaged in Mining and producing Aluminium since 1968. Presently it is the largest Aluminium metal producing unit in the country.

The Board of Directors governs the company. The list of Board of Directors is enclosed as Annexure - 4

- c) **Mineral(s) which is / are included in the prospecting license (For Fresh grant):** NA
- d) **Mineral(s) which is / are included in the letter of Intent / lease deed:** Bauxite
- e) **Mineral(s) which is the applicant /lessee intends to mine:** Bauxite


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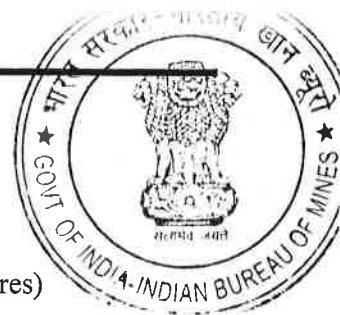
f) Name of Qualified Person preparing Mining Plan:-

Name : Pradip Kumar Sen
Address : Kali Mandir Road, Doranda, Ranchi, Jharkhand - 834002
Phone : 0651 2481110
Email : pkxenranchi@gmail.com
Mobile No. : 09431106275 / 08235816865

(Photocopy of experience certificate (RQP certificate) enclosed as Annexure-11)

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CHAPTER - II
LOCATION AND ACCESSIBILITY

a) **Lease Details**

Name of mine : ORSA BAUXITE MINE (196.27 Hectares)
District & State : Latehar (Previously Palamau), Jharkhand.
Taluka : Mahuadanr.
Village : Orsa
Khata No./Plot No. etc : Land scheduled as on the lease deed.
Lease Area : 196.27 Hectares.
Latitude : 23°23'53.08" N to 23°25'24.91" N
Longitude : 83°59'13.23"E to 84°00'11.45"E

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Lat/Long of any boundary point: BP-10 Latitude : 23° 24' 29.76" N

Longitude: 83° 59' 20.43" E

Date of execution of lease: 17th July 1986.

Period of lease: 20 Years up to 16th July 2006.

Now the lease period is extended up to 16.07.2036 as per the MMDR Amendment Act 2015.

Date of commencement of mining operation: To be commenced, lessee could not start yet for want of EC CTO etc.


Name of lease holder:

M/s Hindalco Industries Limited

Address : Court Road
P.O. : Lohardaga
District : Lohardaga
State : Jharkhand
PIN : 835 302.
Phone No. : 06526-224015, 224016, 224446.
Fax No. : 06526-24112

IBM Registration No: IBM/935/2011

Email ID. : hindalco@adityabirla.com / bijesh.jha@adityabirla.com


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ORSA BAUXITE MINE (196.27 Hectares)
LESSEE: - MS HINDALCO INDUSTRIES LIMITED

- c) Details of applied /lease area with location map (fresh area /mine)

Land scheduled given on the lease deed is enclosed as annexure – 3

Forest		Non-forest	
Forest(specify)	Area(ha)	(i) GM land	35.32 ha
NIL	NIL	(ii) Raiyati land	160.95 ha
Total			196.27 ha

The lease area plan is enclosed as plate no 2 on scale 1:3960 & authenticated lease area plan also attached as plate no 15 on scale 16"=1mile.

Total lease area: 196.27 Hectares

District & State: District – Latehar, State – Jharkhand

Taluka / Thana- Mahuadanr, **Village/Mouza –** Orsa

Whether the area falls under Coastal Regulation Zone (CRZ)? if yes, details thereof : No

Existence of public road/railway line, if any nearby and approximate distance:

The lease area is connected with Ranchi – Mahuadanr – Daltonganj road by a motorable road constructed by R.E.O. This road is 17 Km long. The nearest Railway Station is Chhipadohar on East Central Railway at a distance of 65 Km. It is also connected with Tori Railway Station at a distance of 165 km. on Barkakana – Garhwa Section of East Central.

Toposheet No. : 73A/3 & 64M/15

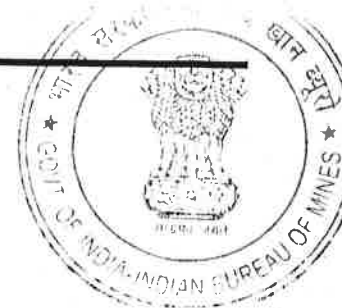
Latitude and Longitude of all corners Boundary Pillars is enclosed as annexure:-13

- c) Attach a general location map showing area and access routes. It is preferred that the area be marked on a Survey of India topographical map or a cadastral map or forest map as the case may be. However, if none of these are available, the area may be shown on an administrative map.

The Key Plan on Toposheet No. 73A/3 & 64M/15 (Scale 1:50000) is enclosed as Plate No.1.


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CHAPTER - III
DETAILS OF APPROVED MINING PLAN /
SCHEME OF MINING (if any)



3.1 **Date and reference of earlier approved MP/SOM**

The mining plan in respect of Orsa bauxite mine over area of 309.19 hectares in mouza Orsa, Thana Mahuadanr, District Latehar was approved under Rule 11 of MCDR, 1988 by the Regional controller of Mines Ranchi vide letter no RAN/LTH/BX/MP-166(11)/04-05 dated 11.05.2005. Photocopy of the approval letter is enclosed as annexure- 14.

3.2 **Details of last modifications if any (for the previous approved period) of approved MP/SOM, indicating date of approval, reason for modification.**

Not applicable. No modification of MP/SOM is approved so far.

3.3 **Give review of earlier approved proposal (if any) in respect of exploration, excavation, reclamation etc.**

A. Exploration:-

As per approved mining plan

Since, detail prospecting has not been done in the area as per the information collected from company. It is proposed that it is essential to propose future exploration programme. So far as proposed exploration is concerned, exploration programme is given as under to explore the area. The boreholes will be given in the area at a grid interval of 100 m during the 5-year of working. Total meterage will be covered by 1875m of drilling, Each year 25 boreholes will be given. The year wise exploration programme is shown on Geological Plan.

Remarks:-

Lessee could not achieve the exploration program as per the approved mining plan due to unavailability of land as well as for the law & order problem in the area.


In the year 2016 lessee drilled total 25 vertical coring bore holes in a grid 100m & 50m also. Total meterage is 366.20m. Copy of form J is enclosed as annexure - 16

B. Excavation:-

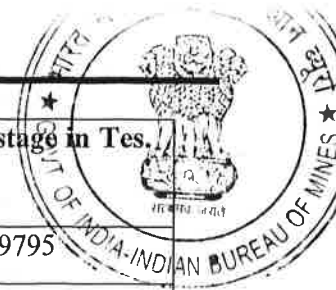
As per approved mining plan

It is proposed to start mining operation near the Southern part at Eastern part of the area as well as near the road in Block-I and extend towards almost in all direction. This is the non-forest working area. In this area thickness of soil is 4 m only. Soil removal will be started from the top edge and advanced all along the quarry.

The details of proposed ob will be generated is given below:-


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**ORSA BAUXITE MINE (196.27 Hectares)
LESSEE: - MS HINDALCO INDUSTRIES LIMITED**



Year	Soil in Tes	Laterite in Tes.	Rejects in Tes.	Total Wastage in Tes.
2004-2005	155982	395970	17843	569795
2005-2006	161202	414715	20516	596433
2006-2007	261708	704890	26447	993045
2007-2008	126798	325826	26015	478639
2008-2009	151410	414160	23432	589002
Total :	857100	2255561	114253	3226914

Remarks:-

Lessee could not achieve the excavation program as per the approved mining plan due to want of CTO NOC from the JSPCB.

C. Exploitation:-

As per approved mining plan

The bauxite production target for the five years along is given below:

Year	Total Bauxite in Tes.
2004-2005	91378
2005-2006	82066
2006-2007	105787
2007-2008	104060
2008-2009	93731
Total :	457022

Remarks:-

Lessee could not achieve the exploitation program as per the approved mining plan due to want of CTO NOC from the JSPCB.

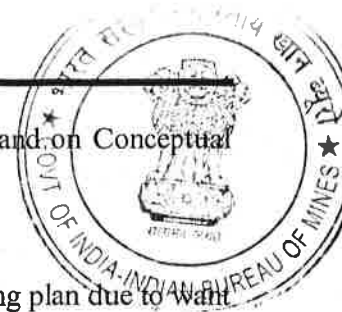
D. Reclamation:-

As per approved mining plan

During the first year of working it will be not possible to backfill the area, so dumping ground for temporary storage of OB and Soil have been selected for both the Blocks near the working site. Second year onward backfilling of the worked out area will be started simultaneously and it will be followed during the remaining period of working.

The dumping yard for top soil and overburden are selected in Central part near the working site of the leasehold area. The proposed sites are situated outside working quarry and these are


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of temporary nature. The dumping sites are shown on Development Plan and on Conceptual Plan.

Remarks:-

Lessee could not achieve the reclamation program as per the approved mining plan due to want of CTO NOC from the JSPCB.

E. Afforestation:-

There is a small part of forest area within the leasehold. However, afforestation will be done along the boundary barrier and quarry roads. Considering a grid of 2.5m x 2.5m about 3.0 hectares area, the total number of plants will be 5000. So every year 1000 numbers of plants of different species, mainly fruit – bearing plants like Mahua, Mango, Jackfruit, Sakhua (as per availability) will be planted. Year wise afforestation programme is shown in Plate No. 9 by different colours.

Remarks:-

Lessee could not achieve the Afforestation program as per the approved mining plan due to want of CTO NOC from the JSPCB & due to unavailability of land on the area.

3.4 Give status of compliance of violations pointed out by IBM

Review of Compliance of violations pointed out after inspections made under MCDR 1988 during last five years.

No violation letter is received for this mine.

3.5 Indicate and give details of any suspension /closure/ prohibitory order issued by any Government agency under any rule or Court of law

There is not any suspension / closure / prohibitory order issued by any Government agency under any rule or Court of law.

3.6 In case the MP/SOM is submitted under rules 9 and 10 of the MCDR'88 or under rule 22(6) of the MCR'1960 for approval of modification, specify reason and justification for modification under these rules.

Not applicable,

PART - A

1.0 GEOLOGY AND EXPLORATION:

- a) Briefly describe the topography, drainage pattern, vegetation, climate, rainfall data of the area applied/mining lease area.

Topography:

The Orsa Plateau is V shaped hillock. The plateau slopes gradually towards East. Steep gradients with cliff faces are characteristics of the West, the hillocks. The link of western plateau is known as Samripat in Sarguja district of Chhatisgarh State. The Bauxite lease area of the company mostly covers in Orsapat. The highest point is at 1117 m and lowest point towards the valley portion in East is about 1015 m above M.S.L. The top is tableland (Plateau), locally called 'Pat' while the valleys are 'V' shaped with moderate gradient.


Occasional springs at the slopes provide water for human consumption. Main water sources are on the middle and foot of the hills. Cultivation depends mainly at the top of the plateau in monsoon. The hill slopes are under Orsa Protected Forest with Forest density of 0.3. Thick growth of Sal and other trees are common in the area. (Topographical Sheet No. 64 M/15part & 73A/3Part).

Drainage:

There is no percolation of water in the working area. There are no streams in the region. Two dry seasonal nallas are in northeast & northwest within the leasehold area and flowing from north -west to southeast and joins Burha River at a distance of 1.25 km away in the western part from the area. They are all seasonal.

Vegetation:

The area has got thin vegetation. Sal and Asan trees of varying heights are available with isolated patches of bushes of Lantana species can be seen at some places. Paddy, maize, Jowar and Gondli are the common crops cultivated by the local people. Within the 500 hundred meters of lease area forest exists and got thick vegetation of Sal trees. Thorny bushes are also available. Density of vegetation is 0.3. Orsa PF & ansari PF is situated in the eastern direction of the area; Kabrapat PF is situated on the South Eastern direction of the area. Lodh PF is situated on the northern direction of the area & Rasag PF is situated in the western direction of the area.


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Climate:

The hottest months are May and June when temp remains around more than 37° C. The coldest months are January and February when the maximum temperatures remains around 20°C to 23°C and minimum temperature remains around 5°C to 15°C. The area is devoid of large variability of temperature and free from exposure.

Year wise rain fall data (in mm) of Latehar district of collected from Customized Rainfall Information System (CRIS), Hydromet Division, India Meteorological Department under Ministry Of Earth Sciences (<http://www.imd.gov.in>) for the is tabulated below:-

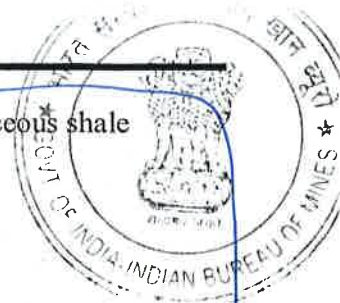
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	Total
2012	57	0	0	0	0	149.9	360	214.6	199.6	25.2	0	0	1006.3
2013	0	0	0	0	0	232.6	267.2	344.9	139.5	321.2	0	0	1305.4
2014	16.8	72.5	35.5	0	114.3	94.7	260.4	224.7	287.3	13	0	0	1119.2
2015	3.2	0	13.4	30.9	1	147.2	538	220.1	62.4	23	0	15	1054.2
2016	5.6	4.2	30	0	18.8	118.2	330.4	582.2	466.3	84.6	0	0	1640.3

b) **Brief descriptions of Regional Geology with reference to location of lease/applied area.**

The bauxite bearing areas of Jharkhand belongs to the Indian Peninsula. It consists mainly of Chotanagpur Granite Gneiss associated with intrusions of quartzite, older rocks and Deccan traps. Ranchi plateau is the main topographic unit in the area with altitudes between 960 m And 1075 m above MSL, capped with laterite and bauxite. Bauxite deposits are the result of Silica leaching process of alumina rich rocks and it occurs informs of an extensive blanket below the laterite cover on the flat topped. It also occurs as segregation, discontinuous boulders and in blanket from over laterite residuum. The thickness of the deposits is in the ranges from 1 m -12 m with an average thickness of 6 meters. Under suitable condition of weathering. Chemical alternation and leaching through geological time, the parent rocks have giving rise laterite and bauxite residuum. The parent rocks which may give rise to bauxite are silicate rocks with high alumina and less of silica. Granite -Gneiss in association with intrusions of quartzite and older basic rocks is the main source rock in the area. The Gondwana formation is present in the northern part of the Ranchi upland. The Pre Cambrian rocks in singhbhum lie in the south. At the western side of Jharkhand, Deccan trap is exposed where Laterite /Bauxite have been reported as cappings. At the eastern side, Laterite appears on the peneplained surface of older rocks. The oldest rock belongs to Dharwar. It is in turn intruded by the batholithic mass of Chotanagpur granite and further metamorphosed into various schistose and gneissic rocks. The generalized stratigraphy of the study area is illustrated below (Roy Chodhury, 1958)


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**ORSA BAUXITE MINE (196.27 Hectares)
LESSEE: - MS HINDALCO INDUSTRIES LIMITED**



Recent		Alluvium ,Conglomerate & Carbonaceous shale
Tertiary to Recent		Laterite, Bauxite and Lithomerge
Upper Cretaceous	Deccan Trap	Basaltic lavas
	Intratrappaeen	Calcified – Silicified rocks and grit
Cuddapah and Earlier	Chotanagpur	Newer Dolerite
	Granite Gneiss	Vein rocks , Pegmatite or Graphic granite
		Aplite ,Quartzveins and quartz-tourmaline rock
		Psuedo-Diorite
Archean		Granites and Gneisses
		Diorite
		Ultrabasic igneous rocks

Dharwar Phyllites, Mica-schist, Quartzites, Lime-Silicate rocks and Basic rocks.

- d) Detailed description of geology of the lease area such as shape and size of the mineral/ore deposit, disposition various litho-units indicating structural features if any etc. (Applicable for Mining Plan for grant & renewal and not for Scheme of Mining/Modifications in the approved mining plan/scheme of Mining).

Local Geology:

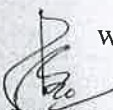
The Orsa area forms almost a elongated polygonal shaped land that exposes bauxites, laterites soil and morrum in the escarpment section, slopes and surface. The nature of deposit at this area is bouldery as seen in the Eastern and western part of the area both in the escarpment sections & plateau region. The area is mostly soil cover. As per the drilled borehole the thickness of the bauxite zone is widely variable from 0.5 m to 7m.

Bauxite which forms the main economic mineral of the area occurs as a part of the lateritic profile in the form of discontinuous bodies between the two laterite formation or underneath the hard morrum. It is often found as lenticular patches within lower laterite at different levels. It is exposed in the scarp sections all around the plateau or where erosion has removed the cover of the plateau top.

A generalized section as per borehole is characterized as follows:

Soil	:	0-7 m
Upper Laterite	:	0 -5 m
Bauxite	:	0-7 m

Litho merge could not be seen in the area. Laterites are red, hard compact, massive masses with vesicles, scoriaceous, ferruginous laterite (morrum). Segregation of Bauxite has been


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found mostly just beneath the pisolitic laterite (morrum). The top surface, a perfect plateau is in general covered with lateritic soil.

It is evident from the Plate no. 4 that the entire laterite overlain by soil has been mapped.

Lithological section as measured in different in the area have been represented in Plate no. 4A.

Two types of bauxite occurrences are observed in the area:

- (i) Segregation in laterites mainly metal grade massive bauxite in the entire area.
- (ii) Bouldery low-grade aluminous laterite occurring as parting.

The Bauxite deposit in Orsa area is not so extensive and continuous and limited in the area. Mineralogically, the bauxite is boehmitic and is found suitable for our Renukoot plant based on American Bayer's Process. The plant is located at Renukoot in the dist. of Sonebhadra in UP. The present capacity of Renukoot plant is 19.80 lakh tonnes of Bauxite and 6.6 lakh tonnes of Alumina per annum. The plant was commissioned in 1962 with capacity of 20000 tpa. Per tonne of alumina is extracted from 3.0 tonne of Bauxite and per tonne of aluminium metal is recovered from 2.0 tonne of alumina. The feed grade of plant is 38.00% Al_2O_3 and < 5.00 % SiO_2 .

Plant*	Capacity (in lac tonne)		Requirement of Bauxite/tonne Al	
	Al_2O_3	Al	Al_2O_3	Al
Renukoot	19.80	6.60	3.00	1.00

d) Name of prospecting / exploration agency -

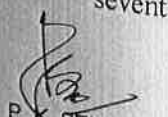
M/s Hindalco Industries Limited

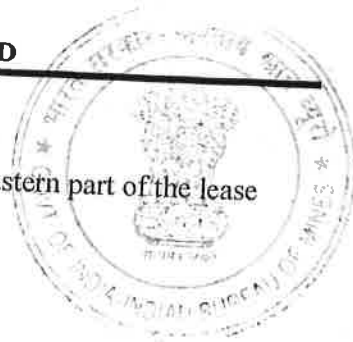
Address : Court Road
 P.O. : Lohardaga
 District : Lohardaga
 State : Jharkhand
 PIN : 835 302.
 Phone No. : 06526-224015, 224016, 224446.
 Fax No. : 06526-24112

e) Details of prospecting / exploration already carried out:

i) Number of pits and trenches indicating dimensions, spacing etc along and across the strike/foliation with reference to geological plan.

Altogether 7 pits are found in the area, which were given by the State DGM in early mid seventies. These pits are studied carefully. The details of these pits are as under: -


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Pit No. 1:

The size of the pit is 10 m x 5 m x 5.4 m it is located at the north – eastern part of the lease hold area. The lithology of the pits is as under:

Soil	-	1.2 m
Laterite / Morrum	-	1.0 m
Bauxite	-	3.2 m.

Pit No. 2 :

It is located just above the escarpment on grid line 2000 N and the size of pit is 10m x 6m x 6.10m. The lithology of the pit is as under: -

Soil	-	1.2 m
Laterite / Morrum	-	0.6 m
Bauxite	-	4.3 m.

Pit No. 3 :

This pit is situated at Grid line 1400 N in the Central Part and having a size 10m x 6m x 5.90m. The lithology of the pit is as follows: -

Soil	-	0.80 m
Laterite / Morrum	-	0.30 m
Bauxite	-	4.80 m.

Pit No. 4 :

It is located on Grid Line No. 1700 N just at the top of escarpment. The pit has a size of 10m x 5m x 4.9m. The lithology as observed is :-

Soil	-	1.0-m
Laterite / Morrum	-	0.9 m
Bauxite	-	3.0 m.

Pit No. 5 :

It is located on 1000 N Grid Line along the eastern escarpment. The size of the pit is 10m x 6m x 5.4m. The details of the pit are as under: -

Soil	-	1.4 m
Laterite / Morrum	-	1.0 m
Bauxite	-	3.0 m.


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**Pit No. 6 :**

It is located at the southern part of the leasehold on 1200 N Grid Line. The size of the pit is 10m x 6.2m x 6.2m. The lithological components of this pit is: -

Soil	-	2.1m
Laterite / Morrum	-	1.0 m
Bauxite	-	3.0 m.

Pit No. 7 :

The size of the pit is 10m x 6m x 5.9m and situated at grid line 1500 N in the western part.

The lithology of the pit is as under: -

Soil	-	1.8 m
Laterite / Morrum	-	1.1 m
Bauxite	-	3.0 m.

The eastern and western escarpment shows the concentration of Bauxite also and these form the basis of reserve estimation in the area.

ii) Number of boreholes indicating type (Core/RC/DTH), diameter, spacing, inclination, Collar level, depth etc with standard borehole logs duly marking on geological plan/sections.

Exploratory drilling was recommended on 2016 by the lessee itself. Two rotary drills were used. Both the Drills were skid mounted. Dry drilling was done mainly with casing for getting maximum core recovery. Total 25 vertical coring bore holes were drilled during the months January to March of year 2016.

Details of drilling carried out are shown in the following table.

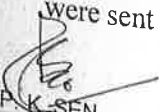
No of boreholes	year of commencement	Meterage drilled	Numbers of samples analyzed
25	2016	366.20	108

Litholog of borehole is enclosed as annexure – 5, Form J for drilling is enclosed as annexure – 16.

iii) Sampling & grade:

The bore hole core samples for laterite & bauxite was collected in the lithological contact between laterite & bauxite zone. In bauxite zone samples was collected at interval of 1m to 1.5m run length.

Each sample was first crushed to about -80 mesh size then & reduced in volume 200gm by coning & quartering. This was followed by spitting the reduced samples into three portions, which of two were sent to chemical laboratory for analysis & the other for retained.


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Collected samples were first analyzed for their Al_2O_3 content & L.O.I. if they assayed more than 40% Al_2O_3 & also analyzed for the redicals SiO_2 & Fe_2O_3 .

The details of the analysis of the borehole samples are given with the borehole log.

Refer annexure no- 5

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Grade:

The average grade of bauxite from the samples of bauxite which are collected from the borehole cores is given below:-

Parameter	Average Result
Al_2O_3	45.59 %
SiO_2	3.24 %

Samples drawn from borehole and analyzed in a NABL laboratory. The result is as follow

Parameter	BH-2	ORSA-3	BH-18	Average
Al_2O_3	46.61	40.84	47.17	44.87
Fe_2O_3	17.42	25.51	18.78	20.57
SiO_2	3.19	5.53	3.16	3.96
LIO	23.11	20.19	21.96	21.75
TiO_2	7.33	5.65	6.85	6.61
V_2O_5	0.20	0.22	0.21	0.21
P_2O_5	0.16	0.12	0.14	0.14

Photocopy of analysis report along with NABL certificate is enclosed as annexure- 15

iv) Expenditure occurred in various prospecting operation:- N/A.

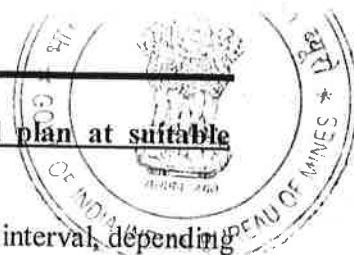
f) The surface plan of the lease area may be prepared on a scale of 1: 1000 or 1: 2000 with contour interval of maximum of 10 m depending upon the topography and size of the area duly marked by grid lines showing all features indicated under Rule 28(1)(a) of MCDR 1988.

The surface plan is prepared on a Scale of 1:2000 with 3m contour interval is enclosed as Plate No. 3.

g) For preparation of geological plan, surface plan prepared on a scale of 1: 1000 or 1: 2000 scale specified under para 1.0 (f) of Part A of the format may be taken as the base plan. The details of exploration already carried out along with supporting data for existence of mineral, locations proposed exploration, various litho units along with structural features, mineralized/ore zone with grade variation if any may be marked on the geological plan along with other features indicated under Rule 28 (1)(b) of MCDR 1988.

The Geological plan is prepared on a Scale of 1:2000 with 3m contour intervals enclosed as Plate No. 4.


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h) Geological sections may be prepared on natural scale of geological plan at suitable interval across the lease area from boundary to boundary.

13 Nos. of Geological Sections (A-A' to M-M') have been prepared at suitable interval, depending on spatial location of the boreholes, on a scale of 1:2000 and is enclosed as Plate No. 4A.

i) Broadly indicate the future programme of exploration with due justification (duly marking on Geological plan year wise location in different colours) taking into consideration the future tentative excavation programme planned in next five years as in table below: -

During 2016 partly area is drilled by the lessee & exploration is proposed in the entire virgin area on a grid interval of 100m as per the Rule 12(3) of MCDR 2017 during the year 2018-19 & 2019-20 of this plan period.

At this plan period 128 numbers boreholes are proposed in the area at 100m X 100m as shown on Geological Plan, Plate no 4.

Total meterage is proposed in around 3200m.

The location proposed for boreholes is shown on geological plan plate no 4.


The allocation of the boreholes is given in the following table:

Year	No. of boreholes	(Core/RC/ DTH)	Grid interval	Explored area	meterage
2018-19	PBH 1 to PBH-46	coring	100m X 100m	460000 m ²	1150 m
2019-20	PBH 47 to PBH-128	coring	100m X 100m	820000 m ²	2050 m
Total				1280000 m ²	3200 m

j) Reserves and Resources as per UNFC with respect to the threshold value notified by IBM may be furnished in a tabular form as given below: (Area explored under different level of exploration may be marked on the geological plan and UNFC code for area considered for different categories of reserve/resources estimation may also be marked on geological cross sections). Submit a feasibility/pre-feasibility study report along with financial analysis for economic viability of the deposit as specified under the UNFC field guidelines may be incorporated.

The borehole is drilled in grid interval of 50m & also 100m. Therefore the category of resources is calculated based on the existence of bauxite in the borehole for the G1 & G2 level of exploration. The influence area of 50m (25m each side) from the borehole is taken as G1 level of exploration & further 50m (25m each side) is taken as G2 level of exploration.

The details are given below:-


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G1 Category:

Details	Area Covered in Sq.m	No. of BH / Pits	Spacing	Average thickness in m	Grade
BH influence	53057	22	50 m X 50 m	3.93m	Al ₂ O ₃ : 34.55 SiO ₂ : 3.23

G2 Category:

Details	Area Covered in Sq.m	No. of BH / Pits	Spacing	Average thickness in m	Grade
BH influence	138160	20	50 m X 50 m	3.93m	Al ₂ O ₃ : 46.02 SiO ₂ : 3.16

- k) Furnish detailed* calculation of reserves/resources section wise (When the mine is fully mechanized and deposit is of complex nature with variation of size, shape of mineralized zones, grade due to intrusion within ore zone etc, an attempt may be made to estimate reserves/resources by slice plan method). In case of deposits where underground mining is proposed, reserve/resources may be estimated by level plan method, as applicable, as per the proposed mining parameters.

Category wise (proved & probable) Reserves estimated in the earlier approved mining Plan.

Category of reserve	Reserve in tonnes
Proved Reserve	2642010
Probable Reserve	2919252
Total Reserve	5561262

Depletion of reserve

Category of reserve	Reserve in tones as on 11.05.2005	Depletion of reserve up to 31.05.2017	Balance reserve as on 01.06.2017
Proved Reserve	2642010	Nil	2642010
Probable Reserve	2919252	Nil	2919252
Total Reserve	5561262	Nil	5561262

Note: - The reserve was calculated for the entire area 309.36 hectares / 764.00 Acres during the year 2005. Now the lease area is reduced at the time of renewal of the mining lease & the lease area is now 196.27 hectares or 485.00 acres. Also the reserve was not calculated based on the UNFC & Minerals (Evidence of Mineral Contents) Rules, 2015. Hence fresh reserve is calculated based on the UNFC & Minerals (Evidence of Mineral Contents) Rules, 2015.

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Fresh reserves established category wise (with basis and parameter considered):

The borehole is drilled in grid interval of 50m & also 100m. Therefore the category of resources is calculated based on the existence of bauxite in the borehole for the G1 & G2 level of exploration. The influence area of 50m (25m each side) from the borehole is taken as G1 level of exploration & further 50m (25m each side) is taken as G2 level of exploration.

The reserve & resources is calculated taking influenced area 25m X 25m on the each side of the borehole for G1 or measured mineral resources category & further 25m X 25 was taken for G2 or indicated mineral resources category on the basis of existence of bauxite in the boreholes logs.

The occurrence of bauxite in the given directions can be justified with presence of workable bauxite in the bore holes where bauxite of considerable thickness.

Therefore, the area considered for the estimation of resources as shown in the Plate No. 4. The influenced area for individual bore hole for the measured mineral resources & indicated mineral resources category separately. Then the calculated area is multiplying with the thickness encountered in each boreholes & pits to achieved bulk volume.

The bulk volume has been calculated by multiplying average thickness of the bauxite as encountered in pits coming under the influence of the block.

The tonnage factor of bauxite in the area has been assessed as 2.3 Tes/cu.m

Tonnage factor

A tonnage factor of 2.30 has been taken into consideration for estimation of reserves.

Method for the calculation of Tonnage factor: - The calculation of tonnage factor is as follows.

Bulk density= Mass/Volume

$$\text{Bulk density} = \frac{\text{weight of bauxite (62000gm)}}{\text{Air free container (30cmX30cmX30cm)}} \\ = 0.062 \text{Tonne} / 0.027 \text{m}^3 = 2.3 \text{Tonne/Cu.m}$$

Mining loss & recovery factor is taken consideration for the calculation of the reserve of bauxite @ 70 % recovery from the ROM based of the general studies from the face of old quarry.

From face of the existing pits & end scarp section has been inspected and exhibited, it was found that the bauxite zone within the matrix of the lateritic horizon is in boulder form and the


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ORSA BAUXITE MINE (196.27 Hectares)
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recovery percentages are anticipated at 70 % on visual basic. This will be confirmed subsequently after pitting.

Length of examined face	Width of examined face	area of the face wall	Bauxite boulder zone area	Anticipated recovery percentage
10m	2m	20m ²	14m ² (average of boulders)	70 %

Grade:

The average grade of bauxite from the samples of bauxite which are collected from the borehole cores is given below:-

Parameter	Average Result
Al ₂ O ₃	45.59 %
SiO ₂	3.24 %

Samples drawn from borehole and analyzed in a NABL laboratory. The result is as follow

Parameter	BH-2	ORSA-3	BH-18	Average
Al ₂ O ₃	46.61	40.84	47.17	44.87
Fe ₂ O ₃	17.42	25.51	18.78	20.57
SiO ₂	3.19	5.53	3.16	3.96
LiO	23.11	20.19	21.96	21.75
TiO ₂	7.33	5.65	6.85	6.61
V ₂ O ₅	0.20	0.22	0.21	0.21
P ₂ O ₅	0.16	0.12	0.14	0.14

Photocopy of analysis report along with NABL certificate is enclosed as **annexure- 15**

MEASURED MINERAL RESERVE CATEGORY: The measured mineral resource of Bauxite @ 70% recovery from the ROM after considering mining loss & recovery factor as arrived has been provided in prima facies in mineable and non-mineable part as follows:-

Category of Reserve	Details	Total Resources in Tonnes (A)	Likely to be Mineable in Tonnes (A-B)	**Non-Mineable in Tonnes due to modifying factor (B)
Measured Mineral Resource (331)	25m Bore hole influence	338732	291765	46967

INDICATED MINERAL RESERVE CATEGORY: The indicated mineral resource of Bauxite @ 70% recovery from the ROM after considering mining loss & recovery factor as arrived has been provided in prima facies in mineable and non-mineable part as follows:-


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**ORSA BAUXITE MINE (196.27 Hectares)
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Category of Reserve	Details	Total Resources in Tonnes (A)	Likely to be Mineable in Tonnes (A-B)	**Non-Mineable in Tonnes due to modifying factor (B)
Indicated Mineral Resource (332)	25m Bore hole influence	873955	775255	98700

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**** Non-Mineable as ore blocked within 7.5m safety barrier, Village road, 10m village road safety barrier & ultimate pit limit or conceptual benches.**

Mineable reserve:

Mineable reserve is based on the feasibility studies over Measured Mineral Resources and indicated mineral resources. Mineable ore reserve has been calculated from the resources in the area considering the ore which is not mineable in view of blocked ore in ML within 7.5m safety barrier, Village road, 10m village road safety barrier & ultimate pit limit or conceptual benches as calculated from the Geological plan & sections. Details calculation of resources & reserve is enclosed as annexure – 7.

Thus the mineable reserve estimated on the basis of measured and indicated category is as tabulated below.

MEASURED MINERAL RESOURCES in Tones (331)	BLOCKED RESERVE IN (UPL/LB) in Tones (211)	MINEABLE RESERVE in Tones (111)
A = B+C	B	C
338732	46967	291765

INDICATED MINERAL RESOURCES in Tones(332)	BLOCKED RESERVE IN (UPL/LB) in Tonnes (222)	MINEABLE RESERVE in Tonnes (122)
A = B+C	B	C
873955	98700	775255


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Summary of reserve:-

Category of Resource	Mineable Reserves in Tonnes	Non Mineable in Tonnes	
Proved (111)	291765	Feasibility Mineral Resources (211)	46967
Probable (122)	775255	Pre-Feasibility Mineral Resources (222)	98700
TOTAL	1067020		145667

Anticipated life of the mine:-

The recoverable reserve would be **1067020** tonnes after considering 70% recovery factor and mining loss. The production of Bauxite in this plan period would be **954146** tonne. The balance recoverable reserve would be **112874** tonnes. After the plan period the balance reserve will be sustain only for further 1 year. Thus the life of the mine would be about 6 years (5 years + 1 Year).

At this plan period 128 numbers boreholes are proposed in the area at 100m X 100m as shown on Geological Plan, Plate no 4.

On the basis of outcome of the exploratory data the reserve may be enhanced and the life of the mine would be increased accordingly.

1) Mineral Reserves/Resources:

Mineral Resources: (Mineral resources may be estimated purely based on level of exploration, with reference to the threshold value of minerals declared by IBM)

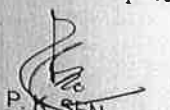
Details	Level of Exploration	Resources in tonnes	Explored area in m ²	Average Grade
Bauxite	G1	338732	53057	Al ₂ O ₃ : 44.87% SiO ₂ : 3.96 %
	G2	873955	138160	
Total		1212687	191217	

Feasibility study based on the geographical conditions and operating conditions:

Infrastructure: Road and railway sand is easily approachable from the working site. Manpower is cheaply available.

Geology: Geologically the area is potential and the deposit with grade as per requirement by the consuming party.

Legal matters: applied lease area is valid as per the rule of M.C.R. -1960. There will be no displacement. Land will be acquired as per the rule.


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Operating: The lessee will make an agreement for all the mining equipments used for the scientific mining with the vendor. The mine is eco-friendly.

Economically the ore is mineable as compared to overburden thickness. The ore is also economically viable for its consuming party.

Thus the economic, feasible and geology axis are categorized as – 1.

Thus the mineable prove reserve as estimated is categorized as 111

Probable reserve is categorized as 122.

Economically ore is mineable as compared to overburden thickness and it is viable for the captive plant and is categorized as – 1.

Feasibility study of the deposit is yet to establish. So, it is categorized as -2

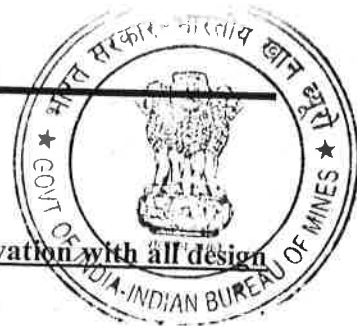
Geologically the area is potential but the deposit in the depth is yet to establish with grade as per the requirement by the captive plant and it is categorized as -2.

Feasibility report is enclosed as annexure- 6.

RESERVES AND RESOURCES ESTIMATED FOR BAUXITE AS ON 31.09.2017

Classification	Code	Quantity in MT	Average Grade	Threshold value
A. Total Mineral Reserve				
Proved Mineral Reserve	111	291765	Al ₂ O ₃ : 44.87% SiO ₂ : 3.96 %	Al ₂ O ₃ : 30.00% SiO ₂ : 5.00 %
Probable Mineral Reserve	121	-----	-----	-----
	122	775255	Al ₂ O ₃ : 44.87% SiO ₂ : 3.96 %	Al ₂ O ₃ : 30.00% SiO ₂ : 5.00 %
B. Total Remaining Resources				
Feasibility Mineral Resource	211	46967	Al ₂ O ₃ : 44.87% SiO ₂ : 3.96 %	Al ₂ O ₃ : 30.00% SiO ₂ : 5.00 %
Pre-feasibility Mineral Resource	221	-----	-----	-----
	222	98700	Al ₂ O ₃ : 44.87% SiO ₂ : 3.96 %	Al ₂ O ₃ : 30.00% SiO ₂ : 5.00 %
Measured Mineral Resource	331	-----	-----	-----
(Indicated Mineral Resource	332	-----	-----	-----
Inferred Mineral Resource	333	-----	-----	-----
Reconnaissance Mineral Resource	334	-----	-----	-----
Total Reserves + Resources		1212687	Al ₂ O ₃ : 44.87% SiO ₂ : 3.96 %	Al ₂ O ₃ : 30.00% SiO ₂ : 5.00 %

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2.0 MINING

A. OPEN CAST MINING:

a) Briefly describe the existing as well as proposed method for excavation with all design parameters indicating on plans /sections.

The proposed area has been topographically surveyed on a Scale of 1:2000, Geologically mapped. Detailed studies have been made to know the mineralization zone, size and quality of mineral etc and ultimate pit limit also marked on the plans.

As described in Part A, under Geology And Exploration chapter there is sufficient bauxite deposit based on exploratory drilled hole, with a total estimated mineable reserve of over 1067020 tonnes after considering 70% recovery after mining loss for mineral with average Al_2O_3 : 45.81 % & SiO_2 : 3.20 % content.

Proposed method of Mining:

Since the deposit in this area is surficial in nature with continuous boulders interspersed with soil & laterite, it is proposed to carry out only opencast fully mechanized mining for this plan period. Category of the mine is category A (Fully mechanized.)

The mine will be worked by fully mechanized opencast mining method. The sequence of mining operation is (a) cutting and removal of soil & morrum by poclain dumper combination (b) drilling of bench using DTH drills in harder strata (c) charging and blasting of holes (d) cutting of laterite & Bauxite by poclain dumper combination (e) removal of waste with dumper for backfilling (f) transporting of blasted materials to the Railway siding at Miralgara after hand shorting.

Initially during the 1st year the part of excavated soil will be dumped consequently when the quarry will be exhausted or reached up to its ultimate pit depth then the excavated soil will be spreaded over the backfilled areas for rehabilitation. The land will be then handover to the owner after plantation over it or making agricultural land as per the requirement of the land owners.

Mining Strategy:-

Since the deposit in this area is surficial in nature with continuous boulders interspersed with soil & laterite, it is proposed to carry out only opencast fully mechanized mining for this plan period. For blasting 100 mm holes will be drilled by wagon drills run by the compressor and overburden will also be removed by poclain dumper combination.


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ORSA BAUXITE MINE (196.27 Hectares)
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Bench Design and Formation:

Since the mine will be worked by fully mechanized during this plan period of 5 years, bench height in soil will be 5m to 6m. In case of laterite the bench height will be 2m to 3m. Bench width will also be maintained 6m in soil & laterite excavation. In Bauxite the bench height will be 3.5m to 6m & the bench width will also be maintained 6m. The face width will vary in each year.

B) Indicate year-wise tentative Excavation in Cubic Meters indicating development, ROM, pit wise as in table below.

I. Insitu Tentative Excavation


The details of overburden removal, generation of Wastes, production targets for bauxite for first five years are as under

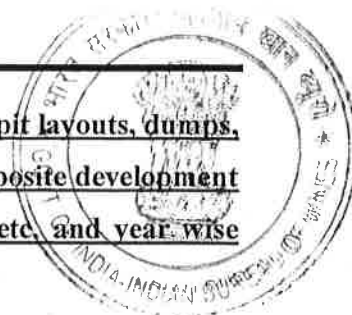
Year	Pit no.	Total tentative Excavation (Cum)	Soil (Cum)	OB/SB/IB (Laterite) (Cum)	ROM (Cum)		Total ROM in cum	ROM / OB Ratio
					Ore (Cum)	Quarry waste (Cum)		
1	2	3	4	5	6	7	8	9
2017-18	1 & 2	410711	240920	73311	67536	28944	96480	1:3.26
2018-19	2 & 3	368245	218060	26209	86783	37193	123976	1:1.97
2019-20	1 & 3	476465	324113	28395	86770	37187	123957	1:2.84
2020-21	1, 1A & 4	350099	218570	7362	86917	37250	124167	1:1.82
2021-22	1A	361911	178816	59038	86840	37217	124057	1:1.92
Total		1967431	1180479	194315	414846	177791	592637	1:2.32

The details proposed quarry no along with advancement direction is as under:-

Year	Quarry no	Advancement direction of the quarry	Quantity of ore @ 70 % recovery from ROM in tonnes
2017-18	1	New face	155333
	2	New face	
2018-19	2	North & west	199601
	3	New face	
2019-20	1	South	199570
	3	South & West	
2020-21	1	East	199909
	4	New face	
2021-22	1A	New face	199733
	1A	North south	
Total			954146


P. K. SEN
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17/08/2017
क्षेत्रीय खान नियंत्रक
Regional Controller of Mines
भारतीय खान ब्यूरो
Indian Bureau of Mines



- C) Enclose Individual year wise development plans and sections showing pit layouts, dumps, stacks of mineral reject, if any, etc in case of 'A' category mines. Composite development plans showing pit layouts, dumps, stacks of mineral reject, if any, etc, and year wise sections in case of 'B' category mines.

Bench Development over the five years:

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2017-18:- During this year working is proposed new quarry face (Quarry 1 & quarry no 2) in the southern part of the area.

In quarry no 1 the working is proposed around the bore hole no BH-1, 2, 3, ORSA 2, 3& 5. All together three benches will be developed. One for soil & morrum removal with average thickness of 6m, over an area for bench of 30541 m², Laterite will be removed from 2nd benches with average thickness 3m, over an area of 24437 m². Bauxite will be extracted from the Third bench with average thickness 3.5m, over an area for working is 18307 m². Width of the benches will be always restricted to 6m.

In quarry no 2 the working is proposed around the bore hole no BH-4 & 5. Here bauxite is present below the morrum so two benches will be developed. One for soil & morrum removal with average thickness of 5.725m, over an area for bench of 10074 m², Bauxite will be extracted from the second bench with average thickness 4.375m, over an area for working is 7407 m². Width of the benches will be always restricted to 6m.

The part of excavated OB soil, morrum & laterite will be temporarily dumped in the non mineralized area initially during opening of the face (excepted 90 days from the opening). When the quarry face will be well developed & mineral also excavated up to the ultimate pit depth then concurrently backfilling will be started on the exhausted part of the quarry. Firstly the excavated OB(laterite) which was dumped previously during the quarry face developing will be rehandled & backfilled along with excavated OB, quarry waste & excavated soil will be spreaded over backfilled/reclaimed area. Consequently the process of backfilling, reclamation & rehabilitation will be done concurrently on quarry no 1.

Pit no.	Soil (Cum)	OB/SB/IB (Laterite) (Cum)	ROM (Cum)		Total ROM (Cum)	Bauxite @ 70 % recovery in tonnes
			Ore (Cum)	Quarry waste (Cum)		
1 & 2	240920	73311	67536	28944	96480	155333


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2018-19:- During this year working is proposed in quarry no 2 & 3.

In quarry no 3 the working is proposed around the bore hole no BH-13 & 14. All together three benches will be developed. One for soil & morrum removal with average thickness of 5.65m over an area for bench of 14985 m², Laterite will be removed from 2nd benches with average thickness 2.175m, over an area of 12050 m². Bauxite will be extracted from the third bench with average thickness 4.18 m, over an area for working is 9396 m². Width of the benches will be always restricted to 6m.

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In quarry no 2 the working is proposed around the bore hole no BH-4, 5 & 6. Here bauxite is present below the morrum so two benches will be developed. One for soil & morrum removal with average thickness of 5.82m, over an area for bench of 22920 m², Bauxite will be extracted from the second bench with average thickness 4.08m, over an area for working is 20760 m². Width of the benches will be always restricted to 6m.

All excavated Overburden & waste will be used for concurrent backfilling in the quarry no 3 by mechanized landscaping, followed by soil spreading for reclamation.

Pit no.	Soil (Cum)	OB/SB/IB (Laterite) (Cum)	ROM (Cum)		Total ROM (Cum)	Bauxite @ 70 % recovery in tonnes
			Ore (Cum)	Quarry waste (Cum)		
2 & 3	218060	26209	86783	37193	123976	199601

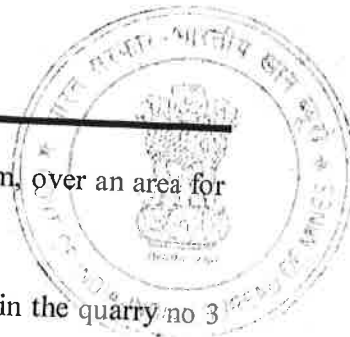
2019-20:- During this year working is proposed in quarry no 1 & 3.

In quarry no 1 the working is proposed around the bore hole no ORSA 5. All together three benches will be developed. First two benches will be developed for soil & morrum removal with average thickness of 6m & 1m, over an area for bench of 4472 m² & 3646 m². Bauxite will be extracted from the third bench with average thickness 2 m, over an area for working is 2832 m². Width of the benches will be always restricted to 6m.

In quarry no 3 the working is proposed around the bore hole no BH-13, 14, 15, 16 & 17. The first bench will be formed to removal of soil & morrum with average thickness of 5.86m, over an area for bench of 36981 m², around bore hole no 15, 16 & 17 thickness of soil & morrum is higher than 6m so this also removed from 2nd bench on this area. The thickness of this bench will be 3.47m with surface area 22169 m². Around Borehole no 13 & 14 laterite is present below the soil & morrum layer so this also removed from 2nd benches in this area with average thickness 2.175m along with surface area 10986 m².

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Bauxite will be extracted from the third bench with average thickness 4.02m, over an area for working is 29426 m². Width of the benches will be always restricted to 6m.

All excavated Overburden & waste will be used for concurrent backfilling in the quarry no 3 by mechanized landscaping, followed by soil spreading for reclamation.

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Pit no.	Soil (Cum)	OB/SB/IB (Laterite) (Cum)	ROM (Cum)		Total ROM (Cum)	Bauxite @ 70 % recovery in tonnes
			Ore (Cum)	Quarry waste (Cum)		
1 & 3	324113	28395	86770	37187	123957	199570

2020-21: - During this year working is proposed in quarry no 1, 1A & 4.

In quarry no 1 the working is proposed around the bore hole no ORSA 3 & 5. All together four benches will be developed. First two benches for soil & morrum removal with average thickness of 6m & 1m, over an area for bench of 8674 m² & 7846 m² respectively. Bauxite will be extracted from the third bench with average thickness 2 m, over an area for working is 2832 m². In borehole no ORSA 3 thickness of bauxite is higher than 6m hence bauxite will be also extracted from iv benches also with average thickness 1.5m along with surface area of 1682m². Width of the benches will be always restricted to 6m.

In quarry no 1A the working is proposed around the bore hole no BH-8 & 9. All together three benches will be developed. One for soil & morrum removal with average thickness of 5.4m, over an area for bench of 5839 m², Laterite will be removed from 2nd benches with average thickness 2.175m, over an area of 3385 m². Bauxite will be extracted from the third bench with average thickness 4.25 m, over an area for working is 3180 m². Width of the benches will be always restricted to 6m.

In quarry no 4 the working is proposed around the bore hole no BH-11 & 12. Here bauxite is present below the morrum so two benches will be developed. One for soil & morrum removal with average thickness of 5.85m, over an area for bench of 21735 m², Bauxite will be extracted from the second bench with average thickness 4.3m, over an area for working is 18206 m². Width of the benches will be always restricted to 6m.


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All excavated Overburden & waste will be used for concurrent backfilling in the quarry no 1 & 4 by mechanized landscaping, followed by soil spreading for reclamation

Pit no.	Soil (Cum)	OB/SB/IB (Laterite) (Cum)	ROM (Cum)		Total ROM (Cum)	Bauxite @ 70 % recovery in tonnes
			Ore (Cum)	Quarry waste (Cum)		
1, 1A & 4	218570	7362	86917	37250	124167	199905

2021-22: - During this year working is proposed in quarry 1A around the bore hole no BH-8, 9, 10 & 11. All together three benches will be developed. One for soil & morrum removal with average thickness of 5.51m, over an area for bench of 32453 m², Laterite will be removed from 2nd benches with average thickness 2.9m, over an area of 20358 m². Bauxite will be extracted from the third bench with average thickness 4.35 m, over an area for working is 28519 m². Width of the benches will be always restricted to 6m.

All excavated Overburden & waste will be used for concurrent backfilling in the quarry no 3 by mechanized landscaping, followed by soil spreading for reclamation.

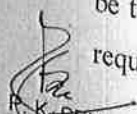
Pit no.	Soil (Cum)	OB/SB/IB (Laterite) (Cum)	ROM (Cum)		Total ROM (Cum)	Bauxite @ 70 % recovery in tonnes
			Ore (Cum)	Quarry waste (Cum)		
1A	178816	59038	86840	37217	124057	199733

d) Describe briefly giving salient features of the proposed method of working indicating Category of mine.

Since the deposit in this area is surficial in nature with continuous boulders interspersed with soil & laterite, it is proposed to carry out only opencast fully mechanized mining for this plan period. Category of the mine is category A (Fully mechanized.)

The mine will be worked by fully mechanized opencast mining method. The sequence of mining operation is (a) cutting and removal of soil & morrum by poclain dumper combination (b) drilling of bench using DTH drills in harder strata (c) charging and blasting of holes (d) cutting of laterite & Bauxite by poclain dumper combination (e) removal of waste with dumper for backfilling (f) transporting of blasted materials to the Railway siding at Miralgara after hand shorting.

Initially during the 1st year the excavated soil will be dumped consequently when the quarry will be exhausted this will spreaded over the backfilled areas for rehabilitation. The land will be then handover to the owner after plantation over it or making agricultural land as per the requirement of the land owners.


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Since the mine will be worked by fully mechanized during this plan period of 5 years, bench height in soil will be 5m to 6m. In case of laterite the bench height will be 2m to 3m. Bench width will also be maintained 6m in soil & laterite excavation. In Bauxite the bench height will be 3.5m to 6m & the bench width will also be maintained 6m. The face width will vary in each year.

The slope angle of the bench is below 60° . When a bench approaches its terminal position, its height is reduced to below 6 m as required by DGMS.

The benches will be sloping gently away from the mining faces. Haul Roads will be laid at a gradient of 1 in 16 except for short ramps if any which will be up to 1 in 12.

e) Describe briefly the layout of mine workings, pit road layout, the layout of faces and sites for disposal of overburden/waste along with ground preparation prior to disposal of waste, reject etc. A reference to the plans and sections may be given. UPL or ultimate size of the pit is to be shown for identification of the suitable dumping site.

Mine Layout:

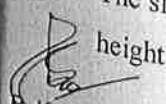
Since the deposit in this area is surficial in nature with continuous boulders interspersed with soil & laterite, it is proposed to carry out only opencast fully mechanized mining for this plan period. Category of the mine is category A (Fully mechanized.)

The mine will be worked by fully mechanized opencast mining method. The sequence of mining operation is (a) cutting and removal of soil & morrum by poclain dumper combination (b) drilling of bench using DTH drills in harder strata (c) charging and blasting of holes (d) cutting of laterite & Bauxite by poclain dumper combination (e) removal of waste with dumper for backfilling (f) transporting of blasted materials to the Railway siding at Miralgara after hand shorting.

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The benches will be sloping gently away from the mining faces. Haul Roads will be laid at a gradient of 1 in 16 except for short ramps if any which will be up to 1 in 12.

Extent of Mechanization

The following machinery will be deployed in the mechanized quarries at the Orsa Bauxite Mine. All equipments are diesel-powered.

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Since mechanized mining is to be done, powered equipment will be deployed. For transporting soil overburden and waste to the respective dumping sites, dumpers will be used.

The ore will be transported by trucks provided by the transport contractors of the company to the Railway siding at Miralgara which is about 230 Km from the area.

For a maximum production of 200000 tonnes per annum of Bauxite along with 324113 cum or 486169 tonnes soil removal & 59038 cum or 118076 tonnes of OB removal, the calculation for adequacy of machinery is presented below.

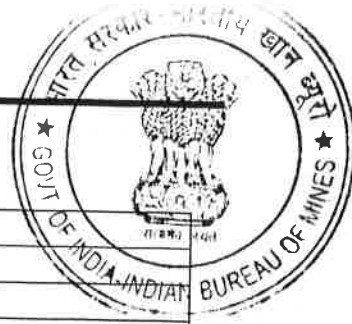
1) DRILL MACHINES (100 mm dia.):

Wagon drill of 100 mm diameter is proposed to be deployed and the numbers of units required are:

a) For OB Removal:

Bench Height	0.5m to 6m , average 3m
Burden	3 m
Spacing	3.5 m
Bulk Density insitu	2.0 MT/m ³
Depth of hole including sub-grade drilling	3.3 m (including 10 % sub grade drilling)
Yield per meter of drilling	$(3 \times 3 \times 3.5 \times 2.0) / 3.3 = 19.09$ MT say 19 MT
OB handling per day	$118076 / 295 = 400.25$ MT (295 working days)
Meterage required per day	$400.25 / 19 = 21.06$ m
Rate of Drilling	25 m per hour
Drilling capacity per day with effective working of 6 hrs per shift	$6 \text{ hrs} \times 25 \text{ m} = 150$ m
No. of drills required for one shifts in a day	$21.06 / 150 = 0.1404$
Considering 80% availability, the requirement of machines will be $0.1404 / 0.80 = 0.1755$ say 1 machines. Therefore one drill machine are adequate to meet the required production target.	


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b) For Bauxite production

Bench Height	1.10m to 3m
Burden	3 m
Spacing	3.5 m
Bulk Density insitu	2.6 MT/m ³
Depth of hole including sub-grade drilling	6.3 m
Yield per meter of drilling	$(3 \times 3 \times 3.5 \times 2.6) / 3.3 = 24.82$ MT
Production per day	200000 / 295 = 677.97 MT or say 678MT (295 working days)
Meterage required per day	678 / 24.82 = 27.32 m
Rate of Drilling	25 m per hour
Drilling capacity per day with effective working of 6 hrs per shift	6 hrs x 25m = 150 m
No. Of drills required for one shifts in a day	27.32 / 150 = 0.18
Considering 80% availability, the requirement of machines will be $0.18 / 0.80 = 0.225$ say 1 machine. Therefore one drill machine is adequate to meet the required production target.	

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Details of drilling machine:

Type	Nos.	Dia of drill hole in mm	Capacity	Motive power	HP
DTH	2	100	25m/hour	Diesel	440

2) EXCAVATORS: (Loading Equipment)

For Bauxite Production:

Required Production	200000 MT/annum
No. of working days	295
Material required to be handled per day	200000 / 295 = 677.97 MT or say 678 MT (295 working days)
Bucket fill factor	80%
Bucket Capacity	0.9 cum i.e. 0.72 cum @ 80%
Bulk density	2.6
Material handled by each bucket	$0.72 \times 2.6 = 1.872$ MT
Cycle time (including pastime) for each bucket	30 sec
Utilization (Job efficiency) and	70%
Tonnage handled/hr	$(1.872 \times 0.7 \times 60 \times 60) / 30 = 157.25$ MT Say 157 MT/hr
Tonnage handled per shift (6hrs shift) for one shift	6 x 157 = 942 MT
Number of excavators required	678 / 942 = 0.72
Considering 80% availability the requirement of excavator is $0.72 / 0.8 = 0.09$ say 1 nos. Therefore one excavator will be sufficient to handle the required targeted production.	

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For Top Soil and OB:

Maximum anticipated development per annum	324113 cum or 486169 tonnes soil 59038 cum or 118076 tonnes of OB Total 604245 MT
No. of working days	295
Material required to be handled per day	$604245 / 295 = 2048.29$ MT say 2048 MT
Bucket fill factor	80%
Bucket Capacity	0.9 cum i.e. 0.72 cum @ 80%
Bulk density loose	2.0 (Avg. of Top soil & OB)
Material handled by each bucket	$0.72 \times 2.0 = 1.44$ MT
Cycle time (including pastime) for each bucket	30 sec
Utilization(Job efficiency) and	70%
Tonnage handled/hr	$(1.44 \times 0.7 \times 60 \times 60) / 30 = 120.96$ MT Say 121MT/hr
Tonnage handled per shift (6hrs shift) for one shift	$6 \times 1 \times 121 = 726$ MT
. Number of excavators required	$2048 / 726 = 2.82$
Considering 80% availability the requirement of excavator is $2.82 / 0.8 = 3.525$. say 4 no. Therefore 4 excavators will be sufficient to handle the required targeted development.	

Detail of excavator:

Type	Nos.	Bucket capacity In cu m	Motive power	H.P
Hydraulic Excavators	5	0.9	Diesel	124

3) Haulage and Transport Equipment:

No. of Tippers to be loaded with the excavators

a) For Top Soil & OB Removal:

1. Lead distance	0.3 km
2. Up hill at 20 kmph. Speed	$(60/20) \times 0.3 = 0.9$ min say 1 minute
3. Down hill at 25 kmph. Speed	$(60/25) \times 0.3 = 0.8$ min say 1 minute
4. Loading time	3.5 minutes **
5. Spotting time	4 minute
6. Unloading	2 minute

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7. Total time required per trip	9.5 minutes
8. No. of trips per hour	$60/9.5 = 6.32$
9. With 80% efficiency	$6.32 \times 0.80 = 4.0448$ trips per hour
10. Capacity of tippers	15 tonnes
11. Hourly output per tipper	$4.0448 \times 15 = 60.672$ MT
12. Total OB handling per day targeted	$604245 / 295 = 2048.29$ MT say 2048 MT
13. Considering one shift per day, 6 hrs per shift so output of 1 tipper per day	$60.672 \times 6 = 364.032$ MT
14. No. of Tippers required	$2048 / 364.032 = 5.62$
Considering 80% availability, number of tippers required is $5.62/0.8 = 7.025$ nos. Therefore 8 tippers are required to transport top soil & OB for reclamation. One for standby is suggested.	

**** Loading time:-**

Bucket fill factor	80%
Bucket Capacity	0.9 cum i.e. 0.72 cum @ 80%
Bulk density loose	2.0 (Avg. of Top soil & OB)
Material handled by each bucket	$0.72 \times 2.0 = 1.44$ MT
Tippers capacity	10 tonnes
Number of bucket for each trippers	$10 / 1.44 = 6.9$ say 7
Cycle time (including pastime) for each bucket	30 sec
Loading time	$7 \times 30 = 210$ sec say 3.5 minutes

Description	Nos.	Size/ capacity	Motive power	H.P
Tippers for top soil & OB transportation	9	10 MT	Diesel	98.5

b) Bauxite transportation to the stock yard:-

The ore will be transported by trucks provided by the transport contractors of the company to stockyard at Miralgara which is about 230 Km from the area.

Machineries Deployed

Salient features of the Proposed Mining Machinery are enlisted below

S. No	Type of machine	No	Dia of hole In mm	Size/ capacity	Motive power	H.P
1	DTH	2	100	25m/hr	Diesel	440
2	Excavators	5	-	0.9 cu. M	Diesel	124
3	Compressor	3	-	300 cfm.	Diesel	-
4	Jackhammer	4	-	-	Diesel	-
5	Tippers	9	-	10 MT	Diesel	98.5

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The above machines will be deployed on hire basis initially till the appointment of any raising contractor. After the appointment of a raising contractor it will be arranged by the raising contractor.

Drilling and Blasting:

The overburden, ranging from 2 -3 m in thickness, and consisting of laterite, is not soft enough to be directly excavated. The laterite are drilled by using 100mm dia drills and blasted, before removing. The wagon drill with compressed air drill shall be used for drilling the hole.

The bauxite bench height is a maximum of 3.5-6m are drilled by using 100mm dia drills and blasted, before removing. The wagon drill with compressed air drill shall be used for drilling the hole.

S. No.	Type of Machine	Dia mm	Capacity	Motive Power	No. of Machine
1.	DTH	100	25m/hour	Diesel	2
2.	Air Compressor	-----	300 cfm	Diesel operated	3

Broad blasting parameters like charge per hole, blasting pattern, charge per delay, maximum no of holes blasted in a round, manner and sequence of firing, etc.

It proposed to adopt the following parameters:

For OB Removal:


Bench Height : average 3m
 Burden : 3 m
 Spacing : 3.5 m
 Bulk Density insitu : 2 MT/m³
 Depth of hole : Bench height 3 m x 10% (S.G.Drilling) = 3.3 m
 Tonnage per hole = 3.3x3x3.5x2
 = 69.3 Tonnes say 69 tonnes

Powder factor = 5 Tonnes/ kg.**
 Charge per hole = 69/5 = 13.8 kg

For Bauxite Production:

Bench Height = 6 m
 Burden = 3 m
 Spacing = 3.5 m
 Bulk Density in situ = 2.3 MT/m³
 Depth of hole = Bench height 6.0m X 10% (S.G.Drilling) = 6.6 m
 Tonnage per hole = 6.6X3X3.5X2.3 = 159.39Tonnes say 159 tonnes

Powder factor = 7 Tonnes/ kg. **


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Charge per hole = $159 / 7 = 22.7$ say 23 kg

** The POWDER FACTOR is a relationship between how much rock is broken and how much explosive is used to break it. It can serve a variety of purposes, such as an indicator of how hard the rock is, or the cost of the explosives needed, or even as a guide to planning a shot. Powder factor can be expressed as a quantity of rock broken by a unit of explosives. Or, alternatively, it can be the amount of explosives required to break a unit measure of rock.

$$PF = W_r / W_e$$

PF – powder factor, W_r – Total weight of rock generated in blast, W_e – Total weight of explosive used in blast.

In this area from the daily practice it is found that about 7 tonnes of bauxite is removed by used of 1 KG explosives to blast as well as 5 tonnes of hard OB is removed by used of 1 KG explosives to blast.

So Powder factor for bauxite = 7 Tonnes/ kg .

Powder factor for Hard OB = 5 Tonnes/ kg.

Holes shall be drilled in square/scattered pattern. The holes are charged with explosives. Shot firing is done usually with the help of safety fuse and ordinary detonator. The following blasting parameters are being adopted. (Slurry Explosive is ANFO (ammonium nitrate/fuel oil))

Explosive	Overburden Slurry Explosive	Bauxite Slurry Explosive
Bench height	3m	6 m
Depth of hole	3.3m	6.3 m
Burden	3 m	3 m
Spacing	3.5 m	3.5 m
Volume	$3.3m \times 3m \times 3.5m = 34.65 \text{ cum}$	$6.6 \text{ m} \times 3m \times 3.5m = 69.3 \text{ cum}$
Specific Gravity	2	2.3
Tonnage per hole	69.3 MT say 69 MT	159 MT
Daily production / OB removal	$118076 / 295 = 400.25 \text{ MT}$	$200000 / 295 = 677.97 \text{ MT}$ or say 678 MT
Numbers of holes per day	$400.25 / 69 = 5.80$ say 9 holes	$678 / 159 = 4.26$ say 3 holes
Charge/hole	13.8 kg	23 kg
Method of blasting	1 row of 9 holes in one round	1 row of 3 holes in one round
Explosive	124.2 kg of slurry explosives (9holes)	69 kg of slurry explosives (3 holes)

Blasting Hours

Blasting hours will be confined within from 12.00 Noon to 1 PM. Moreover keeping blasting time at the lunch hour is also safer because most of the workforce is out the quarry face i.e.


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danger zone and are brought within the safety zone. Frequency of blasting shall be three to four times per week. The shift timings are altered suitably during different seasons.

The magazine is under proposal as per the design laid down in Indian Explosives Rules and safety distances will also be maintained as per the above rules.

Drilling and blasting operations will be carried on strictly as per the various provision of MMR, 1961 under the strict supervision of qualified persons. For storage and issue of explosives, the relevant provisions of Indian Explosives Rules, 1983 will be followed. **APPROVED**

Blasting time is generally fixed after consultation with neighboring mines during the working shift taking all required precautions, like marking the danger zone of 500m with red flags, use of warning signals and providing blasting shelters etc.

Storage of explosives

Lessee will make an agreement with the blasting agency before starting the mining operation or will obtained a blasting license.

Safe practices during shot firing

Drilling and charging of holes could not be carried out in the same area in same time.

A. detailed record of the hole positions, type of explosives, quantity of explosives, hole depth, charge column and stemming could be maintained for finding out the depth of the charge in case of a misfire. Before firing any shot all persons should be withdrawn from the blasting site to a safe place, i.e. more than 300m away.

Blasting time is generally fixed after consultation with neighboring mines during the working shift taking all required precautions, like marking the danger zone of 300m with red flags, use of warning signals and providing blasting shelters etc.

f) Conceptual Mine planning up to the end of lease period taking into consideration the present available reserves and resources describing the excavation, recovery of ROM, Disposal of waste, backfilling of voids, reclamation and rehabilitation showing on a plan with few relevant sections.

While preparing a conceptual mining plan for this area, the following points and precepts have been kept in view:

- i) The ore bodies in the ML area not being continuous extraction of bauxite in a new block would be started only after exhausting the block under operation.
- ii) The removal of overburden as well as breaking and heaping of bauxite would be done with excavator. As space become available in the excavated area, the overburden generated during mining would be concurrently pushed into voids as backfill.


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- iii) Initially during the 1st year the part of excavated soil will be dumped consecutively when the quarry will be exhausted or reached up to its ultimate pit depth then the excavated soil will be spreaded over the backfilled areas for rehabilitation.
- iv) All excavated Overburden & waste will be used for concurrent back filling & the process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. After reclamation of land the land will be then handover to the owner after plantation over it or making agricultural land as per the requirement of the land owners.
- v) During the conceptual plan period these reclaimed areas will be returned to the concerned land owners. The other voids so left will be filled with rain water and shall be treated as water reservoir as required by the local villagers.

Anticipated life of the mine:

The recoverable reserve would be 1067020 tonnes after considering 70% recovery factor and mining loss. The production of Bauxite in this plan period would be 954146 tonne. The balance recoverable reserve would be 112874 tonnes. After the plan period the balance reserve will be sustain only for further 1 year. Thus the life of the mine would be about 6 years (5 years + 1 Year).

At this plan period 128 numbers boreholes are proposed in the area at 100m X 100m as shown on Geological Plan, Plate no 4.

On the basis of outcome of the exploratory data the reserve may be enhanced and the life of the mine would be increased accordingly.

Production:

The production target for the first five years is as under:

Year	Quarry no	Quantity of ore in tonnes
2017-18	1 & 2	155333
2018-19	2 & 3	199601
2019-20	1 & 3	199570
2020-21	1, 1A & 4	199909
2021-22	1A	199733
		954146

The overall average grade of ore in this area is estimated to be +44% on the basis of sampling of /boreholes / quarry samples.

After the conceptual mining period, on the basis of proposed production planning and available reserve position, the ultimate pit area, ultimate pit depth, ultimate generation of waste, final pits slope, afforestation program me is given in the following table:


Ultimate pit area for Bauxite	22.31 ha
Average Ultimate pit depth for Bauxite	10-12 m
Ultimate generation of waste	During Plan period =1552585 Cum Conceptual period = 310517 Cum Total = 1863102 Cum After 20 % swelling = 2235722 Cum
Total No. of plantation during the plan period	31976 saplings
Total No. of plantation after the Conceptual period	38371 saplings

Year	Soil (Cum)	OB/SB/IB Laterite (Cum)	Quarry waste (Cum)	Total OB & waste (Cum)
2017-18	240920	73311	28944	343175
2018-19	218060	26209	37193	281462
2019-20	324113	28395	37187	389695
2020-21	218570	7362	37250	263182
2021-22	178816	59038	37217	275071
Total	1180479	194315	177791	1552585
After plan period (6th year 2022-23)	236096	38863	35558	310517
G. Total	1416575	233178	213349	1863102
After 20 % swelling	1699890	279814	256019	2235722

Reclamation and rehabilitation –

Initially during the 1st year the part of excavated soil will be dumped consequently when the quarry will be exhausted or reached up to its ultimate pit depth then the excavated soil will spreaded over the backfilled areas for rehabilitation.

All excavated Overburden & waste will be used for concurrent back filling & the process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. After reclamation of land the land will be then handover


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ORSA BAUXITE MINE (196.27 Hectares)
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to the owner after plantation over it or making agricultural land as per the requirement of the land owners.

During the conceptual plan period these reclaimed areas will be returned to the concerned land owners. The other voids so left will be filled with rain water and shall be treated as water reservoir as required by the local villagers.

The year wise area to be reclaimed is as under:

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Year	Total Ob & waste for Reclamation (cum)	Dump area in ha	Reclaimed area in ha	Rehabilitated area in ha
2017-18	343175	Temporarily Soil dump - 096	2.47	2.31
2018-19	281462		3.80	3.30
2019-20	389695		4.69	5.18
2020-21	263182		2.82	1.95
2021-22	275071		3.29	4.12
Total	1552585		17.07	16.86

Land Use Pattern:

Existing land use pattern:

Description	Total in ha
Pit	0.10
Road	1.77
Total used area	1.87
Balanced unused area	194.4
Total applied lease area	196.27

After first 5 years of Plan Period

The land Use Pattern at the end of 5 years plan period will be as under:-

Description	Total in ha
Quarry	18.97
	(17.07 ha reclaimed area)
Road	1.77
Greenbelt	2.00
Total used area	22.74
Balanced applied unused area	173.53
Total lease area	196.27


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Year wise land use:-

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)				
	After 2017-18	After 2018-19	After 2019-20	After 2020-21	After 2021-22
Quarry	4.16	7.95	12.1	15.72	18.97
Road	1.77	1.77	1.77	1.77	1.77
Greenbelt	0.40	0.80	1.20	1.60	2.00
Total used area	6.33	10.52	15.07	19.09	22.74
Balanced unused area	189.94	185.75	181.2	177.18	173.53
Total applied lease area	196.27	196.27	196.27	196.27	196.27

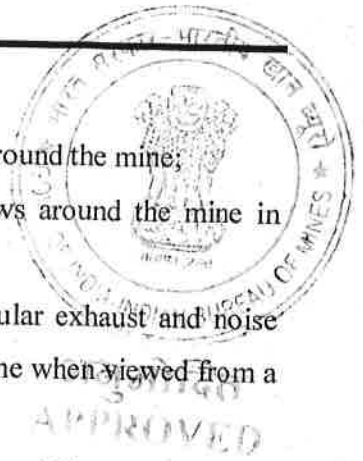
Land use after the Life of the Mine:

Description	Total in ha
Quarry	22.31 (20.42 ha reclaimed area & 1.89 ha water reservoir)
Road	1.77
Greenbelt	2.74
Total used area	26.82
Balanced unused area	169.45
Total applied lease area	196.27

Environment – With rapid industrialization and consequent deleterious impact of pollutants on environment, values of environmental protection offered by trees are becoming clear. Trees are very suitable for detecting, recognizing and monitoring air pollution effects. Monitoring of biological effects of air pollutant by the use of plants as indicators has been applied on local, regional and national scale. Trees function as sinks of air pollutants, besides their bio-esthetical values, owing to their presence in large numbers. Annual need of oxygen for one person is met by 150 m² of leaf surfaces i.e. 30-40 m² of greenery. So, it is necessary to develop green belt in and around the polluted site with suitable species to combat the air pollution effectively.

The green belt development not only functions as a foreground and background landscape feature resulting in harmonizing and amalgamating the physical structures of the mines with surrounding environment, but also acts as a pollution sink as indicated above. Thus, implementation of afforestation program is of paramount importance. In addition to augmenting existing vegetation, it will also check soil erosion, make the ecosystem more complex and functionally more stable and make the climate more conducive.


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o **General Guide Lines for Plantations**

- Trees growing up to 10 m or more in height should be planted around the mine;
- Plantation of trees should be done in appropriate circular rows around the mine in alternate rows to prevent horizontal pollution dispersion;
- Trees should also be planted along road sides, to arrest vehicular exhaust and noise pollution and in such a way that there is no direct line of sight to the mine when viewed from a point outside the foliage perimeter;
- Since tree trunks are normally devoid of foliage (up to 3 m), it would be appropriate to have shrub near such trees to give coverage to this portion;
- Fast growing trees with thick perennial foliage should be grown in order to attain more height and canopy in less time.

Species for Arresting Dust

Trees, particularly having compact branching, closely arranged leaves, broad leaves of simple elliptical and hairy structure, shiny or waxy leaves and hairy twigs are efficient filters for dust. The leaf surface of plants is 10-20 times greater than the earth surface occupied by them. It is known that particles up to 80 milli micron may stick to vertical surfaces. It is found that 8 m wide green belt reduces the dust fall by 2-3 times. The following species are chosen to filter the dust pollution:

Cassia fistula - Amaltaas

Bauhinia purpurea - Purple Orchid Tree

Cassia siamea - Kassod tree

Polyalthialongifolia – Debbaru Tree.

Ficus religiosa – peepul Tree.

Tamarindus indica – Tamarind Tree or Imli Tree.

Meliazedarach - Chinaberry tree or Bakain tree.

Azadirachta indica – Neem Tree.

Terminalia arjuna – Arjun Tree.

Recommended Plant Species

On the basis earlier experiences in this area, the following plant species are recommended for greenery of the applied mine lease area.


Alstonia scholaris- Scholar Tree, Dita bark, Devil tree,

Cassia fistula- Amaltaas

Bauhinia purpurea- Purple Orchid Tree

Cassia siamea- kassod tree

Polyalthialongifolia– Debbaru Tree.


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Ficus religiosa – peepul Tree.
Tamarindus indica – Tamarind Tree or Imli Tree.
Meliazedarach- Chinaberry tree or Bakain tree.
Azadirachta indica – Neem Tree.
Terminalia arjuna – Arjun Tree.
Anthocephalus cadamba – Kadam Tree.
Michelia champaca – Champa Tree.
Cassia siamea – Kassod Tree.
Leucaena leucophloe – subabul Tree.
Dalbergia sissoo – Shisham Tree.



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DETAILS OF AFFORESTATION

Year	Within 7.5 m safety barrier & 10m road barrier		On Reclaimed area **	
	Area (Sq.m)	Number of Plants	Area (Sq.m)	Number of Plants
2017-18	4000	1000	23100	3696
2018-19	4000	1000	33000	5280
2019-20	4000	1000	51800	8288
2020-21	4000	1000	19500	3120
2021-22	4000	1000	41200	6592
Total	20000	5000	168600	26976

** Soil will be spreaded over the backfilled areas for rehabilitation. The land will be then handover to the owner after plantation over it or making agricultural land as per the requirement of the land owners.

Precautionary measures will be taken for carrying of the afforestation made by regular watering in the afforested area, to protect from grazing animals and proper manuring. Man will be deployed for protecting and doing the above. Proposed survival rate of this plantation will be around 80 % based survival rate on the surrounding mines on this area.


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3.0 MINE DRAINAGE

a) Minimum and maximum depth of water table based on observations from nearby wells and water bodies

In a typical bauxite-bearing plateau located on hilltop, no water is to be found even at depth. During monsoons, rainwater drains down the escarpments, the natural slope of plateau acts as the drainage system. From the nearby village water table studied below 30m from the ground level.

b) Indicate maximum and minimum depth of Workings.

In a typical bauxite-bearing plateau located on hilltop, mining of bauxite is subsurface mining up to depth of 10m - 12 m.

c) Quantity and quality of water likely to be encountered, the pumping arrangements and places where the mine water is finally proposed to be discharged

As indicated above, there is no possibility of mining encountering any surface/subsurface water body. However, during the course of mining, rain water in the form of surface run off will be there during monsoons only, which will eventually get discharged by garland drain after settlement of the dissolved particles in to the nearby cultivating land and finally into the north Burha River through innumerable water cut channels on hill slopes or find its way through cracks, joints and fissures in rocks and finally reach to valley or plain land.

The efforts will be taken to treat this water for reducing suspended solid matters and other ingredients within the permissible limit as per IS-2490 before discharging from the applied lease area.

Water quality will be monitored after starting the mining operation & the report also will be submitted accordingly.

d) Describe regional and local drainage pattern. Also indicate annual rain fall, catchments area, and likely quantity of rain water to flow through the lease area, arrangement for arresting solid wash off etc.

DRAINAGE PATTERN:

In a typical bauxite-bearing plateau located on hilltop, no water is to be found even at depth. During monsoons, rainwater drains down the escarpments, the natural slope of plateau acts as the drainage system.

There is no percolation of water in the working area. There are no streams in the region. Three nallas are in northeast & northwest within the leasehold area and flowing from north -west to


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southeast and joins Burha River at a distance of 1.25 km away in the western part from the area. They are all seasonal.

Annual Rain fall:-

Year wise rain fall data (in mm) of Latehar district of collected from Customized Rainfall Information System (CRIS), Hydromet Division, India Meteorological Department under Ministry Of Earth Sciences (<http://www.imd.gov.in>) for the is tabulated below:-

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	Total
2012	57	0	0	0	0	149.9	360	214.6	199.6	25.2	0	0	1006.3
2013	0	0	0	0	0	232.6	267.2	344.9	139.5	321.2	0	0	1305.4
2014	16.8	72.5	35.5	0	114.3	94.7	260.4	224.7	287.3	13	0	0	1119.2
2015	3.2	0	13.4	30.9	1	147.2	538	220.1	62.4	23	0	15	1054.2
2016	5.6	4.2	30	0	18.8	118.2	330.4	582.2	466.3	84.6	0	0	1640.3

Estimation of runoff using Rational Method:-

Annual rainfall (mm) , A	1640.3
Area (sqm) , I	1962700
Rational runoff coefficient, C	0.5
Runoff(cum)= C x I x A	1609414

The runoff coefficient (C) is a dimensionless coefficient relating the amount of runoff to the amount of precipitation received. It is a larger value for areas with low infiltration and high runoff (pavement, steep gradient), and lower for permeable, well vegetated areas (forest, flat land).

It is measured by determining the soil type, gradient, permeability and land use. The values are taken from the table below. The larger values correspond to higher runoff and lower infiltration.

Rational Equation: $Q=ciA$

The Rational equation requires the following units:

Q = Peak discharge, cfs

c = Rational method runoff coefficient

i = Rainfall intensity, inch/hour

A = Drainage area, acre

During the plan period of working, the mining will be restricted up to a moderate depth & the water table of the area is far below the ground. So, no seepages could be seen and entrance of surface water is not possible as clay or lithomarge is present beneath the bauxite zone which is act as an aquitard. Except during rainy season water could not be clogged in the quarry. The efforts will be taken to treat this water for reducing suspended solid matters and other


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ingredients within the permissible limit as per IS-2490 before discharging from the lease area. The drinking water will be supplied from natural springs situated near village and the quality of drinking water will be maintained as per IS-10500. The surface water during the rainy season will accumulate inside the pit limit and outside it goes through the natural stream/nallah. The quarry floor of bauxite horizon is limited up to the level of lithomarge clay, which is good aquifer for water storage. This lithomarge clay will not be disturbed and during the course of mining and backfilling will be carried out over it with laterite boulders having good absorbing capacity for holding water and wastes. Thus the ground water table will not be disturbed and all attempts will be taken that contamination of surface water polluted if any could be avoided to mix up with ground water at any stage.

Since mining in the area will be started from the lower level towards higher ground, water will drain out naturally. The quarry floor will slope inwards, and a ditch would be cut on one side to drain out water into a natural watercourse. While backfilling mined-out areas, suitable conduit would be installed for mine water to drain out, if required the pumps would be used for pumping out.



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**4.0 STACKING OF MINERAL REJECT /
SUB GRADE MATERIAL AND DISPOSAL OF WASTE**

A) Topsoil, morrum , overburden & waste :-

About **1552585** cum of OB & waste will be handled in the 5 years of mining in the lease area.

Initially during the 1st year the part of excavated soil will be dumped consequently when the quarry will be exhausted or reached up to its ultimate pit depth then the excavated soil will be spreaded over the backfilled areas for rehabilitation.

All excavated Overburden & waste will be used for concurrent back filling & the process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. After reclamation of land the land will be then handover to the owner after plantation over it or making agricultural land as per the requirement of the land owners.

The details of excavated Ob & waste are given below:-

Year	Soil (Cum)	OB/SB/IB Laterite (Cum)	Quarry waste (Cum)	Total OB & waste (Cum)
2017-18	240920	73311	28944	343175
2018-19	218060	26209	37193	281462
2019-20	324113	28395	37187	389695
2020-21	218570	7362	37250	263182
2021-22	178816	59038	37217	275071
Total	1180479	194315	177791	1552585

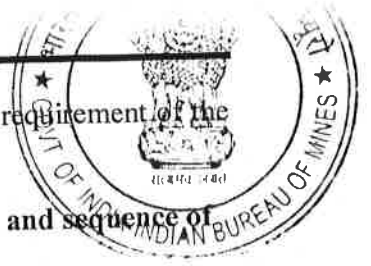
B) The proposed dumping ground within the lease area be proved for presence or absence of mineral and be outside the UPL unless simultaneous backfilling is proposed or purely temporary dumping for a short period is proposed in mineralized area with technical constraints & justification:-

About **1552585** cum of OB & waste will be handled in the 5 years of mining in the lease area.

Initially during the 1st year the part of excavated soil will be dumped consequently when the quarry will be exhausted or reached up to its ultimate pit depth then the excavated soil will be spreaded over the backfilled areas for rehabilitation.

All excavated Overburden & waste will be used for concurrent back filling & the process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. After reclamation of land the land will be then handover


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to the owner after plantation over it or making agricultural land as per the requirement of the land owners.

- C) Attach a note indicating the manner of disposal of waste, configuration and sequence of year wise build up of dumps along with the proposals for protective measures.

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About 1552585 cum of OB & waste will be handled in the 5 years of mining in the lease area.

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All excavated Overburden & waste will be used for concurrent back filling & the process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. After reclamation of land the land will be then handover to the owner after plantation over it or making agricultural land as per the requirement of the land owners.

The year wise area to be reclaimed is as under:

Year	Total Ob & waste for Reclamation (cum)	Dump area in ha	Reclaimed area in ha	Rehabilitated area in ha
2017-18	343175	Temporarily Soil dump - 096	2.47	2.31
2018-19	281462		3.80	3.30
2019-20	389695		4.69	5.18
2020-21	263182		2.82	1.95
2021-22	275071		3.29	4.12
Total	1552585		17.07	16.86

The analysis report and nature of ore in boreholes shows that the entire Bauxite of the area is having average 44.00 % of Al₂O₃ content. Thus there is no sub grade material.


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5.0 USE OF MINERAL AND MINERAL REJECT

Bauxite occurrence as established on the basis of exploration data is within the Laterite profile of the Plateau top. The entire bauxite ore, produced from this mine is meant for captive consumption at the alumina plant at Renukoot. No ore will be sold to the outside agencies and hence the entire mineral is used for extraction of alumina and aluminum metal of the company.

Samples drawn from borehole and analyzed in a NABL laboratory. The result is as follows

Parameter	BH-2	ORSA-3	BH-18	Average
Al ₂ O ₃	46.61	40.84	47.17	44.87
Fe ₂ O ₃	17.42	25.51	18.78	20.57
SiO ₂	3.19	5.53	3.16	3.96
LiO	23.11	20.19	21.96	21.75
TiO ₂	7.33	5.65	6.85	6.61
V ₂ O ₅	0.20	0.22	0.21	0.21
P ₂ O ₅	0.16	0.12	0.14	0.14

Photocopy of analysis report along with NABL certificate is enclosed as **annexure- 15**

The average feed grade of the ore sent to the plant Renukoot is as given below:-

Al₂O₃ - 38.10% minimum & maximum 42.00%

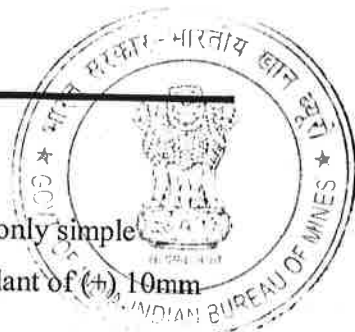
SiO₂ - 3.30% minimum & 5% Maximum

Fe₂O₃ - 20 % Maximum

L.O.I. - 18 % Minimum

As the bauxite of the area is mixed type with predominantly gibbsitic i.e. tri-hydrate alumina (Al₂O₃. 3H₂O) in the range of 70% to 75% and balance 20% is Boehmite i.e. mono-hydrate alumina. The ore is ideally suitable for alumina plant at Renukoot/Muri designed by the KAISER ENGINEERING OF USA basing on BAYER'S PROCESS OF ALUMINIUM EXTRACTION ADOPTING DOUBLE DIGESTION TECHNOLOGY SUITED WELL FOR DIGESTION OF GIBBSITE & BOEHMITE BOTH.

The bauxite of the applied lease can be classified under the metal grade or low grade Bauxite. It is general practice of the consumers to take Bauxite having more than +40.00% Al₂O₃ as metal grade and purchased by Industries for consuming the metal grade ore for metallurgical purpose.



6.0 PROCESSING OF ROM AND MINERAL REJECT

No mineral beneficiation as such is done in the lease area on the other hand only simple manual sorting and sizing is done. ROM produced and supplied to captive plant of (+) 10mm to (-) 200m.

Quality of ore:

Bauxite Samples drawn from borehole and analyzed in a NABL laboratory. The result is as follow

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Parameter	BH-2	ORSA-3	BH-18	Average
Al ₂ O ₃	46.61	40.84	47.17	44.87
Fe ₂ O ₃	17.42	25.51	18.78	20.57
SiO ₂	3.19	5.53	3.16	3.96
LiO	23.11	20.19	21.96	21.75
TiO ₂	7.33	5.65	6.85	6.61
V ₂ O ₅	0.20	0.22	0.21	0.21
P ₂ O ₅	0.16	0.12	0.14	0.14

Photocopy of analysis report along with NABL certificate is enclosed as annexure- 15

Disposal Method of Tailing/ Mineral Beneficiation:

No washing of ore is envisaged in this plan period as such there will be no tailings.


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Site Services:

7.0 OTHER

There are no site services at this stage as the area was non – working since the grant of the mining lease. The site services will be provided during this period by construction of Pit office cum attendance room and first aid centre potable water storage points will be provided within the area. As per safety point of view, as the area is highly disturbed due to law and order problem. Hence keeping these aspects in mind of the security for mine officials and workers and lessee will accommodate all the amenities in Samri which 18 km where all facilities are available there.

Hospital:

A well-equipped hospital is provided and maintained at the Samri which near to mine site where necessary free medicines and medical aids are available. In addition, an Ambulance Van is available at the mine for emergencies. A First Aid Station is also maintained at the mine office to provide timely First Aid.

Rest Shelter:

Separate rest shelters at the quarry Office building complex and site are provided

Drinking Water:

In order to arrange cool drinking water for the employees, water coolers are provided near site office, there is dug well and deep tube well within and around the mine area, which are only the sources of water for human consumption

Vocational Training Centre:

A vocational Training Centre is provided to impart vocational training to employee in Office building complex at Samri Mine site. A number of models and charts are provided.

Lighting Arrangement:

Adequate lighting arrangement is made at Colony and Office. Solar lighting tower arrangement is also made at colony, Hospital, weighbridge, Mine site and nearby villages.

Workshop, Garage and Store:

Mining operation is being carried out by outsourced, a small workshop is maintained at Kusmi Office building complex where all types of repairs and maintenance of Bolero and Explosive trucks, Ambulances is carried out. A store is provided for keeping tools and lubricants.

Administrative Building:

The office building complex, offices of Manager Mining, Residential complex/Colony is located at Kusmi, which 18 km away from mine site. V.T. Centre and Hospital, Aditya Bal vidya Mandir and other infrastructure is located at mine site.


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Welfare Amenities:

The Officers, Staff and Workers of Orsa Bauxite Mine are entitled to welfare amenities provided by Hindalco such as well designed houses with electricity and water connection in well laid out colony, Post Office and Company's bus facility etc.

Apart from this, Company is fulfilling their social obligations by uplifting the standard of living of the nearby area people through different social & cultural activities through different programme taken up by their rural development center.

Water Supply:

Mine water is used for dust suppression, afforestation & equipment washing in workshop. There is dug well and deep tube well within and around the mine area, which are only the sources of water for human consumption.

Employment Potential:

Employment generation is based on the production schedule. Applicant wills employed employs 106 persons including departmental and contractual. In addition, labors will be worked on various non mining jobs like road repairing, civil maintenance, tree plantation etc.

OMS in Ore it is 3.4 Tonnes/man/shift.

Man Power Deployment:

Departmental:

Skilled = 12 No.

Contractual:

Skilled = 29 No.

Semi Skilled (Miner) = 50

Unskilled = 15

Total = 106


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**ORSA BAUXITE MINE (196.27 Hectares)
LESSEE: - MS HINDALCO INDUSTRIES LIMITED**



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Break up of Skilled Manpower both Contractual & Departmental

Mining Engineer (Full Time)	-	1
Geologist (Full Time)	-	1
Manager (1 st Class Certificate Holder)	-	1
Manager (2 nd Class Certificate Holder)	-	1
Surveyor	-	1
Welfare Officer	-	1
CSR	-	1
Foreman	-	2
Mining Mate	-	2
Record Keeper cum Clerk	-	1
Excavator operator	-	6
Loader operator	-	3
Dumper operator	-	11
DTH operator	-	3
Compressor operator	-	3
Driller	-	3
Total	-	41

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Whether the area comes under notified area under Water Act, 1974:

In fact entire State of Jharkhand notified as the Pollution Control area under the Water Act, 1974. By virtue of its location the area falls under the notified area under the Water Act, 1974.

8.2 Impact Assessment:

In such a shallow mine impact due to mining will be insignificant as given below:

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Land Environment:

Land Scape:

Isolated uplifted parts of lands and bound by steep scarps are the characteristic features of Chhotanagpur Plateau. The area under reference is also a part of Chhotanagpur Plateau with steep scarps on western sides. The Plateau ground is almost plane.

Mining will be from the ridge of the Plateau and advancing towards the center.

Overburden/ Wastes are regularly being used in backfilling and not allowing the heaps to rise.

Mining here is sub-surface quarrying and as such there would not be any change in the natural landscape.

During the plan period of five years, the exhausted quarries will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. The level of the backfilling shall be maintained up to a moderate height which is practicable. During the conceptual plan period these reclaimed areas will be afforested with suitable varieties of plants. The other voids so left will be filled with rain water and shall be treated as water reservoir. Refer conceptual plan, Plate no 11.

Aesthetic Environment:

Open – cast mining results in change of aesthetic environment.

Soil and Land Use Pattern:

The quantum of soil removed during the mining will be very less as the thickness of the soil is 1m to 3m to 6m. Soil will loose its compactness.

Present and past use pattern are given below:

Land Use Pattern:

Existing land use pattern:

Description	Total in ha
Pit	0.10
Road	1.77
Total used area	1.87
Balanced unused area	194.4
Total applied lease area	196.27

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After first 5 years of Plan Period

The land Use Pattern at the end of 5 years plan period will be as under:-

Description	Total in ha
Quarry	18.97 (17.07 ha reclaimed area)
Road	1.77
Greenbelt	2.00
Total used area	22.74
Balanced applied unused area	173.53
Total lease area	196.27

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Year wise land use:-

DESCRIPTION	LAND USE IN NON FOREST AREA (HECTARES)				
	After 2017-18	After 2018-19	After 2019-20	After 2020-21	After 2021-22
Quarry	4.16	7.95	12.1	15.72	18.97
Road	1.77	1.77	1.77	1.77	1.77
Greenbelt	0.40	0.80	1.20	1.60	2.00
Total used area	6.33	10.52	15.07	19.09	22.74
Balanced unused area	189.94	185.75	181.2	177.18	173.53
Total applied lease area	196.27	196.27	196.27	196.27	196.27

Land use after the Life of the Mine:

Description	Total in ha
Quarry	22.31 (20.42 ha reclaimed area & 1.89 ha water reservoir)
Road	1.77
Greenbelt	2.74
Total used area	26.82
Balanced unused area	169.45
Total applied lease area	196.27

Forest:

No forest area lies within the lease area. Therefore there will be no impact on forest area.

Vegetation:

No change will be observed on vegetation.

The vegetation found within the buffer zone is as follows:-

The natural vegetation is shown in the buffer area is rich in sal (*Shorea robusta*), a valuable hardwood. Other trees include the asan (*Terminalia tomentosa*), the leaves of which provide food for the silkworms of the sericulture industry, as well as several trees that are important in

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Noise levels

Noise produced at mines due to mining machineries is so less that it does not reach to villages being far off. However noise generated by mining machinery and in nearby villages will be monitored once in every year period of the scheme.

Vibration levels (due to blasting)

Blasting will be carried out using cord relay and during the specified time as practiced now. No monitoring is therefore contemplated.

Water regime

Rain water is diverted through garland drain to siltation pit; the clean water is allowed to join the nallah. Due to shallow mine, no ground water table is intercepted.

Acid mine drainage

The area is not potential to Acid Mine Drainage.

Surface subsidence

No surface subsidence is occur in our lease

Socio-economics

As a part of social upliftment and rural development, the villagers, residing in near by villages will be encouraged and motivated by Rural Development Cell of HINDALCO which is taking care of various activities like continuous running free of cost three health centre in our lease area, Aditya Bal Vidya Mandir ,animal vaccination, pasture land development, orchard development, vegetable growing, honey bee, Aganwari, family welfare center, , Lift irrigation, establishment of hand pump for providing drinking water in the village, and providing street lighting in village to actively participate in the aforesaid activities. These activities will enhance their income generation thus improving living standard of the local people.

Also the affected villagers will be encouraged to buy cultivable land down the plateau where the yield of the crops would be much better than on the plateau, with the money they earn through employment either in organization or from the income from other sources.

Recreation Facility:

The local inhabitants will get more facility of recreation by organizing cultural programme and providing recreational items like football, volleyball, carom board, organizing football tournament, construction of Akhara Mandap under corporate social responsibility.

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Progressive Reclamation Plan:

To mitigate the impacts and ameliorate the condition, describe year wise steps proposed for phased restoration, reclamation of lands already/to be degraded in respect of following items separately for 5 years period.

5.1. Mined-Out Land:

Describe the proposals to be implemented for reclamation and rehabilitation of mined-out land including the manner in which the actual site of the pit will be restored for future use. The proposals may be supported with yearly plans and sections depicting yearly progress in the activities for land restoration/ reclamation / rehabilitation, afforestation etc, called "Reclamation Plan".

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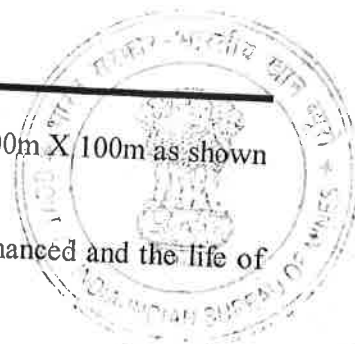
While preparing a conceptual mining plan for this area, the following points and precepts have been kept in view:

- vi) The ore bodies in the ML area not being continuous extraction of bauxite in a new block would be started only after exhausting the block under operation.
- vii) The removal of overburden as well as breaking and heaping of bauxite would be done with excavator. As space become available in the excavated area, the overburden generated during mining would be concurrently pushed into voids as backfill.
- viii) Initially during the 1st year the part of excavated soil will be dumped consequently when the quarry will be exhausted or reached up to its ultimate pit depth then the excavated soil will spreaded over the backfilled areas for rehabilitation.
- ix) All excavated Overburden & waste will be used for concurrent back filling & the process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. After reclamation of land the land will be then handover to the owner after plantation over it or making agricultural land as per the requirement of the land owners.
- x) During the conceptual plan period these reclaimed areas will be returned to the concerned land owners. The other voids so left will be filled with rain water and shall be treated as water reservoir as required by the local villagers.

Anticipated life of the mine:

The recoverable reserve would be 1067020 tonnes after considering 70% recovery factor and mining loss. The production of Bauxite in this plan period would be 954146 tonne. The balance recoverable reserve would be 112874 tonnes. After the plan period the balance reserve will be sustain only for further 1 year. Thus the life of the mine would be about 6 years (5 years + 1 Year).

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At this plan period 128 numbers boreholes are proposed in the area at 100m X 100m as shown on Geological Plan, Plate no 4.

On the basis of outcome of the exploratory data the reserve may be enhanced and the life of the mine would be increased accordingly.

Production:

The production target for the first five years is as under:

Year	Quarry no	Quantity of ore in tonnes
2017-18	1 & 2	155333
2018-19	2 & 3	199601
2019-20	1 & 3	199570
2020-21	1, 1A & 4	199909
2021-22	1A	199733
		954146

The overall average grade of ore in this area is estimated to be +45% on the basis of sampling of /boreholes / quarry samples.

After the conceptual mining period, on the basis of proposed production planning and available reserve position, the ultimate pit area, ultimate pit depth, ultimate generation of waste, final pits slope, afforestation program me is given in the following table:

Ultimate pit area for Bauxite	22.31 ha
Average Ultimate pit depth for Bauxite	10-12 m
Ultimate generation of waste	During Plan period = 1552585 Cum Conceptual period = 310517 Cum Total = 1863102 Cum After 20 % swelling = 2235722 Cum
Total No. of plantation during the plan period	31976 saplings
Total No. of plantation after the Conceptual period	38371 saplings

Year	Soil (Cum)	OB/SB/IB Laterite (Cum)	Quarry waste (Cum)	Total OB & waste (Cum)
2017-18	240920	73311	28944	343175
2018-19	218060	26209	37193	281462
2019-20	324113	28395	37187	389695
2020-21	218570	7362	37250	263182
2021-22	178816	59038	37217	275071
Total	1180479	194315	177791	1552585
After plan period (6 th year 2022-23)	236096	38863	35558	310517
G. Total	1416575	233178	213349	1863102
After 20 % swelling	1699890	279814	256019	2235722

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Reclamation and rehabilitation –

Initially during the 1st year the part of excavated soil will be dumped consequently when the quarry will be exhausted or reached up to its ultimate pit depth then the excavated soil will be spreaded over the backfilled areas for rehabilitation.

All excavated Overburden & waste will be used for concurrent back filling & the process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. After reclamation of land the land will be then handover to the owner after plantation over it or making agricultural land as per the requirement of the land owners.

During the conceptual plan period these reclaimed areas will be returned to the concerned land owners. The other voids so left will be filled with rain water and shall be treated as water reservoir as required by the local villagers.

The year wise area to be reclaimed is as under:

Year	Total Ob & waste for Reclamation (cum)	Dump area in ha	Reclaimed area in ha	Rehabilitated area in ha
2017-18	343175	Temporarily Soil dump - 096	2.47	2.31
2018-19	281462		3.80	3.30
2019-20	389695		4.69	5.18
2020-21	263182		2.82	1.95
2021-22	275071		3.29	4.12
Total	1552585		17.07	16.86

Land Use Pattern:

Existing land use pattern:

Description	Total in ha
Pit	0.10
Road	1.77
Total used area	1.87
Balanced unused area	194.4
Total applied lease area	196.27

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Land use after the Life of the Mine:

Description	Total in ha
Quarry	22.31 (20.42 ha reclaimed area & 1.89 ha water reservoir)
Road	1.77
Greenbelt	2.74
Total used area	26.82
Balanced unused area	169.45
Total applied lease area	196.27

8.3.2 Topsoil Management : The topsoil available at the site and its utilization may be described.

About 1552585 cum of OB & waste will be handled in the 5 years of mining in the lease area. Initially during the 1st year the part of excavated soil will be dumped consequently when the quarry will be exhausted or reached up to its ultimate pit depth then the excavated soil will be spreaded over the backfilled areas for rehabilitation.

All excavated Overburden & waste will be used for concurrent back filling & the process will be continued so on for the next proposed years. The exhausted quarry will be backfilled by mechanized landscaping, followed by soil spreading. Initially, grasses and legumes would be

**ORSA BAUXITE MINE (196.27 Hectares)
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planted, followed by plantation of fast-growing shrubs and trees or after spreading of top soil the land will be used for cultivation. After reclamation of land the land will be then handover to the owner after plantation over it or making agricultural land as per the requirement of the land owners.

The details of excavated Ob & waste are given below:-

Year	Soil (Cum)	OB/SB/IB Laterite (Cum)	Quarry waste (Cum)	Total OB & waste (Cum)
2017-18	240920	73311	28944	343175
2018-19	218060	26209	37193	281462
2019-20	324113	28395	37187	389695
2020-21	218570	7362	37250	263182
2021-22	178816	59038	37217	275071
Total	1180479	194315	177791	1552585

The year wise area to be reclaimed is as under:

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2020-21	263182		2.82	1.95
2021-22	275071		3.29	4.12
Total	1552585		17.07	16.86

8.3.3 Tailings Dam Management: The steps to be taken for protection and stability of tailing dam, stabilization of tailing material and its utilization, periodic desilting measures to prevent water pollution from tailings etc, arrangement for surplus water overflow along with detail design, structural stability studies, the embankment seepage loss into the receiving environment and ground water contaminant if any may be described.

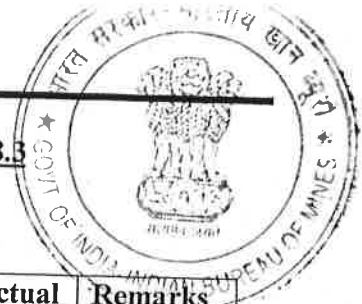
Not Applicable.

8.3.4 Acid mine drainage, if any and its mitigative measures.

There shall be no acid mine drainage in the area.

8.3.5 Surface subsidence mitigation measures through backfilling of mine voids or by any other means and its monitoring mechanism.

The information on protective measures for reclamation and rehabilitation works year wise is provided in the following table below.



SUMMARY OF YEARWISE PROPOSAL FOR ITEM NO. 8.3

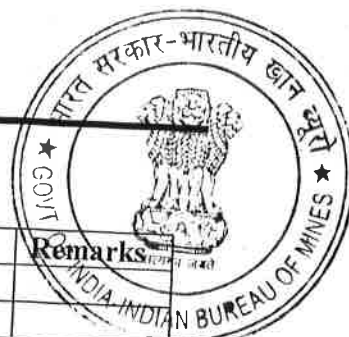
2017-18

Items	Details	Proposed	Actual	Remarks
Dump management	Area afforested (ha)	Nil		31/05/2018 APPROVED
	No of saplings planted	Nil		
	Cumulative no of plants	Nil		
	Cost including watch and care during the year	Nil		
Management of worked out benches	Area available for rehabilitation (ha)	Nil		
	Afforestation done(ha)	Nil		
	No of saplings planted in the year	Nil		
	Cumulative no of plants	Nil		
	Any other method of rehabilitation (specify)	Nil		
	Cost including watch and care during the year	Nil		
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	196mX126mX10m 2.47 ha		
	Void filled by waste /tailings	Nil		
	Afforestation on the backfilled area	3696 numbers of plans		
	Rehabilitation by making water reservoir	Nil		
	Any other means (specify)	Nil		
	Cost involved	Rs. 2839600/-		
Rehabilitation of waste land within lease	Area available (ha)	Nil		
	Area rehabilitated	Nil		
	Method of rehabilitation	Nil		
Others (specify)	Terracing in Waste Dump	Nil		
	Terracing in Soil Dump	0.96 ha		
	Green belt	0.40 ha 1000 no plants		
	Cost involved	Rs. 1060000/-		
	Environmental monitoring cost	Rs. 1,00,000/-		


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2018-19



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Items	Details	Proposed	Actual	Remarks
Dump management	Area afforested (ha)	Nil		
	No of saplings planted	Nil		
	Cumulative no of plants	Nil		
	Cost including watch and care during the year	Nil		
Management of worked out benches	Area available for rehabilitation (ha)	Nil		
	Afforestation done(ha)	Nil		
	No of saplings planted in the year	Nil		
	Cumulative no of plants	Nil		
	Any other method of rehabilitation (specify)	Nil		
	Cost including watch and care during the year	Nil		
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	312mX106mX10m 3.30 ha 111mX45mX10m 0.50ha		
	Void filled by waste /tailings	Nil		
	Afforestation on the backfilled area	5280 numbers of plans		
	Rehabilitation by making water reservoir	Nil		
	Any other means (specify)	Nil		
	Cost involved	Rs. 4328000 /-		
Rehabilitation of waste land within lease	Area available (ha)	Nil		
	Area rehabilitated	Nil		
	Method of rehabilitation	Nil		
Others (specify)	Terracing in Waste Dump	Nil		
	Terracing in Soil Dump	Nil		
	Green belt	0.40 ha 1000 no plants		
	Cost involved	Rs. 100000 /-		
	Environmental monitoring cost	Rs. 1,00,000/-		

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2019-20

Items	Details	Proposed	Actual	Remarks
Dump management	Area afforested (ha)	Nil		
	No of saplings planted	Nil		
	Cumulative no of plants	Nil		
	Cost including watch and care during the year	Nil		अनुमोदित APPROVED
Management of worked out benches	Area available for rehabilitation (ha)	Nil		
	Afforestation done(ha)	Nil		
	No of saplings planted in the year	Nil		
	Cumulative no of plants	Nil		
	Any other method of rehabilitation (specify)	Nil		
	Cost including watch and care during the year	Nil		
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	396mX118mX10m 4.69 ha		
	Void filled by waste /tailings	Nil		
	Afforestation on the backfilled area	8288 numbers of plans		
	Rehabilitation by making water reservoir	Nil		
	Any other means (specify)	Nil		
	Cost involved	Rs. 5518800/-		
Rehabilitation of waste land within lease	Area available (ha)	Nil		
	Area rehabilitated	Nil		
	Method of rehabilitation	Nil		
Others (specify)	Terracing in Waste Dump	Nil		
	Terracing in Soil Dump	Nil		
	Green belt	0.40 ha 1000 no plants		
	Cost involved	Rs. 100000 /-		
	Environmental monitoring cost	Rs. 1,00,000/-		


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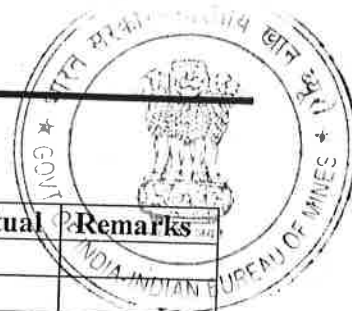
2020-21

Items	Details	Proposed	Actual	Remarks
Dump management	Area afforested (ha)	Nil		अनुमोदित APPROVED
	No of saplings planted	Nil		
	Cumulative no of plants	Nil		
	Cost including watch and care during the year	Nil		
Management of worked out benches	Area available for rehabilitation (ha)	Nil		
	Afforestation done(ha)	Nil		
	No of saplings planted in the year	Nil		
	Cumulative no of plants	Nil		
	Any other method of rehabilitation (specify)	Nil		
	Cost including watch and care during the year	Nil		
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /stope wise	200mX95mX10m 1.89 ha 112mX83mX10m 0.93 ha		
	Void filled by waste /tailings	Nil		
	Afforestation on the backfilled area	3120 numbers of plans		
	Rehabilitation by making water reservoir	Nil		
	Any other means (specify)	Nil		
	Cost involved	Rs. 3132000/-		
Rehabilitation of waste land within lease	Area available (ha)	Nil		
	Area rehabilitated	Nil		
	Method of rehabilitation	Nil		
Others (specify)	Terracing in Waste Dump	Nil		
	Terracing in Soil Dump	Nil		
	Green belt	0.40 ha 1000 no plants		
	Cost involved	Rs. 1000000 /-		
	Environmental monitoring cost	Rs. 1,00,000/-		

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2021-22



Items	Details	Proposed	Actual	Remarks
Dump management	Area afforested (ha)	Nil		
	No of saplings planted	Nil		
	Cumulative no of plants	Nil		
	Cost including watch and care during the year	Nil		
Management of worked out benches	Area available for rehabilitation (ha)	Nil		
	Afforestation done(ha)	Nil		
	No of saplings planted in the year	Nil		
	Cumulative no of plants	Nil		
	Any other method of rehabilitation (specify)	Nil		
	Cost including watch and care during the year	Nil		
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	329mX119mX10m 3.29 ha		
	Void filled by waste /tailings	Nil		
	Afforestation on the backfilled area	6592 numbers of plans		
	Rehabilitation by making water reservoir	Nil		
	Any other means (specify)	Nil		
	Cost involved	Rs. 3949200/-		
Rehabilitation of waste land within lease	Area available (ha)	Nil		
	Area rehabilitated	Nil		
	Method of rehabilitation	Nil		
Others (specify)	Terracing in Waste Dump	Nil		
	Terracing in Soil Dump	Nil		
	Green belt	0.40 ha 1000 no plants		
	Cost involved	Rs. 1000000 /-		
	Environmental monitoring cost	Rs. 1,00,000/-		

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8.4 Disaster Management and Risk Assessment: This may deal with action plan for high risk accidents like landslides, subsidence flood, inundation in underground mines, fire, seismic activities, tailing dam failure etc. and emergency plan proposed for quick evacuation, ameliorative measures to be taken etc. The capability of lessee to meet such eventualities and the assistance to be required from the local authority may also be described.

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The working is proposed to be carried out at shallow depth so heavy blasting is not required so no risk assessment or disaster management is required.

High risk factors such as landslide, subsidence flood, fire, tailing dam failure etc are not encountered nor anticipated during proposed five years plan period. As such, emergency plan for quick evacuation, protective measures are not proposed. Also, no local habitant exists as the working area is far away from the locality. However in case of any emergency, the mines manager may be contacted with the details mentioned below.

Hindalco industries limited

Address- Hindalco Colony, Po-Kusmi, Dist:-Balrampur, Pin NO.-497224.

Nearest Hospital Hindalco hospitals Kushmi.

8.5 Care and maintenance during temporary discontinuance: An emergency plan for the situation of temporary discontinuance due to court order or due to statutory requirements or any other unforeseen circumstances may indicate measures of care, maintenance and monitoring of status of discontinued mining operations expected to re-open in near future.

Due to unforeseen reason the mine will be a closed temporarily then proper care of workers and staffs will be taken. Temporary discontinuance notice in the prescribed form E under rule 28 of M.C.D.R., 2017 will be sent to the concerned authority of Indian Bureau of Mines as well as in the prescribed form under MMR, 1961 to the authority of D.G.M.S., concerned State Government and concerned Labour Department within the stipulated time.

The required care and maintenance of mining machinery will be done as per schedule.

Security guards to take care of the infrastructure shall be kept under the roll of the management in case of any temporary discontinuation.


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8.6 Financial Assurance:

The financial assurance can be submitted in any encashable form preferably a Bank Guarantee from a Scheduled Bank as stated in Rule 27 of Mineral Conservation and Development Rules, 2017 for five years period expiring at the end of validity of the document. The amount calculated for the purpose of Financial Assurance is based on the CCOM's Circular no. 4 dated 2006 as below.

Table indicating the break-up of areas in the Mining Lease for calculation of Financial Assurance

Sl No	Head	Area put on use at start of scheme of mining Ha.	Additional requirement during plan period Ha.	Total Area in Ha.	Area considered as fully reclaimed & rehabilitated Ha.	Net area considered for calculation Ha.
A	B	C	D	E E=(C+D)	F	G G= (E-F)
1.	Area under mining	0.10	18.87	18.97	NIL	18.97
2.	Storage for top soil	00	00	00	NIL	00
3.	Waste Dump site	00	00	00	NIL	00
4.	Mineral storage	00	00	00	NIL	00
5.	Infrastructure (Workshop, administrative building etc.)	00	00	00	NIL	00
6.	Roads	1.77	00	1.77	NIL	1.77
7.	Railways	00	00	00	NIL	00
8.	Tailing pond	00	00	00	NIL	00
9.	Effluent treatment plant	00	00	00	NIL	00
10.	Mineral separation plant	00	00	00	NIL	00
11.	Township area	00	00	00	NIL	00
12.	Others to specify Greenbelt	00	2.00	2.00	NIL	2.00
	Grand Total	1.87	20.87	22.74	NIL	22.74

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Computation for financial assurance:-

Total area under use - 22.74 Hectares


Rate - Rs. 300000/- per hect..

Amount for financial assurance = 22.74 Hects. X Rs. 300000/-

= Rs. 6822000/-

**अनुमोदित
APPROVED**

Financial assurance for an amount of Rs. 6822000/- (sixty eight lac twenty two thousand only) is already submitted to the Regional Controller of Mines, Indian Bureau of Mines, Ranchi Region, in the form of Bank Guarantee. The photocopy of the Bank Guarantee & additional amount as enhanced value of financial assurance Rs. 68,22,000.00 (sixty eight lac twenty two thousand only) along with the extended validity up to 31.03.2022 is enclosed as annexure – 17.


17/08/2017
क्षेत्रीय खान नियंत्रक
Regional Controller of Mines
भारतीय खान ब्यूरो
Indian Bureau of Mines


P. K. SEN
Qualified Person