JILLING LANGALOTTA IRON ORE BLOCK

Over an area of 456.037 Ha (as per DGPS)/ 456.100 Ha (as per RoR)
in Village Jalahuri, Jurudi, Banspani, Khuntpani, Bholebeda, Jajang and Bajtamal
Reserve Forest under Barbil Tahasil of Keonjhar district of Odisha

MINING PLAN

(For the period from 2020-21 to 2024-25)

Under Rule 16 (1) of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rule, 2016

PROGRESSIVE MINE CLOSURE PLAN

Under Rule 23 of Mineral Conservation and Development Rules, 2017

Lessee Details	Odisha Mining Corporation Limited OMC House, Bhubaneswar - 751001, District: Khurda, State: Odisha E-mail: info@orissamining.com Tel: 0674-2377400 & 2377401, Fax No: (0674) 2580145/020
ML Area	Lease Area: 456.037 Ha (as per DGPS)/ 456.100 Ha (as per RoR) Govt Land: 74.557 Ha Forest Land: 342.199 Ha Pvt. Land: 39.261 Ha
Category of Mine: Fully Mechanised (FM)	Date of Execution of the ML: 11.01.2021 Date of Expiry of the ML: 10.01.2031 Lease Period: 10 Years
Registration no under Rule 45 of MCDR 2017: IBM/4269/2011 Mine Code No: 30ORI08125	

TEXT

Prepared by Qualified Persons

Sri Saroj Kumar Prusty, B. E in Mining Engineering

Sri Rabindra Mohanty, M. Sc in Geology

Odisha Mining Corporation Limited
OMC House, Bhubaneswar - 751001,
District: Khurda, State: Odisha

भारत सरकार GOVERNMENT OF INDIA
खान मंत्रालय MINISTRY OF MINES
भारतीय खान ब्यूरो INDIAN BUREAU OF MINES
क्षेत्रीय खान नियंत्रक के कार्यालय
OFFICE OF THE REGIONAL CONTROLLER OF MINES

50 YEARS OF CELEBRATING THE MAHATMA

BY REGD PARCEL
Phone 0674-2352463
Tele Fax 0674-2352456
Email:e-bbsneshwar@ibm.gov.in
Plot No. 149, Pokhariput
BHUBANESWAR-751020

No. MP/A/37-ORI/BHU/2020-21/2990 Date: 19.03.2021

सेवामे

The Managing Director & Nominated Owner,
M/s Odisha Mining Corporation Ltd,
OMC House, Bhubaneswar -751001

विषय: Approval of Mining Plan of Jilling-Langalotta Iron Ore Mine along with Progressive Mine Closure Plan (PMCP), over an area of 456.037 ha (As per DGPS)/ 456.100 ha (As per RoR) in Keonjhar district of Odisha State, submitted by M/s Odisha Mining Corporation Ltd under Rule 16 of Mineral Concession Rules, 2016.

संदर्भ:- i) Your letter No. 3120/OMC/PMC/2021 dated 25.02.2021.
ii) This office letter of even no. dated 26.02.2021.
iii) This office letter of even no. dated 26.02.2021 addressed to the Director of Mines, Govt. of Odisha, copy endorsed to you.
iv) This office letter of even no. dated 04.03.2021.
v) Your letter No. 3706/OMC/PMC/2021 dated 10.03.2021.

महोदय,

In exercise of the power delegated to me vide Gazette Notification No. S.O. 1857(E) dated 18.05.2016, I hereby **Approve** the Mining Plan including Progressive Mine Closure Plan of Jilling-Langalotta Iron Ore Mine over an area of 456.037 ha (As per DGPS)/ 456.100 ha (As per RoR) of M/s Odisha Mining Corporation Ltd in Keonjhar district of Odisha State submitted under Rule 16 of Mineral Concession Rules, 2016. This approval is subject to the following conditions:

I. The Mining Plan is approved without prejudice to any other law applicable to the mine area from time to time whether made by the Central Government, State Government or any other authority and without prejudice to any order or direction from any court of competent jurisdiction.
II. The proposals shown on the plates and/or given in the document is based on the lease map /sketch submitted by the applicant/ lessee and is applicable from the date of approval.
III. It is clarified that the approval of aforesaid Mining Plan does not in any way imply the approval of the Government in terms of any other provision of Mines & Minerals (Development & Regulation) Act, 1957, or the Mineral Concession Rules, 2016 and any other laws including Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 or the rules made there under, Mines Act, 1952 and Rule & Regulations made there under.
IV. Indian Bureau of Mines has not undertaken verification of the mining lease boundary on the ground and does not undertake any responsibility regarding

correctness of the boundaries of the leasehold shown on the ground with reference to lease map & other plans furnished by the applicant / lessee.

V. At any stage, if it is observed that the information furnished, data incorporated in the document are incorrect or misrepresent facts, the approval of the document shall be revoked with immediate effect.

VI. If this approval conflicts with any other law or court order/ Direction under any statute, it shall be revoked immediately.

VII. The Mining Plan has been processed based on Geological Report without field verification. Deficiencies/ discrepancies observed if any during the inspection will be communicated which should be incorporated in the Mining Plan by way of modification.

भवदीय / yours faithfully,

Encl: - One copy of
of Mining Plan

(HARKESH MEENA)
क्षेत्रीय खान नियंत्रक / Regional Controller of Mines

Copy for kind information to:-

1. The Director of Mines, Directorate of Mines, Government of Odisha, Heads of the Department Building, Bhubaneswar– 751001, Odisha along with one copy of Mining Plan by **REGISTERED PARCEL**.
2. Shri Saroj Kumar Prusty & Shri Rabindra Mohanty, M/s Odisha Mining Corporation Ltd, OMC House, Bhubaneswar -751001.

(HARKESH MEENA)
क्षेत्रीय खान नियंत्रक / Regional Controller of Mines

INDEX

Saroj Kumar Prusty

Rabindra Mohanty

LIST OF PLATES

Sl. No	Description	Plate No.	Scale
1	Key Plan	Plate No - 1	1 : 50000
2	DGPS Map of Jilling Langalota Iron Ore ML	Plate no - 2	16" : 1 Mile
3	Surface Plan	Plate No - 3	1 : 4000
4	Geological Plan	Plate No - 4	1 : 4000
5	Geological Cross Sections	Plate No 5A to I	1 : 4000
6	Geological L-V Section	Plate No 5J	1 : 4000
7	Year wise Pit Development Plans for 5 Years	Plate No – 6A to F	1 : 2000
8	Year wise Pit Development Sections for 5 Years	Plate No – 7A to F	1 : 2000
9	Conceptual Plan	Plate No - 8	1 : 4000
10	Conceptual Sections	Plate No - 9	1 : 4000
11	Environmental Plan	Plate No - 10	1 : 5000
12	Reclamation Plan	Plate No - 11	1 : 4000
13	Financial Assurance Plan	Plate No - 12	1 : 4000
14	Geo-referenced Mining Lease map superimposed on latest high-resolution satellite image.	Plate No - 13	16" : 1 Mile

Saroj Kumar Prusty

Rabindra Mohanty

LIST OF ANNEXURES

Annexure No	Description	Page No
Annexure - 1	Copy of List of Board of Directors.	1-1
Annexure - 2	Copy of Board resolution on appointment of nominated owner.	2-2
Annexure - 3	Copy of Photo Id & Address proof of the Nominated Owner.	3-5
Annexure - 4	Copy of Certificate of Incorporation.	6-6
Annexure - 5	Copy of Qualification & Experience of Qualified Persons.	7-13
Annexure - 6	Copy of Order No. F.No. 4/1/2020-M.VI dated 05.01.2021 issued by the Central Government reserving the mine in favour of Odisha Mining Corporation Limited for a period of 10 years.	14-19
Annexure - 7	Copy of notification no. 299/SM dated 11.01.2021 of State Government of Odisha reserving Jilling Langalotta Iron Ore block in Keonjhar district of Odisha state in favour of Odisha Mining Corporation Limited for a period of 10 years.	20-34
Annexure - 8	Copy of Letter of Intent (LoI) issued by State Government vide letter No. 307/SM dated 11.01.2021 for grant of mining lease to Odisha Mining Corporation Limited for a period of 10 years.	35-38
Annexure - 9	Copy of Order No. 317/SM dated 11.01.2021 of State Government transferring all the valid rights, approvals, clearances, licensees and the likes vested with the previous lessee in favour of Odisha Mining Corporation Limited for a period of 2 years.	39-42
Annexure - 10	Copy of Order No 338/SM dated 11.01.2021 of State Government of Odisha granting the mining lease for iron ore in favour of Odisha Mining Corporation in respect of Jilling Langalotta Iron Ore block over an area of 456.037 Ha (as per DGPS)/ 456.100 Ha (as per RoR) in village Guali, Panduliposi etc under Barbil Tahasil of Keonjhar district for a period of 10 (ten) years.	43-50
Annexure - 11	Copy of Mining Lease Deed executed on 11.01.2021.	51-103
Annexure - 12	Copy of Mineral Block Summery Report available in MSTC website.	104-108
Annexure - 13	Copy of Environment Clearance	109-118
Annexure - 14	Copy of Land Schedule	119-149
Annexure - 15	Copy of Forest Clearance	150-153
Annexure - 16	Copy of the Consent to Operate from SPCB	154-167
Annexure - 17	Copy of the Surface Rights	168-170
Annexure - 18	Copy of Surveyor Certificate	171-171
Annexure - 19	Copy of NOC from CGWA for drawl of ground water.	172-173
Annexure - 20	Copy of Permission to prepare plans on scale other than prescribed scale.	174-174

Saroj Kumar Prusty

Rabindra Mohanty

Saroj Kumar Prusty

Rabindra Mohanty

OMC | ODISHA
NEW OPPORTUNITIES

CONSENT LETTER / UNDERTAKING / CERTIFICATE FROM THE LESSEE

1. The Mining Plan in respect of Jilling Langalotta Iron Ore Block of Odisha Mining Corporation Limited over an area of 456.037 Ha (as per DGPS)/ 456.100 Ha (as per RoR) in Village Jalahuri, Juruli, Banspani, Khuntpani, Bholebeda, Jajang and in Baitrani Reserve Forest in Barbil Taluka of Keonjhar District of Odisha state submitted under Rule 16(1) of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rule, 2016 has been prepared by following Qualified Persons namely **Sri Saroj Kumar Prusty, Sr Manager (Mining) & Sri Rabindra Mohanty, Manager (Geology) of OMC Ltd** jointly.

   This is to request the Regional Controller of Mines, Indian Bureau of Mines, Bhubaneswar, to make any further correspondence regarding any correction of the Mining Plan with the said qualified person at their addresses below.

Sri Saroj Kumar Prusty Sr Manager (Mining), OMC House, Post Box No 34, Bhubaneswar, Odisha - 751001 Phone: (0674), 2399950 Fax: (0674) 2391629, 2396889, Email: sprusty@odishamining.in	Sri Rabindra Mohanty Manager (Geology), OMC House, Post Box No 34, Bhubaneswar, Odisha - 751001 Phone: (0674), 2399950 Fax: (0674) 2391629, 2396889, Email: rmohanty@odishamining.in

   We hereby undertake that all modifications / updating as made in the said Mining Plan by the said qualified person be deemed to have been made with our knowledge and consent and shall be acceptable on us and binding in all respects.

2. It is certified that the **CCOM's Circular no. 2/2010** will be implemented and complied with when an authorized agency is approved by the State Government.

3. It is certified that the Progressive Mine Closure Plan prepared under Rule 23 of MCDR, 2017 of Jilling Langalotta Iron Ore Block of Odisha Mining Corporation Ltd over an area of 456.037 Ha (as per DGPS)/ 456.100 Ha (as per RoR) complies with all statutory rules, regulations, orders made by the Central or State Government, statutory organization, court etc. which have been taken into consideration and wherever any specific permission is required the lessee will approach the concerned authorities.
   The information furnished in the **Progressive Mine Closure Plan** is true and correct to the best of our knowledge and records.

4. The provisions of **Mines Act, Rules and Regulations** made there under have been observed in the Mining Plan of Jilling Langalotta Iron Ore Block over an area of 456.037 Ha (as per DGPS)/ 456.100 Ha (as per RoR) in Village Jalahuri, Juruli, Banspani, Khuntpani, Bholebeda, Jajang and in Baitrani Reserve Forest in Barbil Taluka of Keonjhar district of Odisha state belonging to Odisha Mining Corporation Limited and where specific permissions are required, the applicant will approach the **DGMS**. Further, standards prescribed by **DGMS** in respect of **miner's health** will be strictly implemented.

Place: Bhubaneswar
Date: 05.03.2021

Managing Director & Nominated Owner
Odisha Mining Corporation Limited
OMC House, Bhubaneswar

CERTIFICATE FROM THE QUALIFIED PERSONS

The provisions of the Mineral Conservation and Development Rules, 2017 have been observed in the preparation of the Mining Plan for Jilling Langalotta Iron Ore Block over an area of 456.037 Ha (as per DGPS)/ 456.100 Ha (as per RoR) of Odisha Mining Corporation Limited in village Jalahuri, Jurudi, Banspani, Khuntpani, Bholebeda, Jajang and in Baitrani Reserve Forest in Barbil Taluka of Keonjhar district of Odisha state and whenever specific permissions are required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

The information furnished in the Mining Plan is true and correct to the best of our knowledge.

Saroj Kumar Prusty
Qualified Person

Rabindra Mohanty
Qualified Person

Place: Bhubaneswar
Date: 09.03.2021

INTRODUCTORY NOTE

Odisha Mining Corporation is a Gold category state PSU, Govt of Odisha and one of the fastest growing mining companies in India. The major minerals mined by OMC are chrome, iron, manganese & bauxite ore which cater to the requirement of mineral based industries such as steel, sponge iron, pig iron, ferro-manganese, ferro-chrome, aluminum etc. both in India as well as overseas. To a large extend, OMC provides the ore and fulfills the commitment of the State Government.

Pursuance to the order No. F.No. 4/1/2020-M.VI dated 05.01.2021 of the Central Government, the Jilling Langalotta Iron Ore block in Keonjhar district of Odisha state has been reserved in favour of Odisha Mining Corporation Limited for a period of 10 years vide notification No. 299/SM dated 11.01.2021 of State Government. Refer Annexure 6 & 7.

Letter of Intent vide letter No. 307/SM dated 11.01.2021 for grant of mining lease for a period of 10 years has been issued to Odisha Mining Corporation Limited by Government of Odisha. Refer Annexure 8.

अनुमोदित
APPROVED

Vide order No. 317/SM dated 11.01.2021 all the valid rights, approvals, clearances, licensees and the likes vested with the previous lessee has been transferred in favour of Odisha Mining Corporation Limited for a period of 2 years by Government of Odisha. Refer Annexure 9.

Vide order No 338/SM dated 11.01.2021, Government of Odisha granted the mining lease for iron ore in favour of Odisha Mining Corporation in respect of Jilling Langlotta Iron Ore Block over an area of 456.037 Ha (as per DGPS)/ 456.100 Ha (as per RoR) in village Jalahuri, Jurudi, Banspani, Khuntpani, Bholebeda, Jajang and in Baltrani Reserve Forest under Barbil Tahasil of Keonjhar district for a period of 10 (ten) years. Refer Annexure 10.

क्षेत्रीय खान नियंत्रक
Regional Controller of Mines
भारतीय खान ब्यूरो
Indian Bureau of Mines
भुवनेश्वर/Bhubaneswar

Accordingly, the Mining Lease Deed has been executed on 11.01.2021. Refer Annexure 11.

Jilling Langalotta Iron Ore Block is located in village Jalahuri, Jurudi, Banspani, Khuntpani, Bholebeda, Jajang and in Baltrani Reserve Forest in Barbil Taluka of Keonjhar district of Odisha state between Latitude & Longitude 21056'37.5297" to 2108'53.4158" N; 85025'08.8832" to 850 26'37.1370" E and is covered by survey of India topo-sheet no. 73F/8 & 73G/5. Refer Key Plan at Plate No 1.

As the block has been reserved by Central Government in exercise of power under section 17A(2) of the MMDR Act read with section 20A, there is no provision of Mine Development and Production Agreement (MDPA) made.

Saroj KumarPrusty

Rabindra Mohanty

STATUS OF CLEARANCES:

As per Section 8B of the MMDR Act, 1957, and vide order No. 307/SM dated 11.01.2021 of Government of Odisha, the Jilling_Langalotta Iron Ore Block deemed to have acquired all valid rights/ approvals/ clearances/ licenses and the like of the previous lessee for a period of two years.

Environmental Clearance:

Environmental Clearance for 6.28 MTPA of Iron Ore has been obtained by the previous lessee vide Ministry of Environment & Forest's letter J-11015/959/2007-IA-II (M) dated the 07 June 2012. Refer Annexure 13.

The lease has been executed on 11.01.2021, which forms the first year of the plan period i.e 2020-21 during which a production of 0.5 Million Tonnes has been considered. For the second year of the plan period i.e 2021-22 an existing EC capacity of 6.28 MTPA has been proposed. From third year onwards a production capacity of 10 MTPA has been proposed for the balance three years of the plan period i.e 2022-23, 2023-24 and 2024-25. Hence revised Environmental clearance for the enhanced quantity will be applied. Similarly lessee shall obtain requisite statutory clearances from different statutory authorities and also shall execute an amendment to the lease deed as per provision in para 2.4 of executed lease deed.

Forest Clearance:

Stage-II Forest Clearance has been obtained from MoEF & CC on 08.10.2014 vide letter no-F.No.8-49/98-FC(pt.) over an area of 342.602 Ha of forest land in respect of Jilling Langalotta Iron Ore Block situated in Keonjhar district, Odisha. Refer Annexure 15.

Consents from SPCB:

Consent for discharge of sewage and trade effluent under section 25/26 of the water (PCP) Act 1974 and for operation of the existing plant under Section 21 of Air (PCP) Act 1981 have been received from State Pollution Control Board, Odisha vide Letter No- 2127/IND-I-CON-248 dt. 26.02.2018. Refer Annexure 16.

Saroj KumarPrusty

Rabindra Mohanty

Sl No	Details	Description
Product		
1	Iron Ore (ROM)	6.28 MTPA
Details of Mineral Handling Plants/Units		
1	Railway siding towards Jajang section of the mine lease area	
2	Stationary Crusher Plant (In pit plant)	1 x 300 TPH
3	Stationary Crusher Plant (OCU-1)	1 x 300 TPH
4	Stationary Crusher Plant (OCU-2)	1 x 200 TPH
5	Stationary Crusher Plant (OCU-3)	1 x 300 TPH
6	Stationary Crusher Plant (OCU-5)	1 x 200 TPH
7	Mobile Crusher Plant	1 x 400 TPH
8	Stationary Screening Plant	1 x 50 TPH
9	Mobile Screening Plant	1 x 150 TPH
10	Mobile Screening Plant	1 x 100 TPH
11	Mobile Screening Plant	5 x 150 TPH

NOC for Ground Eater:

NOC from CGWA for drawl of ground water for a quantity of 1564 CuM per day has been obtained vide letter no-21-4(33)/CGWA/SER/2007-619 dtd.01.04.2014. Refer Annexure 19.

Mining Plan along with Progressive Mine Closure Plan:

The Mining Plan along with Progressive Mine Closure Plan being submitted is a fresh Mining Plan proposal after reservation, allocation and execution of the mining lease deed in favour of Odisha Mining Corporation Ltd. Hence the details of earlier approved Mining plan and review of Mining plan is not applicable in this case. This mining plan is prepared based on the Geological report provided by the State Government.

As part of the statutory clearance, this Mining Plan and Progressive Mine Closure Plan is being submitted under Rule 16(1) of MCR, 2016 and Rule 23 of MCDR, 2017 respectively for a period from 2020-21 to 2024-25.

Saroj KumarPrusty

Rabindra Mohanty

Justification for proposed enhanced production of 10 MTPA

Consequent to sub-section (6) of Section 8A of the Mines & Mineral (Development and Regulation) Act, 1957 as amended in 2015, the lease period of many operating non-captive iron ore mines in the state of Odisha expired on 31st March, 2020. Non-operationalisation of these mines resulted in decline of production and dispatch of iron ore. This leads to spike in iron ore price in the market. To meet the exigencies of the situation, stabilize the production levels and to ensure supply of iron ore, Central and State Government companies were roped in to facilitate production from such auctioned mines which are not in operation. Hence, to ensure the availability of iron ore in the state, production rate of 10MTPA has been proposed from Jilling Langalotta Iron Ore block.

Saroj KumarPrustv

Rabindra Mohanty

1.0 GENERAL

a. Name of applicant/ lessee/ Rule 45 registration No.	Shri Balwant Singh, IAS, Managing Director & Nominated Owner Odisha Mining Corporation Limited, Bhubaneswar, Odisha A list of Board of Directors is enclosed as Annexure 1. A copy of the relevant extract from the minutes of the 416th meeting approved by Board regarding appointment of Nominated Owner of the mine is enclosed as Annexure 2. A copy of photo id & address proof of the nominated owner of the mine is enclosed as Annexure 3.
Registration No. of OMC Ltd. under Rule 45	IBM/4269/2011
Address	OMC House, Post Box No. 34 Bhubaneswar - 751001
District	Khurda
State	Odisha
Pin Code	751001
Phone	0674-2393431, 2395689, 2393389
Fax	0674-2391629, 2396889, 2394772
Gram	-
Telex	-
e-mail	info@orissamining.com, planningcellomc@gmail.com

b) Status of the applicant

Private individual	No
Cooperative Association	No
Private Company	No
Public Company	No
Public Sector Undertaking	Yes
Joint Sector Undertaking	No
Other (pl. specify)	Not Applicable

Certificate of Incorporation is enclosed as Annexure - 4.

c) Mineral(s) which is / are include in the prospecting license (For fresh grant)	Not applicable
d) Mineral(s) which is / are include in the lease deed	Iron ore

Saroj KumarPrusty

Rabindra Mohanty

e) Mineral(s) which the applicant /lessee intends to mine: Iron ore

f) Name of Qualified Person under rule 15(1) of MCR, 2016 preparing Mining Plan:

	Saroj Kumar Prusty Mining Engineer	Rabindra Mohanty Geologist
Name of the Qualified Person preparing the Mining Plan	Copy of the proof of qualification & experience of qualified persons satisfying the requirements under rule 15(1) of MCR 2016 who have prepared this document are enclosed as Annexure 5.	
Address	Saroj Kumar Prusty, Sr. Manager (Mining) OMC House, P. B. No. 34, Bhubaneswar, Odisha – 751001	Rabindra Mohanty, Manager (Geology) OMC House, P. B. No. 34, Bhubaneswar, Odisha – 751001
Phone	0674- 2399937, 2399936	
Fax	0674-2391629, 2396889, 2394772	
e-mail	info@orissamining.com, planningcellomc@gmail.com	
Telex	-	
Registration No.	NA	
Date of grant / renewal	NA	
Valid upto	NA	

Saroj KumarPrusty

Rabindra Mohanty

2.0 LOCATION AND ACCESSIBILITY

a) Lease Details (Existing Mine)

Name of Mine: Jilling Langalotta Iron Ore Block 456.037 Ha (as per DGPS)/ 456.100 Ha (as per RoR)

Jilling Langalotta Iron Ore Block of Odisha Mining Corporation Limited is located between Latitude & Longitude 21°59'21.98" to 22°00'01.10"N; 85°17'04.19" to 85°18'57.35"E and is covered by survey of India topo-sheet no. 73 G/5 & 73F/8.

Lat/long of any boundary point.

Co-ordinates of ML boundary pillars (DGPS readings) are given below.

ML Pillar No	Latitude	Longitude	Easting	Northing
A	21°57'20.7037	85°25'36.9333	337560.8368	2428763.117
A1	21°57'17.6005	85°25'36.8569	337557.6662	2428667.704
A2	21°57'12.0098	85°25'36.7189	337551.9428	2428495.806
A3	21°57'07.6027	85°25'36.6103	337547.433	2428360.299
A4	21°57'01.1656	85°25'36.4501	337540.8066	2428162.38
A5	21°56'50.2945	85°25'36.1825	337529.6944	2427828.125
B	21°56'38.7555	85°25'35.9597	337519.6606	2427473.316
B1	21°56'38.6218	85°25'44.4895	337764.3512	2427466.695
B2	21°56'38.5366	85°25'48.8067	337888.1906	2427462.805
B3	21°56'38.4950	85°25'50.8906	337947.9677	2427460.913
B4	21°56'38.3800	85°25'57.6576	338142.0876	2427455.39
C	21°56'38.4067	85°26'04.6321	338342.2039	2427454.167
C1	21°56'42.0508	85°26'04.6192	338342.9782	2427566.241
C2	21°56'48.0432	85°26'04.7563	338348.7967	2427750.493
C3	21°56'57.8746	85°26'04.9810	338358.3299	2428052.784
C4	21°57'07.8699	85°26'05.1562	338366.4957	2428360.131
C5	21°57'09.6896	85°26'05.2127	338368.6895	2428416.077
C6	21°57'17.7307	85°26'05.3666	338375.6304	2428663.33
C7	21°57'22.1143	85°26'05.4503	338379.4101	2428798.119
C8	21°57'27.6630	85°26'05.5561	338384.1893	2428968.736
D	21°57'31.9497	85°26'05.6375	338387.8709	2429100.545
E	21°57'31.9463	85°26'13.1516	338603.4371	2429098.241
E1	21°57'36.5700	85°26'13.2687	338608.2462	2429240.403
E10	21°58'25.6617	85°26'14.5453	338660.2781	2430749.809
E11	21°58'29.3245	85°26'14.6378	338664.0821	2430862.43
E2	21°57'40.7278	85°26'13.3791	338612.7189	2429368.242
E3	21°57'43.9488	85°26'13.4625	338616.1232	2429467.278
E4	21°57'48.0602	85°26'13.5705	338620.511	2429593.689
E5	21°57'52.9042	85°26'13.6953	338625.6111	2429742.625

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Rabindra Mohanty

E6	21°57'57.8511	85°26'13.8235	338630.8412	2429894.727
E7	21°58'03.2700	85°26'13.9636	338636.5625	2430071.341
E8	21°58'13.5016	85°26'14.2294	338647.3997	2430375.929
E9	21°58'21.5896	85°26'14.4394	338655.9605	2430624.607
F	21°58'32.3281	85°26'14.7129	338667.1787	2430954.781
F1	21°58'39.0790	85°26'23.1848	338912.31	2431159.922
F2	21°58'41.6502	85°26'26.4119	339005.686	2431238.055
F3	21°58'43.6852	85°26'28.9649	339079.555	2431299.893
F4	21°58'45.1917	85°26'30.8562	339134.2767	2431345.673
F5	21°58'47.4663	85°26'33.7088	339216.8123	2431414.793
G	21°58'49.9926	85°26'36.8764	339308.4641	2431491.564
H	21°58'51.7040	85°26'35.6796	339274.6701	2431544.545
H1	21°58'51.0815	85°26'33.4675	339211.0242	2431526.046
H2	21°58'49.5485	85°26'28.0242	339054.4076	2431480.49
H3	21°58'48.5382	85°26'24.4328	338951.0757	2431450.467
H4	21°58'47.9350	85°26'22.2907	338889.4408	2431432.543
H5	21°58'44.4224	85°26'09.8175	338530.5523	2431328.168
H6	21°58'42.8716	85°26'04.3123	338372.1519	2431282.09
I	21°58'41.4555	85°25'59.2795	338227.342	2431240.013
J	21°58'37.2931	85°25'53.9850	338074.1606	2431113.557
J1	21°58'33.4440	85°25'53.9305	338071.3848	2430995.196
J2	21°58'25.2666	85°25'53.8133	338065.4467	2430743.741
J3	21°58'24.0326	85°25'53.7953	338064.5405	2430705.794
J4	21°58'18.3544	85°25'53.7129	338060.3873	2430531.191
J5	21°58'16.4352	85°25'53.6843	338058.9619	2430472.174
J6	21°58'12.5006	85°25'53.6282	338056.1139	2430351.186
J7	21°58'05.3304	85°25'53.5242	338050.872	2430130.7
K	21°57'58.1327	85°25'53.4192	338045.592	2429909.373
K1	21°57'56.2324	85°25'46.8092	337855.3699	2429852.873
L	21°57'54.9445	85°25'42.3262	337726.3588	2429814.582
L1	21°57'58.8319	85°25'41.2658	337697.1678	2429934.449
L10	21°58'43.0125	85°25'29.2094	337365.2856	2431296.752
L2	21°58'03.3392	85°25'40.0362	337663.3158	2430073.43
L3	21°58'07.1575	85°25'38.9946	337634.6434	2430191.169
L4	21°58'10.2004	85°25'38.1640	337611.7764	2430284.995
L5	21°58'16.4885	85°25'36.4482	337564.5442	2430478.888
L6	21°58'20.3635	85°25'35.3911	337535.4457	2430598.372
L7	21°58'29.1434	85°25'32.9985	337469.5864	2430869.098
L8	21°58'31.8159	85°25'32.2642	337449.369	2430951.505
L9	21°58'36.3543	85°25'31.0290	337415.3719	2431091.446
M	21°58'46.8454	85°25'28.1689	337336.6513	2431414.939

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O	21°58'49.0071	85°25'11.9036	336870.7767	2431490.774
N	21°58'53.0273	85°25'30.0539	337392.6785	2431607.581
N1	21°58'50.8955	85°25'20.4915	337117.7145	2431541.766
O1	21°58'45.9093	85°25'11.8417	336868.0201	2431390.978
O2	21°58'40.4875	85°25'11.6349	336860.3656	2431224.294
O3	21°58'33.0915	85°25'11.3973	336851.2027	2430996.903
O4	21°58'21.2993	85°25'11.0330	336837.0083	2430634.349
O5	21°58'11.4163	85°25'10.6976	336824.2494	2430330.501
O6	21°58'04.3915	85°25'10.4712	336815.5242	2430114.524
O7	21°57'57.8838	85°25'10.2661	336807.5763	2429914.445
P	21°57'50.3235	85°25'10.0409	336798.7139	2429681.999
P1	21°57'50.2150	85°25'19.1083	337058.8038	2429675.979
Q	21°57'50.0993	85°25'31.3084	337408.7564	2429668.819
Q1	21°57'44.5511	85°25'31.1335	337401.986	2429498.239
Q2	21°57'40.7093	85°25'31.0487	337398.3386	2429380.112
Q3	21°57'36.7643	85°25'30.9593	337394.5263	2429258.813
Q4	21°57'33.9569	85°25'30.8961	337391.8249	2429172.492
Q5	21°57'30.9782	85°25'30.8288	337388.9541	2429080.902
R	21°57'20.7029	85°25'30.6054	337379.2946	2428764.957

Date of grant of lease	11.01.2021
Period/Expiry Date	10.01.2031
Name of lease holder	Odisha Mining Corporation Limited
Postal Address	OMC House, Post Box No. 34 Bhubaneswar – 751001, Odisha
Tel.	0674-2393431, 2395689, 2393389
Fax	0674-2391629, 2396889, 2394772
e-mail	info@orissamining.com; planningcellomc@gmail.com

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

Government Land	74.577 Ha
Forest Land	342.199 Ha
Private Land	39.261 Ha
Total	456.037 Ha

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Total lease area / applied area	358.258 Ha (as per DGPS)/ 365.026 Ha (as per ROR)
District & State	District: Keonjhar, State: Odisha
Taluka	Barbil
Post	Joda
Village	Jalahuri, Jurudi, Banspani, Khuntpani, Bholebeda, Jajang and in Baitrani Reserve Forest
Whether the area falls under Coastal Regulation Zone (CRZ)? If yes, details thereof	No

Authenticated DGPS Lease Plan of Jilling Langalotta Iron Ore Block is shown in Plate No 2.

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

The approaches to the mine are as follows.

Rail :	The nearest railway station is Jaroli (both Passenger and goods train). Located at a distance of 1km in Baspani-Jakhapura branch of East-coast & South-eastern Railway Line..
Road :	The area is well connected by metal road with Jamshedpur (175 kms), Rourkela (165 kms) and Keonjhar District Head Quarter Town (75 kms). The national high way No.520 is located at a distance of 09 kms from the mine site and Express Highway No.02 passes through the leasehold area.
Air strips :	Bhubaneswar (Odisha) at a distance of 280 km.

Topo-sheet No. with latitude & longitude of all corner boundary point/pillar:

Jilling Langalotta Iron ore Block of M/s Odisha Mining Corporation Limited is located between Latitude & Longitude $21^{0}59'21.98"$ to $22^{0}00'01.10"$N; $85^{0}17'04.19"$ to $85^{0}18'57.35"$E and is covered by survey of India topo-sheet no: 73 F/8 & 73 G/5.

Details of the DGPS reading of boundary pillar co-ordinates has been given at para 2.0 (a) above.

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:

General location map of lease area has been shown in the Key Plan (Plate No: 1).

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3.0 DETAILS OF APPROVED MINING PLAN / SCHEME OF MINING (if any)

3.1 Date and reference of earlier approved MP/ SOM:

The Mining Plan being submitted is a fresh Mining Plan. Hence the details of earlier approved Mining Plan and review of Mining Plan is not applicable in this case.

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. As part of the statutory clearance, this Mining Plan and Progressive Mine Closure Plan is being submitted under Rule 16(1) of MCR, 2016 and Rule 23 of MCDR, 2017 respectively for a period from 2020-21 to 2024-25.

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

As part of the statutory clearance, this Mining Plan and Progressive Mine Closure Plan is being submitted under Rule 16(1) of MCR, 2016 and Rule 23 of MCDR, 2017 respectively for a period from 2020-21 to 2024-25. Hence, review in respect of exploration, excavation, reclamation etc. is not applicable.

3.4 Give status of compliance of violations pointed out by IBM

Not applicable.

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

Not applicable.

3.6 In case the MP/RMP is submitted under rule 17(3) of the MCR' 2016 for approval of modification, specify reason and justification for modification under these rules:

Not applicable.

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PART – A

1.0 GEOLOGY AND EXPLORATION

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

i. Topography & Drainage:

The Jilling Langalotta Iron ore Block of Odisha Mining Corporation Ltd is located in the Champua Sub-division, Barbil Tehesil of Keonjhar district in Odisha.

The mine area consists of a series of N-S trending Parallel ridges and valleys. The Langalotta, Jilling, Rakhaburu, Khuntpani, Appahatu hills and its associated valleys constitutes the mine area. The eastern slope of the hill is steeper than western slope. The eastern slope of the hill is steeper than western slope. The lowest and highest relief of the area is 620 mRL.

The extent of lease area mentioned above is situated within the village boundaries of Jalahuri, Juruli, Banspani, Khuntpani, Bholebeda, Jajang and in Baitrani Reserve Forest in Keonjhar district of Odisha.

River Baitarani flows at a distance of 1.5 km on the eastern direction of the lease boundary constitutes the main drainage. Dalco Nala flows through the lease area before meeting the river Baitarani.

ii. Vegetation

The vegetation cover within the lease hold area is very less. However some native species like Sal, Kendu, Mahua, Asan, Mango, Banyan are found within the lease hold area within virgin forest area.

iii. Climate & Rainfall of the Lease Area

The climate of the lease area is characterized by an oppressively hot summer with high humidity. Summer generally commences in the month of March. Temperature begins to rise rapidly attaining the maximum in the month of May. During summer, the maximum temperature goes up to 45°C .The weather becomes more pleasant with the on-set of the monsoon in June and remains as such up to the end of October. The temperature in the month of December is lowest. Sometimes it even drops down to 4.6°C. From the available data collected from the nearest Joda town, the recorded average annual rainfall is 1497.6 mm. Rainfall occurs mainly during South West monsoon starting from June and extending up to September. The rainfall during North East monsoon is negligible and summer rains are erratic.

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

Regional Geology

The Precambrian banded iron-formations of the Singhbhum region of eastern India occur within a sequence of predominantly volcanogenic met sediments (Iron Ore Super group) which occur around a central granitic platform. A review of the stratigraphy and tectonic history of these rocks indicates that they are made up of four separate groups, representing successive phases of sedimentation and deformation, spanning a time range between 2,700 and 950 million years ago. Two banded iron-formations occur within these rocks out of which the older one, occurring in the northern, eastern, and southern parts of the platform, is of the Algoma type whereas the younger one, occurring in the western part, is of the Lake Superior type. An offshore zone of deep-seated fracture and volcanism has been envisaged to have supplied the major part of the materials of the Iron Ore Super group and associated banded iron- formations and manganese ores which were deposited in the inner shallow sea (mio-geosyncline), marginal to the platform.

The Iron ore deposit of Jilling Langalotta Block is a part of Singhbhum-Bonai- Keonjhar group forming a part of 'Horse-shoe Synclinorium' comes under the litho- stratigraphic units as suggested by Murthy (1975) based on his studies of the western limbs of the southern part, near to the closure of the major Synclinorium. The general trend of the rock is N-S with a variation between NNW-SSE to NNE-SSW with rolling dip.

The major lithological units of the area comprised of mainly the older metamorphic Banded Iron Formation (BIF) Intergrowth of several major granitic intrusive, i.e. Singhbhum, Bonai, Mayurbhanj etc. along with the volcanic Sedimentary sequences. The rocks of the Iron Ore Group underwent the green schist facies of metamorphism and were characterized by the presence of some schistose rocks in the area.

Broadly three different major lithological Groups are observed in the area. They usually consist of Basic Volcanics, Green Stone, the argillaceous and Tuffaceous suite of rocks along with the cherty quartzite & variegated shale, containing workable deposit of Iron, Dolomite& Manganese ore.

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LITHO-STRATIGRAPHIC SUCCESSION OF THE AREA

Jones (1934)		Saha (1994) Modified after Sarkar & Saha (1977)		Murthy & Acharya (1975)
Upper shales, epidiorite and ash bed		Singhbhum granite		Mixed formation facies
B.H.Q. with iron ore bodies	IRON ORE GROUP	Upper Shale with volcanics	KOIRA GROUP	Upper Formation Shale
Shales with occasional sandstones				
Purple sandstone with basal conglomerate		BHJ with iron ore, ferruginous quartzite		Banded Iron Formation
-----Unconformity ------				
Older Dharwars		Lower shale and acid, intermediate tuffs, local		Lower Formation Shale
				Volcanic Formation

Regional Stratigraphy

Jones (1934) first studied the geology of Bihar-Orissa Iron Ore Craton and referred the 'U'-pattern belt as a "horse-shoe shaped Synclinorium" from its geometric configuration. A detailed account of stratigraphy was also given by Jones (1934) who assigned them under iron ore series. Subsequent workers termed this belt as Jamda-Koira valley.

The stratigraphy succession of the region has been studied by many researches. The study area constitutes a part of the well-known Synclinorium. Various workers based on their study area designed the rock assemblages as Noamundi Group, Barbil Group, Kandahar Group, Koira Group, and Barsuana Group and so on. However views of different workers on stratigraphy of the region in different periods are briefly described below, highlighting the sequence of importance.

Dunn and Dey (1942) while carrying out geological work around North Orissa and South Bihar (undivided Bihar state) sub-divided the iron ore series into two stages; Iron Ore Stage and Chaibasa Stage and assigned Iron Ore Stage to the rock of this region. They discussed three alternative stratigraphic successions of these rocks based on structural interpretations.

Saroj KumarPrusty

Rabindra Mohanty

The entire topo sheet no.73G/1 of survey of India was mapped by Seth (1958) as a part of GSI field programme. He grouped the total sequence starting from quartzite at the base to the granites and gneisses at the top with iron and manganese rich sedimentaries in between under Iron Ore Series (= Dharwars) However, Mishra (1961) slightly modified this stratigraphy and indicated that the Singhbhum granites to be of late Dharwar age.

Sarkar and Saha (1962, 1977) while studying the regional geology of the area proposed that the Iron Ore Group of rocks were deposited in between the close of the Older Metamorphic Group of rocks and emplacement of Singhbhum granite, and was later involved in the iron ore orogeny.

Prasad Rao et.al (1964) while studying the stratigraphic sequence in parts of Keonjhar, Cuttack, Dhenkanal and Sundergarh districts of Orissa had deciphered six sequences in all. They assigned the rocks of Bonai-Keonjhar belt in their fourth sequence and described them to be equivalent to iron ore stage of Dunn (1940). According to them the lava-gritty quartzite (third sequence) is separated from the overlying shale formation (fourth one) by an unconformity. Banerjee (1974) suggested two groups of iron ore having distinct lithological characters. He termed "Noamundi Group" to the rocks in the western part (present belt) of the Singhbhum granite, which rest over the Dhanjori lava.

Murty and Acharya (1975) carried out geological work in the southern part of the belt and provided a stratigraphic succession of the area and proposed the name Koira group for this purpose. They have reported a mixed facies formation younger than the Upper shale, which is equivalent to the Upper shale with Epidiorites and ash beds of Jones (1934).

The stratigraphy of the closure zone (in the south) of the horseshoe Synclinorium around Khandadhar region has been discussed by Sarangi and Acharya (1975). They have established the local stratigraphy of the region on the basis of fold geometry and analysis of different sedimentological features developed in the various litho units. They referred the stratigraphy of this region as "Khandadhar Group" and classified the sequence in to four formations such as lower volcanic formation, lower shale formation, banded iron formation and upper shale formation. They demarcated a discontinuity between the lower volcanic formation and lower shale formation.

Iyenger and Murty (1982) while reviewing the stratigraphy and geo-chemistry of the books of the area contemplated that the term Iron Ore Super group may be used in lieu of "Iron Ore series". They further stated that more than one iron ore bearing formation exists in the region and termed the litho units of study area as "Barbil Group".

Saroj KumarPrusty

Rabindra Mohanty

Acharya (1984) delineated three separate BIF sequence in Orissa on the basis of structure, stratigraphy and type of ore deposit. He assigned BIF-III as the youngest one for this belt (Horse Shoe of Jones, 1934). Saha et al (1988) have expressed their view that the Iron Ore Group is younger than SBG-A(3300 m.y) but older than S8G-B (3100 m.y).

Mohapatra et al (1991) while studying the geological formation around Barsuan-Kalta region established the stratigraphic sequence of the litho types of this belt and assigned it as "Barsuan Group". They have classified the litho succession into four different formations such as lower volcanic formation, lower shale formation, iron ore formation and upper shale formation (Manganiferous). Though the succession of Barsuana Group and Khandadhar Group and more or less similar, the former differ from the later with respect to their individual litho-assemblages.

Acharya (2000) carried out extensive geological studies all around the Bonai-Synclinorium Banded Iron Formation and grouped them as BIF-I, BIF-II, BIF-III. He assigned BIF-I to highly metamorphosed, meta-sedimentaries of Badampahar region, BIF- II to the Daitary- Tomka iron ore formation and BIF-III to the iron ore deposits of the horse shoe shaped Synclinorium of the Bonai-Keonjhar area. He suggested that the lower pillite consisting of tuffs and variegated shale is Manganiferous whereas other workers have suggested that the upper shale formation is manganese bearing. The regional stratigraphic succession as suggested by different workers is shown below.

Regional Structure

It is evident from the foregoing description and discussion that the bedding plane (S1), the earliest plane of reference, is well developed in almost all litho types and regarded as the ultimate plane of reference for unraveling the structure of the area. S2 has got an E- W trend dipping to the north. It is so oriented due to the early east-west folding episode. In banded iron formation the trend of S2, being sub-parallel to S1 along the limbs is better discernible from the associated small scale folds, developed on S1. The intersection of these two planar structures (S1xS2) is parallel to the axial trend of the east-west fold. In the northern sector and in a part of southern sector the structures, related to this early folding episode are preserved. These folds are mostly parallel open folds with comparatively low plunge (8°-12° and vary rarely up to 18°). This represents the imprints of the earliest folding episode experienced by the rocks of the region and the allied structures may be regarded as D1 fold structures.

The fold of the second generation with mostly NNE-SSW trending axial plane is the major one that controls the map pattern of the area and in turn also has been responsible in carving the physiographic configuration of the region. The imprints of this folding episode are more penetratively reflected on all the rock types throughout the region and can be referred to as D2 structures. In the banded iron formation, the regional geometry of the D2 structure is discernible from the associated small-scale folds, developed on S1 and S2. But in the shale, this is represented by an axial-plane (S3).

Saroj KumarPrusty

Rabindra Mohanty

The general trend of the axial- planes have vertical to steep westerly dip. Throughout the region, the trend of S1 varies between NNW-SSE to NNE-SSW with a westerly dip of about 48° to 56°. In banded hematite jasper it has resulted in configuration of folds whose axial planes are oriented in N-S direction. The intersection lineation produced by S1 and S3 is in agreement with the general plunge of the north-south fold axes. The folds resulted due to D2 structures are comparatively high plunging, essentially due to superposition of structures. The Mesoscopic folds are observed to be tighter in the limb of the regional fold and tend to open up in the closure zone of the main fold (D2). In the closure zone, they tend to be of compound (disharmonic) type.

The linear features associated with the north-south folding exhibit a doubly plunging nature yet show fanning of all the linear attitudes. This is at least partly (i) due to synchronous cross folding of D2 folds on an east-west plane, (ii) due to their (D2-fold structure) development on an earlier folded surface (D1-fold) and (iii) at places being affected by later folds (D3 – fold).

The last in the folding episodes of the region is marked by a less intensive east-west deformation (D3-folds). This is mostly localized in the central part of the region. The imprints of this deformation are better displayed, as axial plane cleavage (S4) in the rocks of Phyllitic shale and in the banded hematite shale. The intersection of S3 and S4, measured is in agreement with the general plunge of the late east-west folds (D3-folds).

In the area, where the effects of late east west folds (D3-folds) are imprinted, S4 is likely to be confused with S2 (as they have got broadly similar trend) but S4 has got a regular and without bending in nature (E-W).

An analysis of the distribution and mutual relations of the litho-types and minor structures indicate that the present disposition of the rocks resulted from three major fold movements. Pre-existing folds have been bent sideway as well as downward.

The earliest linear structures are parallel to the axes of the major E-W (first) fold; they were distorted as the bedding planes became refolded during the second fold movements and they show a second set of linear structures superimposed upon them. Similarly, the axial plane cleavage and axial planes of minor folds parallel to the E-W, first folds were refolded during the second episode of folding and a new axial plane cleavage now cut across the early minor folds.

These folds have caused warping of limbs of earlier plunging folds and have resulted in development of a series of elongated doubly plunging anti-form and Syn-form and axial culminations and depressions. Small-scale folds are varying widely in style and orientation with curved hinge lines commonly giving rise to dome and basin structures.

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c) **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.**

Local Geology:

The Iron ore deposit of Jilling - Langalota Iron Block leasehold area forms a part of 'Horse-shoe Synclinorium', near to the closure of the major Synclinorium. The major lithological units of the area comprised of mainly Banded Iron Formation (BIF) with several major granitic intrusive e.g. Singhbhum, Bonai, Mayurbhanj Granite etc. along with the volcano Sedimentary sequences. The rocks of the Iron Ore Group underwent the green schist facies of metamorphism and were characterized by the presence of some schistose rocks in the area. The metamorphic rocks observed in the area are mostly the product of regional metamorphism.

Broadly three different major lithological Groups are observed in the area. They usually consist of Basic Volcanics, Green Stone, the argillaceous and Tuffaceous suite of rocks along with the cherty quartzite & variegated shale, containing workable deposit of Iron & Manganiferous ore with stray occurrence of calcareous rocks,

The area is a part of the westerly dipping eastern limb of the NNE plunging asymmetric Synclinorium. The general trend of the rock is N-S with a variation between NNW-SSE to NNE-SSW with rolling dip. The structure of the rock of this area is complicated due to several fold movements. The axis of the major fold is N-S. The ore bodies are laid down in the Syn- form with their axes plunging due to south and north.

The rock formation of the area is meta-Volcanics and sequence of meta-sedimentary rocks belongs to koira group of iron ore series of Precambrian age. The stratigraphic sequence is as follows:

Alluvium
Laterite / Float Iron Ore
Iron Ore (Massive / Laminated / Blue Dust)
Banded Hematite Jasper (BHJ)
Shale
----------Unconformity----------
-------Older Metamorphic----------

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A brief overview of deposit type, geological setting and details of dip, strike, old workings, surface exposures etc. of the lease area as per field observation and Geological Study Report received from State Government are as follows:

1. The strike of ore body varies from NNE-SSW to NNW-SSE with dip varying from 18° to 40° towards west and as well as towards east.
2. BHJ has a strike mostly varying between 15° -30° and at some places with 145°- 160° and dip varying from 27° -35° towards ESE-SSE
3. Shale has a strike which varies from 10° -30° towards East. Shale anticlines were discernible on the bench faces
4. 5-6 joint sets present in ore body
5. 2-3 vertical type of joints, with strikes varying from 55° -80° and 160° -180° (mainly 75° and 175°) forming Rhombohedra blocks of ore.
6. 1-2 horizontal type of joints.

Structural Interpretations

1. Even though the area is structurally disturbed to a great extent due to poly phase deformation, some conclusion can still be drawn on the basis of field study. They are as follows:
2. The major fold has its fold axis along N-S
3. Many minor folds encountered having fold axis ENE-WSW
4. The joints along N-S and along E-W could be axial planer cleavage developed during the formation of fold
5. 2 fold axis are almost perpendicular to each other
6. The folds developed can be considered Type-0 folds according to Ramsay's Classification of folds
7. Folds here form Dome-Basin Structure

The different litho units of Jilling Langalotta Iron Ore Block is given below:

Lower Shale Formation:

The Lower Shale Formation (LSF) overlies the volcanic formation and underlies the sedimentaries of BIF conformably. This formation mainly comprises of variegated shale members underlying brown and grey shales. The different colored shale members exhibit gradational contact with each other. This unit is considered as weathering product of volcanics. This shale at many places contains well-preserved relics of vesicles and Amygdules, which obviously suggest its primary Tuffaceous/volcanic parentage. The members of this formation often exhibit fine lamination inherited from parent Tuff/Tuffites. Close interbedded interrelationship of lava flows with the overlying tuff indicates a sub- aqueous origin for the lava. Besides, the associated tuffs and ash beds show evidence of having been laid in water.

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The thick conformable bands of LSF overlying tuff-volcanics are attributable to in-situ weathering of Tuffaceous rocks. However, the kaolinite in some shales represent the weathered or altered products of tuffs probably formed under strong leaching condition. Abundance of pyroclasts in tuffs and tuffaceous shales suggests strong explosive nature of volcanic material. Presence of primary and peni- contemporaneous structures like current lamination, occasional graded bedding etc. in tuffs and some relic structures in LSF stands in favour of shallow quiet water environment. All these clearly reveal the parent Tuffaceous rocks of lower shale formation to be of volcano-sedimentary type.

Upper shale formation

The cessation of the chemical sedimentation is marked by the beginning of deposition of argillaceous group of rocks known as Upper Shale Formation (USF). This formation is divided into two members. Lower member is purple, brown and grey;thinly laminated and encloses lenticular /irregular shaped bodies of manganese ores.The upper member of USF is yellow, maroon and white coloured and devoid of manganese mineralization. The presence of laminations indicates its deposition in quite water environment

Banded Iron Formation (BHJ & BHQ)

On the basis of field disposition and broad composition of different members, the BIF in the study area can be classified broadly in to following three categories:

(i) Banded Hematite Jasper: BHJ is red / buff in color and show distinct banding. Often the bands are gradational. The jasper and hematite are more or less similar in thickness. Such litho units are predominantly seen in this area.

(ii) Banded Chert / Ferruginous Chert: The exposures of Banded Chert/ Ferruginous Chert are seen in this area. Often banding is recognized by the fine color difference. They are very poor in iron content.

(iii) Banded Hematite Shale (BHS): The Banded Ferruginous Shale is often overlain by banded hematite jasper. This unit is characteristically banded with iron minerals and shale. This is locally called as transitional ore. It is persistently noticed throughout the Iron ore mines. In this unit the banding is thinner and sharper than those in BHJ.

(iv) Banded Shale (BS) / Ferruginous Shale (FS): Ferruginous shale / Banded shale is a type of shale that is rich in iron. In the study area the rock typically exhibits a reddish tint if the iron present is ferric or a green tint if the iron is ferrous. Dark gray or black shale, however, often results from the presence of appreciable manganese content.

(v) Laterites: Most part of the area is covered by laterite of various types. The laterites have been developed mostly over the shale unit of the area and depending upon the composition of the shale, different types of laterites have been developed. The shale rich in alumina has given rise to bauxitic laterite and those rich in iron have developed ferruginous laterites respectively. Ferruginous laterite occupies most of the high lands in the vicinity and is wide-spread.

(vi) Alluvial Soil: The low lying areas are filled up mostly with alluvial soil.

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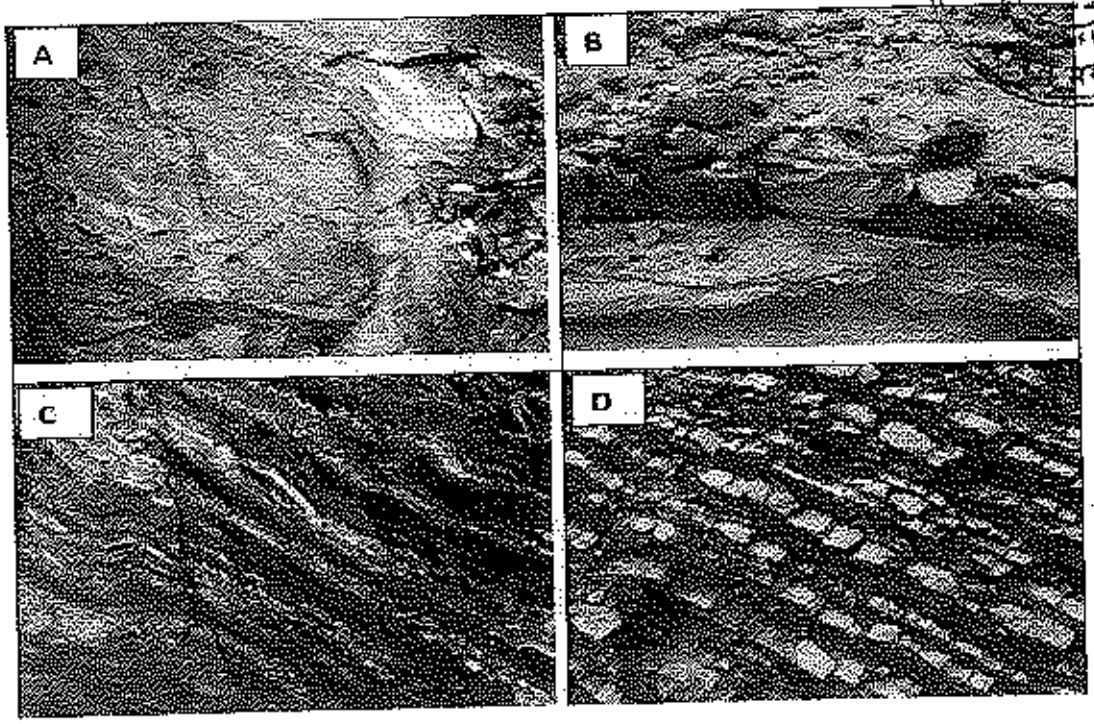

Close view of BHJ / BHQ / FC / BC in the lease area

A. BHJ showing alternate bands of Hematite & Jasper
B. Ferruginous Chert
C. BHQ
D. Banded Chert

Description of various Ore types in the lease area:

1) Massive Ore

Massive ore is usually fine grained, dense and compact. It often exhibits fine laminations parallel to the bedding plane. The thickness of the laminae ranges from microscopic dimension to as thick as 0.7cm. Perpendicular set of joints is well developed in massive ore. The massive ore does not exhibit much evidence of slumping. It is seen in the topographic highs and show gradational relation with the underlying laminated ore/blue dust.

2) Laminated ore (HLO / SLO):

The laminated ore exhibits well developed layering due to alternate iron rich and clay / tuffaceous shale rich bands. This type can be grouped into hard laminated ore (HLO) and soft laminated ore (SLO) depending on its compactness and thickness of clay layer.

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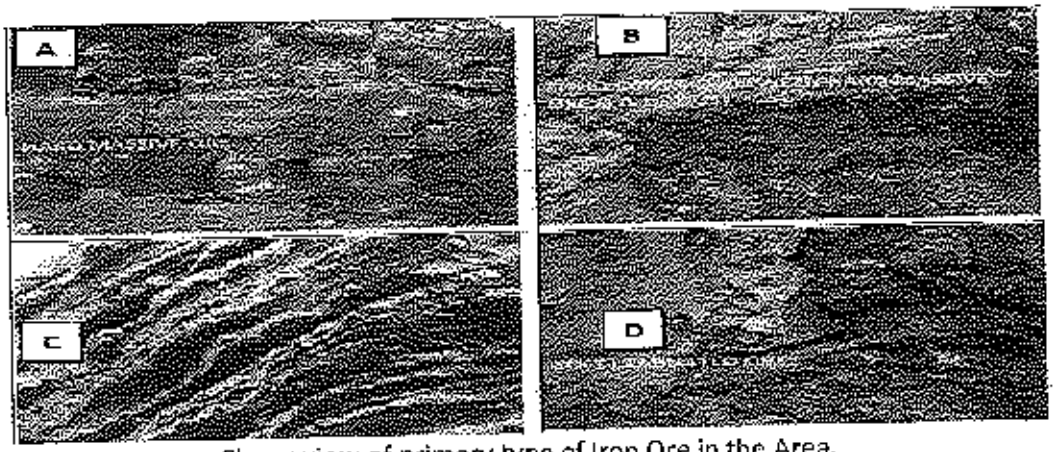
The HLO exhibits large-scale open folds in mine faces while small scale puckers and tight folds are generally seen in SLO / shaly iron ores. The laminated ore of this region is observed to be associated and / or interlayered with thin bands of ferruginous shale. The shaly iron ore / banded hematite shale are termed when shale bands are relatively thicker than iron bands.

3) Primary modified type

The primary modified ore is friable, flaky in nature and possess considerable amount of void space. It is the modified form of primary type resulted due to removal / leaching of gangue materials from the original bulk. Two ore types, viz., biscuity ore and blue dusts are categorized under this group.

4) Biscuity/Friable ore:

The Biscuity / Friable ores are usually seen associated with BHJ/BHQ and laminated ore.



Closer view of primary type of Iron Ore in the Area.

A. Hard Massive Ore
B. Litho contact between Hard Massive Ore & Blue dust
C. Hard Laminated Ore (HLO)
D. Soft Laminated Ore (SLO)

Blue dusts:

The fine-grained iron ore powder with characteristic metallic blue color is well known as blue dusts (BD). This ore occurs as pockets passing laterally or vertically into one of the primary ore types. Occurrence of blue dust is neither related to topography nor confined to any stratigraphic sequence.

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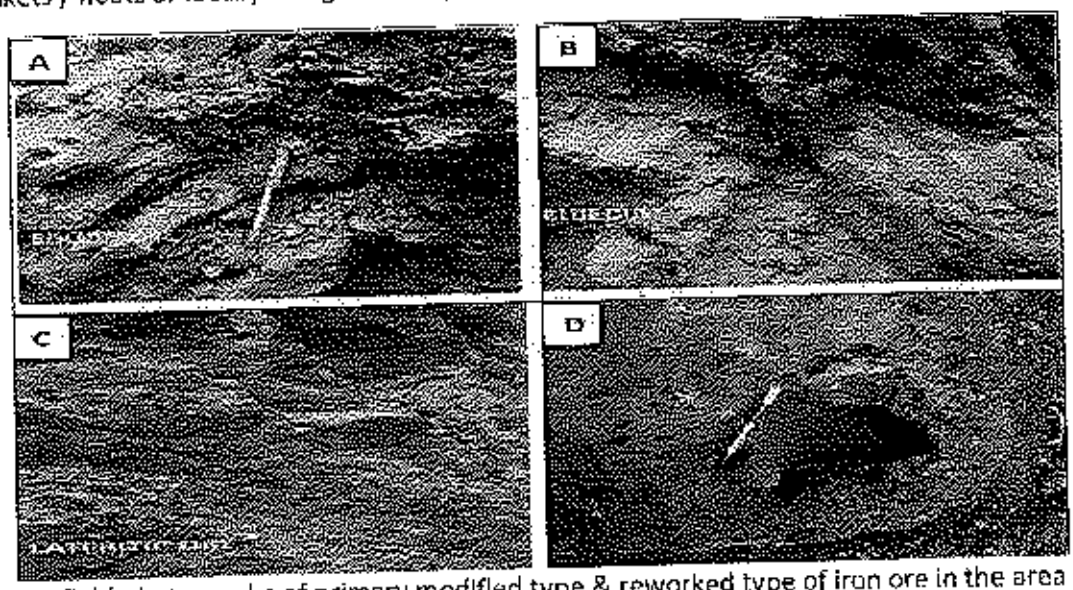
Usually BD is of very good grade, need no beneficiation and is generally processed without passing through the washing plant and hence named locally as 'direct ore'. Distinct gradation between primary litho types to biscuit bands to fragile zone containing blue colored powder (BD) is recorded in different quarry bench levels of the study area.

5) Reworked type

The 'reworked type' ores are formed when the primary ore/ rock types (BHJ/BHQ/iron ores etc.) are subjected to internal changes under environmental variation. It develops due to chemical weathering through supergene enrichment processes. Litho facies of reworked types occur either as blankets / floats or locally along fracture planes. This can be further divided into two types.



Macro field photographs of primary modified type & reworked type of iron ore in the area

A. Biscuity ore
B. Blue dust
C. Lateritic ore
D. Detrital ore

Lateritic ore:

Laterite / lateritic ore in the region occur as blankets over almost all the members of iron formations. When it is developed in contact with some ore bodies, its grade is proved to be relatively high (Fe: Av. 59%), while with contact of shaly horizon, it is of low grade (Fe: Av. 56%) nature and contain more alumina (6-7% -Al2O3). When it is of commercial / economic grade it is termed as lateritic ore.

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Detrital ore:

Detrital ore appears like a sedimentary conglomerate. It usually occurs as floats over the hill tops and slopes. Fragments of different ore types are observed to be cemented by secondary filling of iron rich materials. The difference between primary modified and reworked ore types are, i) the modified type mostly retains structure and texture of the primary type while the reworked type show different features, ii) the mineralogy of modified type remains same as primary type except that the percentage of iron minerals increases in latter type. On the contrary, the reworked type exhibits a distinctly different mineralogy.

The ratio of different Ore types of Iron Ore in the deposit is furnished in tabulated format below.

Different Ore Type	Percentage of Incidence
Blue Dust	0.9
Lateritic Ore	23
Laminated Ore	42
Shaly Ore	2
Soft Friable Ore	32

The strike length of the iron ore body available within the lease hold area is 900 meter. The width of the Iron ore body varies from 400 meters to 600 meters. The maximum and minimum thickness of the iron ore body within the lease hold area is 90 meters and 30 meters respectively.

d) Name of prospecting /exploration agency: As per the Geological Report attached at Annexure-26 received from state Govt.the details area given below;

Name	Address	Email id	Contact No
The ACC Limited	CRS Complex, L.B.S Marg,Thane, 4000604, India,	accminres@vsnl.com	Phone: 5835040
M/S. Geotech India	At- 51, Panchdeep Nagar, Wardha Road,Nagpur-440025	www.geotechindia.co.in	Phone no- 0712 2282655.
M/S. The Thriveni Exploration	M/S. The Thriveni Exploration (A unit of Thriveni Earthmovers Pvt. Ltd.) Opp. Joda Womens College Post. Boneikala Joda. Dist: Keonjhar (Orissa)		
M/s Essel Mining & Industries Ltd	At / P.O – Barbil, District: Keonjhar, State: Odisha, Pin code: 758035	emilbbl@adityabirla.com	Phone no-: 06767-275224/ 275437/ 279209/ 279233

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e) **Details of prospecting/exploration already carried out:**

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

Based on the Geological Report of Jilling Langalotta Iron Ore Block received from State Government, attached at Annexure-26, the pitting and trenching was done during earlier stages of minerals prospecting, the trails of which have been disturbed due to mining activities.

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.**

As per the Geological report received from Govt. of Odisha, a total of 347 nos of bore holes/ drill holes having 14904.7 meter have been completed under G1 & G2 category. Form J & K are attached at Annexure- 25 & 24 of Geological Report respectively. Chemical analysis report by NABL accredited laboratory are attached at Annexure- 19 of Geological Report. The detail information furnished as per Geological Report attached at annexure-26 approved by the state government is furnished in the table below;

a) Summary of the exploration carried out in the lease hold area indicating mapping, pitting, drilling (No./ spacing), sample drawn/ analyzed etc, existing pit data, grade variation, thickness is given in the table below: -

Summary of all drill holes as per the Geological Report as on 01.04.2019

Year	Drill Type	Agencies / Parties	Nos. of BH	Hole Diameter (mm.)	Inclination/ Dip Angle	Grid Size	Avg. Depth, m	Drilling meterage (m)
1998	DTH	The ACC Ltd.	16	127-203.2	Vertical	100 X 100 m	20.75	332.0
	RC		34				31.12	1058.0
	CD		11	75.7(NQ) & 96 (HQ)			42.50	476.5
2001-05	RC	The ACC Ltd.	119	127-203.2			37.45	4457.0
2009-11	CD	M/s. Geotech India	14	75.7(NQ) & 96 (HQ)			53.58	750.15
		Thriveni	73				51.81	3782.4
2013-14	CD	In-House	11				63.01	693.1
Total			278		Total			11540.1
2018-19	RC	In house Exploration	63	165	Vertical	100 x 200m	49.238	3102
	CD		6	63			43.766	262.6
Total			69	Total				3364.6

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All the boreholes have been depicted in the Geological plan and section (Plate NO 4 & 5) showing collar RL, depth, Lithology, Fe% etc.

The details of boreholes like, collar RL, Co-ordinates, Hole path, azimuth etc. of the borehole drilled is referred at Geological Report. Annexure 26.

Geological Mapping as per Geological Report as on 01.04.2019

The lease area has been geologically mapped in 1: 2000 scale as per geological report received from Govt. of Odisha. The details level wise exploration are tabulated below:

Item of information	Lease area explored as per UNFC norms (in Ha) as on Total Lease area = A+B+C				Remarks / Comments including reasons for not carrying out the exploration as per UNFC norms.
	G1 Level	G2 Level	G3 Level	Unexplored lease area	
	A	B	C	E	
Area (in Ha) as per level of exploration	164.91	255.135	Nil	36.055 Ha (SER Acquired Area)	36.055 Ha (South Eastern Railway Acquired Area)
No. of BH drilled	278	69			
No. of BH considered for Resource Estimation	278	69			
Meterage Drilled	11540.1	3364.6			
Grid Interval (Mtrs)	100 x 100 & 100 x 50	100 x 200			
Scale of Mapping	1:2000				

Justification of area considered for G1/G2/G3 & G4.

G1 area:

Borehole spacing has been considered within 100mtrs on a grid pattern.

Geological mapping has been done in 1:2000 scale.

Detailed three-dimensional delineation of an ore body has been achieved though sampling, pit mapping etc. and relevant characteristics of the deposit are established with high degree of accuracy using software.

G2 area:

Borehole spacing has been considered within 200mtrs on a grid pattern.

Geological mapping has been done in 1:2000 scale.

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Detailed three-dimensional delineation of an ore body has been achieved through sampling, Pit/Surface mapping etc. and relevant characteristics of the deposit are established with high degree of accuracy using software.

iii) Details of samples analysis indicating type of sample (surface/sub-surface from pits/trenches/borehole etc) Complete chemical analysis for entire strata for all radicals may be undertaken for selected samples from a NABL accredited Laboratory or Government laboratory or equivalent. Entire mineralized area may be analyzed meter wise with 10% of check samples. (At least for 10% of total samples may be analyzed in accordance to BIS and reports from NABL accredited/other Government laboratory).

Based on the Geological report received from Govt. of Odisha, the RC bore hole samples were analyzed with a sample length of one meter whereas the core samples were analyzed with a sample length of 3 meter based on the uniformity /homogeneity of strata. The length of core samples is also less than one meter where litho types in between the ore strata are varying. The drilling technique deployed was based on the rock type for achieving maximum sample recovery. The samples generated are analysed for Fe, SiO2 & Al2O3, S, P, Lol etc. All the samples were analyzed through NABL accredited lab. The litho logs along with the analysis result of the borehole samples (CD &RC) drilled within the leasehold area in form-K are enclosed vide Annexure-24 of the Geological Report.

The details of Bore hole wise sample analysed are given in Geological Report Annexure 26.

iv) Expenditure incurred in various prospecting operations.

Since Lease executed by Odisha Mining Corporation Limited on dtd. 11.01.2021, so no prospecting work yet been started.

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.

Based on the topographical survey of the area, surface plan of the lease area has been prepared on 1:2000 scales with contour interval of 10 m and grid lines at 100 m interval. All surface features as indicated under rule 32(a) of MCDR, 2017 have been marked in the Surface Plan (Plate No 3).

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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 in scale 1:2000 of the leaschold area showing all the above features is enclosed as Plate No.4.

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

The geological sections in natural scale of 1:2000 of the leasehold area showing all the above features is enclosed as Plate No.5A to 5I & the LV Section is enclosed as Plate No. 5J.

i) **Broadly indicate the future programme of exploration with due justification (duly marking on Geological plan year wise location in different colors) taking into consideration the future tentative excavation programme planned in next five years.**

Based on the Geological Report attached at annexure-26 received from Govt. of Odisha, the entire Mining lease area are converted in to G1 & G2 category covering 347 nos. of boreholes. Mineralised and Non-Mineralised area are marked on the Geological Plan. But during the plan period, a portion i.e. north Jilling-Gangaigora Quarry will be exhausted in 1st year of excavation proposal. Subsequently, it is planned to dump waste material (over burden) in the exhausted Quarry from 2nd year onwards and reclaim the area. Before commencement of dumping, 20 nos. boreholes have been proposed at 100m x 100m @ 100m depth of each borehole to prove the barrenness of the area. Further, complying rule 12(3) of MCDR'2017, additional 188 nos of boreholes are proposed to convert G1 level of exploration from G2 level (potential Mineralised area). The details boreholes area given below;

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Year of drilling	Proposed BH No	Northing	Easting	Collar RL	Core/RC /DTH	Proposed Depth (In Mtr)	Inclination	Forest/Non Forest diverted/Non Diverted	Surface Right/Non surface right area
2021-22	PBH_1	2431263	336898	590	Core	*100	Vertical	DivertedForest	SurfaceRightarea
	PBH_2	2431263	336961	584	Core	*100			
	PBH_3	2431263	337061	565	Core	*100			
	PBH_4	2431263	337161	552	Core	*100			
	PBH_5	2431264	337261	550	Core	*100			
	PBH_6	2431263	337360	552	Core	*100			
	PBH_7	2431163	336893	613	Core	*100			
	PBH_8	2431164	336960	607	Core	*100			
	PBH_9	2431163	337061	595	Core	*100			
	PBH_10	2431163	337160	580	Core	*100			
	PBH_11	2431162	337261	570	Core	*100			
	PBH_12	2431062	336898	607	Core	*100			
	PBH_13	2431063	336960	597	Core	*100			
	PBH_14	2431062	337061	590	Core	*100			
	PBH_15	2431063	337161	574	Core	*100			
	PBH_16	2430963	336877	609	Core	*100			
	PBH_17	2430963	337061	583	Core	*100			
	PBH_18	2430963	337160	583	Core	*100			
	PBH_19	2430863	336899	612	Core	*100			
	PBH_20	2430864	337060	585	Core	*100			
	PBH_21	2430763	336861	615	Core	*100			
	PBH_22	2430763	336961	596	Core	*100			
	PBH_23	2430762	337060	590	Core	*100			
	PBH_24	2430664	336862	617	Core	*100			
	PBH_25	2430664	336960	605	Core	*100			
	PBH_26	2430663	337161	594	Core	*100			
	PBH_27	2430563	336861	600	Core	*100			
	PBH_28	2430563	336961	595	Core	*100			
	PBH_29	2430563	337061	599	Core	*100			
	PBH_30	2430563	337161	606	Core	*100			
	PBH_31	2430463	336861	599	Core	*100			
	PBH_32	2430463	336961	582	Core	*100			
	PBH_33	2430463	337061	589	Core	*100			
	PBH_34	2430474	337161	591	Core	*100			
	PBH_35	2430372	337260	569	Core	*100			

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PBH_36	2430368	337461	563	Core	*100
PBH_37	2430280	336860	585	Core	*100
PBH_38	2430277	336960	582	Core	*100
PBH_39	2430270	337360	553	Core	*100
PBH_40	2430269	337461	559	Core	*100
PBH_41	2430267	337558	561	Core	*100
PBH_42	2430162	336961	556	Core	*100
PBH_43	2430171	337359	553	Core	*100
PBH_44	2430168	337513	562	Core	*100
PBH_45	2430079	336861	552	Core	*100
PBH_46	2430076	337061	537	Core	*100
PBH_47	2430069	337359	542	Core	*100
PBH_48	2430066	337562	548	Core	*100
PBH_49	2429577	338361	575	Core	*100
PBH_50	2429577	338461	585	Core	*100
PBH_51	2429562	338562	564	Core	*100
PBH_52	2429528	338461	585	Core	*100
PBH_53	2429228	338161	516	Core	*100
PBH_54	2429228	338361	539	Core	*100
PBH_55	2429130	338061	513	Core	*100
PBH_56	2429128	338261	504	Core	*100
PBH_57	2429079	338161	484	Core	*100
PBH_58	2428979	338061	493	Core	*100
PBH_59	2428979	338261	506	Core	*100
PBH_60	2428879	338061	496	Core	*100
PBH_61	2428729	337761	485	Core	*100
PBH_62	2428729	337825	482	Core	*100
PBH_63	2428630	337661	490	Core	*100
PBH_64	2428629	337761	496	Core	*100
PBH_65	2428629	337861	511	Core	*100
PBH_66	2428579	337713	500	Core	*100
PBH_67	2428580	337820	510	Core	*100
PBH_68	2428530	337661	498	Core	*100
PBH_69	2428530	337761	514	Core	*100
PBH_70	2428529	337861	525	Core	*100
PBH_71	2429163	337960	533	Core	*100
PBH_72	2429163	338160	498	Core	*100
PBH_73	2429163	338361	538	Core	*100

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	PBH_74	2429062	337861	527	Core	*100				
	PBH_75	2429062	337960	524	Core	*100				
	PBH_76	2429063	338061	503	Core	*100				
	PBH_77	2429063	338361	537	Core	*100				
	PBH_78	2428963	337861	526	Core	*100				
	PBH_79	2428963	337960	520	Core	*100				
	PBH_80	2428963	338160	486	Core	*100				
	PBH_81	2428963	338361	535	Core	*100				
	PBH_82	2428863	338161	484	Core	*100				
	PBH_83	2431463	336900	524	Core	*100				
	PBH_84	2431464	336961	523	Core	*100				
	PBH_85	2431463	337061	520	Core	*100				
	PBH_86	2431464	337160	520	Core	*100				
	PBH_87	2431463	337261	523	Core	*100				
	PBH_88	2431364	336867	550	Core	*100				
	PBH_89	2431362	336906	545	Core	*100				
	PBH_90	2431363	336961	540	Core	*100				
	PBH_91	2431363	337061	527	Core	*100				
	PBH_92	2431363	337161	524	Core	*100				
	PBH_93	2431363	337311	529	Core	*100				
	PBH_94	2431463	339161	568	Core	*100				
	PBH_95	2431363	338762	533	Core	*100				
	PBH_96	2431363	339061	565	Core	*100				
2022-23	PBH_97	2431263	338361	530	Core	*100	Vertical	DivertedForest	SurfaceRightsfree	
	PBH_98	2431263	338860	536	Core	*100				
	PBH_99	2431206	338260	524	Core	*100				
	PBH_100	2431163	338161	541	Core	*100				
	PBH_101	2431163	338461	516	Core	*100				
	PBH_102	2431164	338560	515	Core	*100				
	PBH_103	2431163	338661	516	Core	*100				
	PBH_104	2431063	338108	538	Core	*100				
	PBH_105	2431062	338160	533	Core	*100				
	PBH_106	2431063	338261	528	Core	*100				
	PBH_107	2431062	338359	526	Core	*100				
	PBH_108	2430963	338361	538	Core	*100				
	PBH_109	2430963	338460	533	Core	*100				
	PBH_110	2430963	338561	523	Core	*100				
	PBH_111	2430963	338661	509	Core	*100				

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PBH_112	2430863	338161	557	Core	*100
PBH_113	2430863	338361	548	Core	*100
PBH_114	2430863	338461	532	Core	*100
PBH_115	2430762	338108	557	Core	*100
PBH_116	2430763	338161	551	Core	*100
PBH_117	2430763	338261	543	Core	*100
PBH_118	2430763	338361	554	Core	*100
PBH_119	2430763	338461	542	Core	*100
PBH_120	2430763	338560	561	Core	*100
PBH_121	2430763	338617	544	Core	*100
PBH_122	2430563	338107	567	Core	*100
PBH_123	2430564	338161	557	Core	*100
PBH_124	2430562	338262	560	Core	*100
PBH_125	2430563	338361	578	Core	*100
PBH_126	2430563	338461	594	Core	*100
PBH_127	2430562	338560	567	Core	*100
PBH_128	2430563	338617	543	Core	*100
PBH_129	2430363	338097	551	Core	*100
PBH_130	2430363	338160	543	Core	*100
PBH_131	2430362	338260	552	Core	*100
PBH_132	2430363	338361	568	Core	*100
PBH_133	2430362	338459	586	Core	*100
PBH_134	2430362	338561	546	Core	*100
PBH_135	2430363	338606	526	Core	*100
PBH_136	2430162	338099	529	Core	*100
PBH_137	2430163	338160	524	Core	*100
PBH_138	2430163	338261	556	Core	*100
PBH_139	2430163	338361	581	Core	*100
PBH_140	2430162	338460	569	Core	*100
PBH_141	2430163	338560	545	Core	*100
PBH_142	2430162	338607	523	Core	*100
PBH_143	2430063	338111	523	Core	*100
PBH_144	2430063	338305	582	Core	*100
PBH_145	2430063	338410	587	Core	*100
PBH_146	2430063	338514	572	Core	*100
PBH_147	2429964	338099	534	Core	*100
PBH_148	2429963	338162	556	Core	*100
PBH_149	2429962	338360	600	Core	*100

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	PBH_150	2429963	338460	586	Core	*100			
	PBH_151	2429963	338561	567	Core	*100			
	PBH_152	2429962	338603	556	Core	*100			
	PBH_153	2429859	338061	536	Core	*100			
	PBH_154	2429861	338159	557	Core	*100			
	PBH_155	2429863	338261	576	Core	*100			
	PBH_156	2429762	338061	549	Core	*100			
	PBH_157	2429762	338161	546	Core	*100			
	PBH_158	2429763	338561	558	Core	*100			
	PBH_159	2429662	337962	510	Core	*100			
	PBH_160	2429662	338061	546	Core	*100			
	PBH_161	2429662	338162	543	Core	*100			
	PBH_162	2429662	338261	564	Core	*100			
	PBH_163	2429662	338360	583	Core	*100			
	PBH_164	2429662	338462	594	Core	*100			
	PBH_165	2429664	338561	569	Core	*100			
	PBH_166	2429565	337961	517	Core	*100			
	PBH_167	2429562	338062	521	Core	*100			
	PBH_168	2429564	338161	543	Core	*100			
	PBH_169	2429563	338260	542	Core	*100			
2023-24	PBH_170	2429463	337959	515	Core	*100	Vertical	DivertedForest	SurfaceRights:area
	PBH_171	2429463	338061	523	Core	*100			
	PBH_172	2429463	338161	539	Core	*100			
	PBH_173	2429463	338261	538	Core	*100			
	PBH_174	2429464	338361	564	Core	*100			
	PBH_175	2429462	338461	569	Core	*100			
	PBH_176	2429463	338561	557	Core	*100			
	PBH_177	2429364	337761	520	Core	*100			
	PBH_178	2429363	337860	522	Core	*100			
	PBH_179	2429363	337961	522	Core	*100			
	PBH_180	2429362	338060	531	Core	*100			
	PBH_181	2429363	338160	540	Core	*100			
	PBH_182	2429363	338260	547	Core	*100			
	PBH_183	2429363	338360	536	Core	*100			
	PBH_184	2429362	338460	562	Core	*100			
	PBH_185	2429363	338560	549	Core	*100			
	PBH_186	2429263	337961	529	Core	*100			
	PBH_187	2429263	338461	543	Core	*100			

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	PBH_188	2429262	338561	550	Core	*100
	PBH_189	2429164	337761	525	Core	*100
	PBH_190	2429163	337860	523	Core	*100
	PBH_191	2429228	338462	543	Core	*100
	PBH_192	2429163	338461	546	Core	*100
	PBH_193	2429163	338560	538	Core	*100
	PBH_194	2429062	337761	524	Core	*100
	PBH_195	2428863	337860	507	Core	*100
	PBH_196	2428863	338260	509	Core	*100
	PBH_197	2428863	338361	517	Core	*100
	PBH_198	2428764	337660	486	Core	*100
	PBH_199	2428764	337761	483	Core	*100
	PBH_200	2428663	337860	503	Core	*100
	PBH_201	2428667	337960	498	Core	*100
	PBH_202	2428462	337712	510	Core	*100
	PBH_203	2428464	337761	512	Core	*100
	PBH_204	2428463	337861	529	Core	*100
	PBH_205	2428364	337761	510	Core	*100
	PBH_206	2428363	337860	523	Core	*100
	PBH_207	2428262	337759	520	Core	*100
	PBH_208	2428263	337861	517	Core	*100

Year	No of boreholes (Core/RC/DTH)	Grid Interval	Total meterage	No.of Pits, dimension and volume	No of Trenches, dimension and volume
2021-22	82	100m x 100m	Each borehole @ 100mtrs or till the end of mineralisation /discontinuation of ore body, whichever is earlier.	Nil	Nil
2022-23	70				
2023-24	56				

The locations are spaced suitably (in a grid pattern to the extent possible and may be modified depending on structural complexity) for establishing existence of the ore body and its lateral and vertical continuity.

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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.**

Vide Govt. of Odisha order no.338/SM/IV(B)SM-11/2020, dtd. 11.01.2021 mining lease for iron ore over an area of 456.100 Ha of Jilling-Langlotta Iron Ore block has been granted in favour of Odisha Mining Corporation Ltd. Lease deed has been executed on 11.01.2021d. Based on the Geological report of the ML area received from Govt. of Odisha, assessment of the reserve / resource has been done referring updated geological plan and sections which were received along with the geological report. The copy of the Geological Report as supplied by the state government has been submitted as separate at annexure no. 26 . The mineral block summary report is also attached at above the geological report along with text, annexure and plates of the Geological report.The summery of resource as per Geological Report as on 01.04.2019 and remaining resource after depletion of production is tabulated below;

Geological Resource as on 01.04.2019

Category	> 55% Fe (in tonnes)	(45 - 55)% Fe (in tonnes)	Resource Quantity (in tonnes)
G1	59618834	6241829	65860663
G2	5879990	7381810	13261800
Total	65498824	13623639	79122463

Depletion of Resource:

Total Geological Resource as on 01.04.2019 as per Geological Report received from Govt of Odisha in tonnes.	Production of Iron Ore during FY: 2019-20 in tonnes by previous lessee, i.e. Essel Mining & Industries Limited	Remaining Resource as on 01.04.2020 after depletion of Production in tonnes
79122463	6268395.89	7,28,54,067.11

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Assessment of the Reserve/Resource

Considering Minerals (Evidence of Mineral Contents) Rule 2015, a fresh estimation has been made on the basis of all the boreholes incorporated in the geological report and the Geological plan & cross section attached in the report considering following parameters using software i.e. 'SURPAC' at 45% Fe threshold value and the resources/ reserves figures have been established as per the guidelines of UNFC.

Parameters considered for estimation of Mineral Resources

All the parameters considered for reserve/resource estimation like recovery factor, bulk density etc as per the Geological Report received from GoO as on 01.04.2019. The details are given below;

(a) The threshold value has been considered as per the IBM guidelines is 45% Fe.
(b) The Cutoff grade considered for estimation of resource/reserve is 55 % Fe.
(c) Updated pit position as on date.
(d) Borehole collar, survey, assay & litho data from exploration.
(e) Pit exposures data & Ultimate Pit.
(f) The influence of the ore body has been taken @ 50 mtrs on either side of the grid along the strike of the bore hole drilled. No extrapolation of the ore section has been done beyond 50mtrs.
(g) The depth continuity of mineralization has been considered limited to the depth up to which direct evidence of mineralization is established.
(h) The lateral extension has been considered for resource assessment depending on geological continuity by mapping and has not been more than 50 mtrs of the probe point.
(I) Entire data has been transferred to create a geological database in an ore body modeling software namely 'SURPAC'.
(j) Based on the Geological report received from Govt. of Odisha, Bulk density of individual ore types has been used as a tonnage conversion factor (TCF) in this document. The copy of Bulk Density report by NABL Accredited laboratory is attached in Annexure-16 of the Geological Report.
(k) Based on the Geological report received from Govt. of Odisha, the Recovery Factor of 100 % for Saleable Ore (+55 % Fe) & Mineral Rejects (+45 % Fe to -55 % Fe) for assessment of Ore resource/reserve has been taken in to consideration.The copy has been attached at Annexure- 21 of the Geological Report.
(l) In total, 48 nos. of cross sections and 3 nos. longitudinal sections have been prepared for estimations of resource. The details sections have been furnished at Table –(Part-A)-1.16 of the text.

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Preparation of Database

Four basic files namely collar, survey, assay and litho files are prepared as per information/data of Geological report received from GoO in Comma Separated Value (CSV) format for further processing by SURPAC Software. Ore type-wise litho codes used for database preparation is given below.

Ore Type Used for Database Preparation

Litho Type
Lateritic Ore (LO)
Soft Laminated Ore (SLO) / Friable Ore
Hard Laminated Ore (HLO)/Hard Massive Ore (HMO)
Blue Dust (BD)/ Powdery Ore
BHJ/ BHQ/ BMQ
Lateritic/ Shale Ore (Mineral Rejects) (45 % to 55% Fe)
Waste (Shale, Soil Cover etc.)

Delineation of Ore Geometry and Construction of Ore Body

Preparation of Transverse Sections

Boreholes were displayed in SURPAC graphics window along with litho, Fe%, SiO2% & Al2O3%. 74 nos. of transverse sections at 50 m and 100m interval were extracted from the strike direction along with 3nos. LV Section .The envelopes of ore (Fe% >= 55%), Mineral Rejects (45%<=Fe%<55%) & Waste (Fe%<45%) were delineated at each section considering the continuity of mineralization, lithology and other geological features. Lateral extent of mineralization has been limited upto 50% of borehole spacing & vertical extent of mineralization has been limited upto the depth of evidence of established mineral evidence in the boreholes.

Preparation of Digital Terrain Model (DTM) of Surface Topography

The digitized contour of updated surface plan with Z values have been transformed into digital terrain model (DTM) utilizing the principle of triangulation and wire framing of points with X, Y and Z co-ordinates. Digital terrain model is the most effective way of representing a surface in three-dimensional computerized form. It is an important tool to calculate volume between two or more surfaces. The digital terrain model of surface topography with drill holes of Jilling-Langalotta Iron Ore Block is shown in the figure below: -

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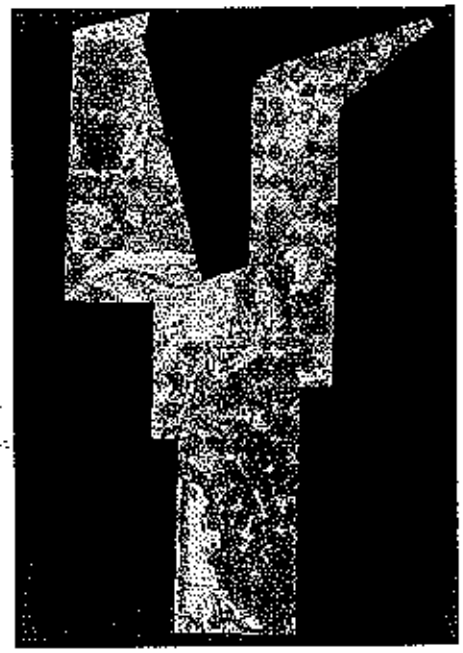
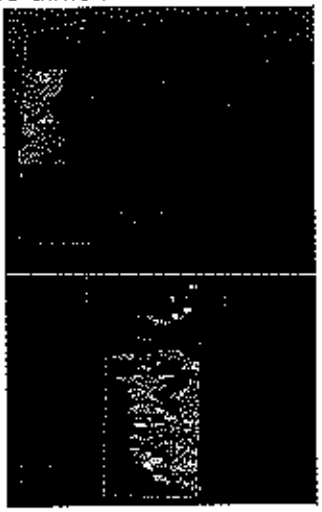
Digital Terrain Model (DTM) of Surface Topography with drill holes



3-D Solid Modeling of Ore Body

The respective envelopes of ore lithology, Mineral Rejects & waste of the respective transverse cross sections have been connected/ joined to form respective solid ore body models. 3-D solid model of Jilling Langalota Iron Ore Block is presented in the figure below: -

3D dimensional solid model



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Block Modeling

The entire deposit is divided into no. of judiciously chosen sub-blocks for proper estimation of grade and quantity, keeping in view of the structural discontinuity of the deposit, extent etc. The estimated blocks in the block model has been used for optimum pit generation, mine planning and production scheduling.

Selection of Block Size

Considering the accuracy desired, borehole spacing and mining constraints, a unit block of 10 m x 10 m x 2.5 m has been selected for block wise grade estimation.

Development of Block Model

In order to cover the entire extent of Jilling Langalota Iron Ore Block in three dimensions, a dummy block model with unit block sizes as indicated above have been generated.

Addition of Attributes

Attributes are the properties of individual block such as Fe, SiO2, Al2O3, specific gravity, litho code etc. These attributes were added in the dummy block model using suitable technique.

Application of Constraints

Constraints are the logical combination of spatial operators and objects such as DTM of surface contour, solid model of ore zone, block etc. with which the block model can be enveloped/ intersected with respect to inside/ outside and above/ below their spatial position.

The block model developed for Jilling Langalota Iron Ore Block has been constrained with the surface DTM with updated pit positions, mining lease boundary, statutory safety barriers, individual quarry boundaries as well as ore type-wise 3-D solid models as developed and discussed in the preceding paragraphs. In this way, the blocks have been enveloped within ore zone boundary and surface topography for the purpose of grade interpolation and reserves estimation. Constrained block model is given below.

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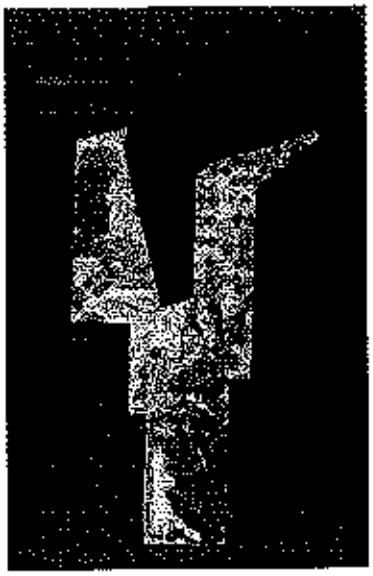
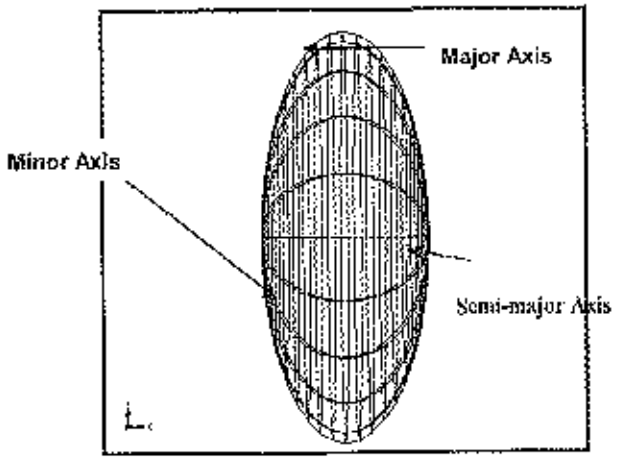


Block model estimation

The globally accepted technique of Inverse Square Distance (ISD) method has been used for ore reserve estimation for different ore types. A search ellipsoid as indicated below has been used to select samples for assigning grade to the blocks. The axial parameters and its search orientation were derived from the results of geo-statistical analysis.



The bulk density of the individual ore types as given below were taken as the in-situ densities of the respective ore type. Same has been derived from the exploration report of Jilling Langalota Iron Ore Block.

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Qualified Person

Average Bulk Density of Different Ore Types

Sl. No.	Ore Type	Bulk Density, t/cu.m
1	Lateritic Ore (LO) (Mineral rejects) (45 % to 55% Fe)	2.50
2	Soft Laminated Ore (SLO)/ Friable Ore	3.30
3	Hard Laminated Ore (HLO)/ Hard Massive Ore (HMO)	3.50
4	Blue Dust (BD)/ Powdery Ore	3.30

Copy of report of bulk density test report by a NABL accredited lab is enclosed as Annexure-16 of the Geological Report.

For estimation resources the following parameters have been considered: -

Measured resources: -
The entire exploratory drill holes with grid spacing of 100m X 100m has been considered as G1 category and has been categorized under 331 as per UNFC code.

Indicated resources: -
The entire exploratory drill hole with grid spacing at more than 100m X 100m and less than 200m x 200m grid interval and also where the borehole density is quite low has been considered as G2 category and has been categorized under 332 as per UNFC code.

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.**

<u>Section-wise Reserve/Resource</u>

The Measured Mineral Resource (331) and Indicated Mineral Resource (332) under different sections are tabulated below.

The Measured Mineral resource (331) under different sections on saleable grade @ >55% Fe as on 12.01.2021 are given below: -

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Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade. (Fe %)
1	JJ-0.5	SLO	2287.619	50	114380.97	3.3	377457.19	60.80
		HMO	959.6996	50	47984.982	3.5	167947.44	58.67
2	JJ-1.0	SLO	2968.876	50	148443.78	3.3	489864.48	60.92
		HMO	1018.038	50	50901.893	3.5	178156.63	58.16
3	JJ-1.5	SLO	4588.864	50	229443.21	3.3	757162.58	59.23
		HMO	1329.673	50	66483.668	3.5	232692.84	62.20
4	JJ-2.0	SLO	8779.464	50	438973.22	3.3	1448611.61	60.79
		HMO	1141.365	50	57068.228	3.5	199738.80	58.46
5	JJ-2.5	BLUE DUST	1171.057	50	58552.867	3.3	193224.46	63.22
		SLO	2141.587	50	107079.35	3.3	353361.84	61.57
		HMO	7888.591	50	394429.54	3.5	1380503.39	61.60
6	JJ-3.0	BLUE DUST	838.116	50	41905.798	3.3	138289.14	64.62
		SLO	1128.087	50	56404.355	3.3	186134.37	62.22
		HMO	3729.085	50	186454.27	3.5	652589.94	61.99
7	JJ-3.5	SLO	4508.161	50	225408.06	3.3	743846.59	61.33
		HMO	2966.082	50	148304.12	3.5	519064.42	64.61
8	JJ-4.0	SLO	8003.879	50	400193.97	3.3	1320640.11	62.24
		HMO	1088.61	50	54430.487	3.5	190506.70	60.67
9	JJ-4.5	SLO	11775.24	50	588761.94	3.3	1942914.39	62.91
		HMO	4371.566	50	218578.3	3.5	765024.06	62.45
10	JJ-5.0	SLO	2782.665	50	139133.23	3.3	459139.65	64.38
		HMO	8050.343	50	402517.17	3.5	1408810.08	63.70
11	JJ-5.5	SLO	7783.777	50	389188.86	3.3	1284323.25	63.75
		HMO	12141.37	50	607068.61	3.5	2124740.15	63.69
12	LL-6.0	SLO	1841.134	50	92056.705	3.3	303787.13	58.95
		HMO	7339.744	50	366987.19	3.5	1284455.17	61.86
13	LL-6.5	SLO	604.395	50	30219.752	3.3	99725.18	58.26
		HMO	9914.541	50	495727.05	3.5	1735044.68	61.95
14	LL-7.0	SLO	3740.266	50	187013.32	3.3	617143.97	61.65
		HMO	9954.717	50	497735.86	3.5	1742075.52	64.05
15	LL-7.5	SLO	112.846	50	5642.2988	3.3	18619.59	58.26
		HMO	13757.87	50	687893.44	3.5	2407627.05	63.08
16	LL-8.0	SLO	1618.24	50	80912.021	3.3	267009.67	64.17

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		HMO	10707.24	50	535362.17	3.5	1873767.584	61.29
17	LL-8.5	SLO	897.1577	50	44857.884	3.3	148031.02	66.63
		HMO	9273.459	50	463672.97	3.5	1622855.39	61.94
18	LL-9.0	BLUE DUST	525.0878	50	26254.39	3.3	86639.49	58.60
		SLO	1579.112	50	78955.595	3.3	260553.46	63.96
		HMO	5625.774	50	281288.71	3.5	984510.47	60.54
19	LL-9.5	SLO	1153.59	50	57679.504	3.3	190342.36	63.23
		HMO	3837.042	50	191852.09	3.5	671482.30	61.83
20	LL-10.0	HMO	7305.502	50	365275.12	3.5	1278462.92	62.88
21	LL-10.5	HMO	4074.956	50	203747.8	3.5	713117.29	59.49
22	LL-11.0	HMO	914.9813	50	45749.066	3.5	160121.73	66.67
23	LL-11.5	HMO	2300.898	50	115044.88	3.5	402657.07	65.89
24	LL-12.0	HMO	5646.383	50	282319.14	3.5	988117.00	65.14
25	LL-12.5	HMO	1896.337	50	94816.87	3.5	331859.04	64.50
26	GG-0.5	SLO	179.7938	50	8989.6889	3.3	29665.97	57.93
27	GG-1.0	SLO	199.6805	50	9984.026	3.3	32947.29	57.93
28	GG-2.0	SLO	759.6183	50	37980.917	3.3	125337.03	61.32
		HMO	292.2633	50	14613.166	3.5	51146.08	60.97
29	GG-2.5	BLUE DUST	162.4584	50	8122.9177	3.3	26805.63	64.49
		SLO	120.9362	50	6046.8105	3.3	19954.47	60.03
		HMO	6.585108	50	329.2554	3.5	1152.39	60.87
30	GG-3.0	BLUE DUST	154.6637	50	7733.1834	3.3	25519.51	66.20
		SLO	3.22368	50	161.184	3.3	531.91	60.05
31	GG-4.0	BLUE DUST	24.05381	50	1202.6906	3.3	3968.88	67.49
		SLO	110.4547	50	5522.7345	3.3	18225.02	66.79
32	GG-4.5	SLO	233.6764	50	11683.82	3.3	38556.61	57.93
		HMO	791.5988	50	39579.939	3.5	138529.79	58.11
33	JL-6	SLO	67.93964	50	3396.982	3.3	11210.04	58.32
		HMO	281.1325	50	14056.626	3.5	49198.19	62.79
34	JL-7.5	SLO	145.6389	50	7281.9464	3.3	24030.42	63.09
35	JL-8	SLO	405.7459	50	20287.293	3.3	66948.07	59.74
		HMO	66.08942	50	3304.4711	3.5	11565.65	62.08
36	JL-9.0	HMO	213.4509	50	10672.544	3.5	37353.90	64.41
39	AP-8	SLO	11395.49	50	569774.27	3.3	1880255.09	61.33
40	AP-8.5	SLO	1310.802	50	65540.102	3.3	216282.34	60.25
41	AP-9	SLO	3993.901	50	199695.03	3.3	658993.60	60.40

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42	AP-9.5	SLO	8920.605	50	446030.24	3.3	1473995.79	61.58
		HMO	1402.686	50	70134.28	3.5	245469.98	64.58
43	AP-10	SLO	7372.931	50	368646.56	3.3	1216533.65	63.98
		HMO	992.887	50	49644.35	3.5	173755.23	63.04
44	AP-10.5	SLO	4742.932	50	237146.61	3.3	782583.82	64.73
		HMO	1145.907	50	57295.334	3.5	200533.67	65.90
45	AP-11	SLO	4057.313	100	405731.25	3.3	1338913.13	63.98
		HMO	262.1962	100	26219.622	3.5	91768.68	63.86
46	AP-12	SLO	10105.11	100	1010511.5	3.3	3334687.91	63.55
		HMO	531.7294	100	53172.944	3.5	186105.30	64.82
47	AP-13	SLO	12284.67	100	1228467.1	3.3	4053941.455	64.73
		HMO	1219.098	100	121909.78	3.5	426684.22	64.76
48	AP-14	SLO	3769.963	100	376996.35	3.3	1244087.95	64.96
		HMO	1377.883	100	137788.29	3.5	482259.01	65.84
	GRAND TOTAL						54420150.86	62.75

The Measured Mineral resource (331) under different sections on Mineral Reject @>45% Fe to <55% Fe are given below: -

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade. (Fe %)
1	JJ-0.5	Laterite (MR)	311.26	50	15562.80	2.5	38907	51.68
2	JJ-1.0	Laterite (MR)	418.01	50	20900.57	2.5	52251.42	49.98
3	JJ-1.5	Laterite (MR)	11.01	50	550.43	2.5	1376.077	50.17
4	JJ-2.0	Laterite (MR)	407.34	50	20366.79	2.5	50916.97	52.02
5	JJ-2.5	Laterite (MR)	210.17	50	10508.57	2.5	26271.43	52.02
6	JJ-3.0	Laterite (MR)	733.95	50	36697.37	2.5	91743.43	46.80
7	JJ-3.5	Laterite (MR)	507.75	50	25387.71	2.5	63469.27	47.35
8	JJ-4.0	Laterite (MR)	372.31	50	18615.57	2.5	46538.94	46.60
9	JJ-4.5	Laterite (MR)	221.85	50	11092.74	2.5	27731.84	47.36
10	JJ-5.0	Laterite (MR)	2421.35	50	121067.42	2.5	302668.6	48.55
11	JJ-5.5	Laterite (MR)	631.52	50	31576.10	2.5	78940.26	51.97
12	LL-6.0	Laterite (MR)	1749.79	50	87489.44	2.5	218723.6	51.95
13	LL-6.5	Laterite (MR)	4601.82	50	230091.13	2.5	575227.8	50.82
14	LL-7.0	Laterite (MR)	651.87	50	32593.70	2.5	81484.24	51.62

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15	LL-7.5	Laterite (MR)	1262.72	50	63135.98	2.5	157840	[illegible]
16	LL-8.0	Laterite (MR)	203.17	50	10158.41	2.5	25396.04	51.48
17	LL-8.5	Laterite (MR)	88.08	50	4403.87	2.5	11009.68	52.02
18	LL-9.0	Laterite (MR)	292.24	50	14612.25	2.5	36530.62	52.99
19	LL-9.5	Laterite (MR)	1.00	50	49.96	2.5	124.9038	52.02
20	LL-10.0	Laterite (MR)	645.54	50	32276.85	2.5	80692.11	51.12
21	LL-10.5	Laterite (MR)	104.42	50	5221.19	2.5	13052.98	52.02
22	LL-11.0	Laterite (MR)	61.05	50	3052.35	2.5	7630.874	52.02
23	LL-11.5	Laterite (MR)	381.65	50	19082.74	2.5	47706.84	52.02
24	LL-12.0	Laterite (MR)	1627.35	50	81367.66	2.5	203419.2	52.02
25	GG-0.5	Laterite (MR)	75.938	50	3796.91	2.5	9492.26	47.83
26	GG-1.0	Laterite (MR)	1.515	50	75.73	2.5	189.33	47.55
27	GG-2.5	Laterite (MR)	147.332	50	7366.61	2.5	18416.53	52.02
28	GG-3.0	Laterite (MR)	3.611	50	180.54	2.5	451.34	52.02
29	JL-6	Laterite (MR)	1979.656	50	98982.81	2.5	247457.04	50.98
30	JL-7.5	Laterite (MR)	208.896	50	10444.81	2.5	26112.02	49.08
31	JL-8	Laterite (MR)	245.495	50	12274.76	2.5	30686.89	45.00
32	JL-9.0	Laterite (MR)	232.451	50	11622.53	2.5	29056.34	54.06
33	AP-8	Laterite (MR)	5246.69	50	262334.67	2.5	655836.7	50.34
34	AP-8.5	Laterite (MR)	1569.97	50	78498.51	2.5	196246.3	47.78
35	AP-9	Laterite (MR)	1042.86	50	52143.17	2.5	130357.9	49.27
36	AP-9.5	Laterite (MR)	1787.15	50	89357.66	2.5	223394.2	48.81
37	AP-10	Laterite (MR)	521.10	50	26055.14	2.5	65137.86	52.35
38	AP-11	Laterite (MR)	297.08	100	29707.88	2.5	74269.71	52.02
39	AP-12	Laterite (MR)	1120.27	100	112026.52	2.5	280066.3	51.95
40	AP-13	Laterite (MR)	3174.50	100	317449.69	2.50	793624.22	51.99
41	AP-14	Laterite (MR)	606.67	100	60666.94	2.5	151667.4	51.65
			GRAND TOTAL				5172116.25	50.52

N.B- MR- MINERAL REJECT (Fe % >45 TO <55)

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The Indicated Mineral Resources (332) under different sections on saleable grade @ >55% Fe are given below;

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of Influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade. (Fe %)
1	AP-2	SLO	2674.608	100	267460.8	3.3	882620.583	62.18
		HMO	559.277	100	55927.72	3.5	195747.015	63.39
2	AP-6	SLO	5631.533	100	563153.3	3.3	1858405.92	60.41
3	AP-7	SLO	6904.989	100	690498.9	3.3	2278646.346	58.59
4	AP-15	SLO	1783.824	100	178382.4	3.3	588661.7886	61.15
5	KH 10	SLO	230.025	100	23002.53	3.3	75908.34695	60.23
	GRAND TOTAL						5879990.00	60.14

The Indicated Resources (332) under different sections on Mineral Rejects @ >45 % Fe to <55 % Fe are given below in tones;

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of Influence (mtr)	Volume (Mcu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade. (Fe %)
1	AP-1	Laterite (MR)	2898.193	100	289819.31	2.5	724548.27	54.08
2	AP-3	Laterite (MR)	794.301	100	79430.069	2.5	198575.17	51.05
3	AP-4	Laterite (MR)	3368.843	100	336884.25	2.5	842210.63	50.06
4	AP-6	Laterite (MR)	3513.028	100	351302.84	2.5	878257.09	49.12
5	AP-7	Laterite (MR)	7746.252	100	774625.24	2.5	1936563.1	49.68
6	AP-15	Laterite (MR)	2885.757	100	288575.72	2.5	721439.3	50.08
7	AP-16	Laterite (MR)	7303.676	100	730367.61	2.5	1825919	50.18
8	KH 09	Laterite (MR)	1017.190	100	101718.96	2.5	254297.39	51.00
	GRAND TOTAL						7381810.00	50.33

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From the above table, the summarized Measured and Indicated Resources assessed under as on 12.01.2021 are given below in tonnes.

Resource Type	Total Tonnage @ +45% Fe (Threshold value)	Saleable Grade @ +55% Fe.	Mineral Rejects @ +45 % Fe to (-) 55 % Fe.
331	59592267.11	54420150.86	5172116.25
	61.69 % Fe	62.75 % Fe	50.52 % Fe
332	13261800	5879990	7381810
	54.68 % Fe	60.14 % Fe	50.33 % Fe
Total	72854067.11	60300140.86	12553926.25
	60.41 % Fe	62.50 % Fe	50.41 % Fe

* Recovery Factor of 100 % for Saleable Ore & Mineral Rejects have been considered for estimation of Reserve & Resource.

Mineral Reserves/Resources:

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

The details of the resources established based on level of exploration as on 12.01.2021 is given in the table below at a cut off of 45% Fe.

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade. (Fe %)
1	JJ-0.5	SLO	2287.619	50	114381	3.3	377457.2	60.80
		HMO	959.700	50	47984.98	3.5	167947.4	58.67
		Laterite (MR)	311.256	50	15562.8	2.5	38907	51.68
2	JJ-1.0	SLO	2968.876	50	148443.8	3.3	489864.5	60.92
		HMO	1018.038	50	50901.89	3.5	178156.6	58.16
		Laterite (MR)	418.011	50	20900.57	2.5	52251.42	49.98

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3	JJ-1.5	SLO	4588.864	50	229443.2	3.3	757162.6	69.69	
		HMO	1329.673	50	66483.67	3.5	232692.8	62.20	
		Laterite (MR)	11.009	50	550.4307	2.5	1376.077	50.17	
4	JJ-2.0	SLO	8779.464	50	438973.2	3.3	1448612	60.79	
		HMO	1141.365	50	57068.23	3.5	199738.8	58.46	
		Laterite (MR)	407.336	50	20366.79	2.5	50916.97	52.02	
5	JJ-2.5	BLUE DUST	1171.057	50	58552.87	3.3	193224.5	63.22	
		SLO	2141.587	50	107079.3	3.3	353361.8	61.57	
		HMO	7888.591	50	394429.5	3.5	1380503	61.60	
		Laterite (MR)	210.171	50	10508.57	2.5	26271.43	52.02	
6	JJ-3.0	BLUE DUST	838.116	50	41905.8	3.3	138289.1	64.62	
		SLO	1128.087	50	56404.36	3.3	186134.4	62.22	
		HMO	3729.085	50	186454.3	3.5	652589.9	61.99	
		Laterite (MR)	733.947	50	36697.37	2.5	91743.43	46.80	
7	JJ-3.5	SLO	4508.161	50	225408.1	3.3	743846.6	61.33	
		HMO	2966.082	50	148304.1	3.5	519064.4	64.61	
		Laterite (MR)	507.754	50	25387.71	2.5	63469.27	47.35	
8	JJ-4.0	SLO	8003.879	50	400194	3.3	1320640	62.24	
		HMO	1088.610	50	54430.49	3.5	190506.7	60.67	
		Laterite (MR)	372.311	50	18615.57	2.5	46538.94	46.60	
9	JJ-4.5	SLO	11775.239	50	588761.9	3.3	1942914	62.91	
		HMO	4371.566	50	218578.3	3.5	765024.1	62.45	
		Laterite (MR)	221.855	50	11092.74	2.5	27731.84	47.36	
10	JJ-5.0	SLO	2782.665	50	139133.2	3.3	459139.6	64.38	
		HMO	8050.343	50	402517.2	3.5	1408810	63.70	
		Laterite (MR)	2421.348	50	121067.4	2.5	302668.6	48.55	
11	JJ-5.5	SLO	7783.777	50	389188.9	3.3	1284323	63.75	
		HMO	12141.372	50	607068.6	3.5	2124740	63.69	
		Laterite (MR)	631.522	50	31576.1	2.5	78940.26	51.97	

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12	LL-6.0	SLO	1841.134	50	92056.7	3.3	303788.1	58.95
		HMO	7339.744	50	366987.2	3.5	1284455	61.86
		Laterite (MR)	1749.789	50	87489.44	2.5	218723.6	51.95
13	LL-6.5	SLO	604.395	50	30219.75	3.3	99725.18	58.26
		HMO	9914.541	50	495727.1	3.5	1735045	61.95
		Laterite (MR)	4601.823	50	230091.1	2.5	575227.8	50.82
14	LL-7.0	SLO	3740.266	50	187013.3	3.3	617144	61.65
		HMO	9954.717	50	497735.9	3.5	1742076	64.05
		Laterite (MR)	651.874	50	32593.7	2.5	81484.24	51.62
15	LL-7.5	SLO	112.846	50	5642.299	3.3	18619.59	58.26
		HMO	13757.869	50	687893.4	3.5	2407627	63.08
		Laterite (MR)	1262.720	50	63135.98	2.5	157840	51.80
16	LL-8.0	SLO	1618.240	50	80912.02	3.3	267009.7	64.17
		HMO	10707.243	50	535362.2	3.5	1873768	62.99
		Laterite (MR)	203.168	50	10158.41	2.5	25396.04	51.48
17	LL-8.5	SLO	897.158	50	44857.88	3.3	148031	66.63
		HMO	9273.459	50	463673	3.5	1622855	61.94
		Laterite (MR)	88.077	50	4403.873	2.5	11009.68	52.02
18	LL-9.0	BLUE DUST	525.088	50	26254.39	3.3	86639.49	58.60
		SLO	1579.112	50	78955.6	3.3	260553.5	63.96
		HMO	5625.774	50	281288.7	3.5	984510.5	60.54
		Laterite (MR)	292.245	50	14612.25	2.5	36530.62	52.99
19	LL-9.5	SLO	1153.590	50	57679.5	3.3	190342.4	63.23
		HMO	3837.042	50	191852.1	3.5	671482.3	61.83
		Laterite (MR)	0.999	50	49.96151	2.5	124.9038	52.02
20	LL-10.0	HMO	7305.502	50	365275.1	3.5	1278463	62.88
		Laterite (MR)	645.537	50	32276.85	2.5	80692.11	51.12
21	LL-10.5	HMO	4074.956	50	203747.8	3.5	713117.3	59.49
		Laterite	104.424	50	5221.192	2.5	13052.98	52.02

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		(MR)						
22	LL-11.0	HMO	914.981	50	45749.07	3.5	160121.7	65.67
		Laterite (MR)	61.047	50	3052.35	2.5	7630.874	52.02
23	LL-11.5	HMO	2300.898	50	115044.9	3.5	402657.1	65.89
		Laterite (MR)	381.655	50	19082.74	2.5	47706.84	52.02
24	LL-12.0	HMO	5646.383	50	282319.1	3.5	988117	65.14
		Laterite (MR)	1627.353	50	81367.66	2.5	203419.2	52.02
25	LL-12.5	HMO	1896.337	50	94816.87	3.5	331859	64.50
26	GG-0.5	SLO	179.794	50	8989.689	3.3	29665.97	57.93
		Laterite (MR)	75.938	50	3796.905	2.5	9492.26	47.83
27	GG-1.0	SLO	199.681	50	9984.026	3.3	32947.29	57.93
		Laterite (MR)	1.515	50	75.73238	2.5	189.33	47.55
28	GG-2.0	SLO	759.618	50	37980.92	3.3	125337.03	61.32
		HMO	292.263	50	14613.17	3.5	51146.08	60.97
29	GG-2.5	BLUE DUST	162.458	50	8122.918	3.3	26805.63	64.49
		SLO	120.936	50	6046.81	3.3	19954.47	60.03
		HMO	6.585	50	329.2554	3.5	1152.39	60.87
		Laterite (MR)	147.332	50	7366.614	2.5	18416.53	52.02
30	GG-3.0	BLUE DUST	154.664	50	7733.183	3.3	25519.51	66.20
		SLO	3.224	50	161.184	3.3	531.91	60.05
		Laterite (MR)	3.611	50	180.5353	2.5	451.34	52.02
31	GG-4.0	BLUE DUST	24.054	50	1202.691	3.3	3968.88	67.49
		SLO	110.455	50	5522.734	3.3	18225.02	66.79
32	GG-4.5	SLO	233.676	50	11683.82	3.3	38556.61	57.93
		HMO	791.599	50	39579.94	3.5	138529.79	58.11
33	JL-6	SLO	67.940	50	3396.982	3.3	11210.04	58.32
		HMO	281.133	50	14056.63	3.5	49198.19	62.79
		Laterite (MR)	1979.656	50	98982.81	2.5	247457.04	50.98
34	JL-7.5	SLO	145.639	50	7281.946	3.3	24030.42	63.09

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		Laterite (MR)	208.896	50	10444.81	2.5	26112.02	49.98
35	JL-8	SLO	405.746	50	20287.29	3.3	66948.07	59.74
		HMO	66.089	50	3304.471	3.5	11565.65	62.08
		Laterite (MR)	245.495	50	12274.76	2.5	30686.89	45.00
36	JL-9.0	HMO	213.451	50	10672.54	3.5	37353.90	64.41
		Laterite (MR)	232.451	50	11622.53	2.5	29056.34	54.06
	AP-1	Laterite (MR)	2898.193	100	289819.3	2.5	724548	54.08
	AP-2	SLO	2674.608	100	267460.8	3.3	882621	62.18
		HMO	559.277	100	55927.72	3.5	195747	63.39
	AP-3	Laterite (MR)	794.301	100	79430.07	2.5	198575	51.05
	AP-4	Laterite (MR)	3368.843	100	336884.3	2.5	842211	50.06
37	AP-6	SLO	5631.533	100	563153.3	3.3	1858406	60.41
		Laterite (MR)	3513.028	100	351302.8	2.5	878257.1	49.12
38	AP-7	SLO	6904.989	100	690498.9	3.3	2278646	58.59
		Laterite (MR)	7746.252	100	774625.2	2.5	1936563	49.68
39	AP-8	SLO	11395.485	50	569774.3	3.3	1880255	61.33
		Laterite (MR)	5246.693	50	262334.7	2.5	655836.7	50.34
40	AP-8.5	SLO	1310.802	50	65540.1	3.3	216282.3	60.25
		Laterite (MR)	1569.970	50	78498.51	2.5	196246.3	47.78
41	AP-9	SLO	3993.901	50	199695	3.3	658993.6	60.40
		Laterite (MR)	1042.863	50	52143.17	2.5	130357.9	49.27
42	AP-9.5	SLO	8920.605	50	446030.2	3.3	1471900	61.58
		HMO	1402.686	50	70134.28	3.5	245470	64.58
		Laterite (MR)	1787.153	50	89357.66	2.5	223394.2	48.81
43	AP-10	SLO	7372.931	50	368646.6	3.3	1216534	63.98
		HMO	992.887	50	49644.35	3.5	173755.2	63.04

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		Laterite (MR)	521.103	50	26055.14	2.5	65137.86	52.45
44	AP-10.5	SLO	4742.932	50	237146.6	3.3	782583.8	64.73
		HMO	1145.907	50	57295.33	3.5	200533.7	65.90
45	AP-11	SLO	4057.313	100	405731.3	3.3	1338913	63.98
		HMO	262.196	100	26219.62	3.5	91768.68	63.86
		Laterite (MR)	297.079	100	29707.88	2.5	74269.71	52.02
46	AP-12	SLO	10105.115	100	1010511	3.3	3334688	63.55
		HMO	531.729	100	53172.94	3.5	186105.3	64.82
		Laterite (MR)	1120.265	100	112026.5	2.5	280066.3	51.95
47	AP-13	SLO	12284.67	100	1228467.1	3.3	4053941.43	64.73
		HMO	1219.098	100	121909.8	3.5	426684.2	64.76
		Laterite (MR)	3174.50	100	317449.69	2.5	793624.22	50.93
48	AP-14	SLO	3769.963	100	376996.3	3.3	1244088	64.96
		HMO	1377.883	100	137788.3	3.5	482259	65.84
		Laterite (MR)	606.669	100	60666.94	2.5	151667.4	51.65
49	AP-15	SLO	1783.824	100	178382.4	3.3	588661.8	61.15
		Laterite (MR)	2885.757	100	288575.7	2.5	721439.3	50.08
50	AP-16	Laterite (MR)	7303.676	100	730367.6	2.5	1825919	50.18
51	KH 09	Laterite (MR)	1017.190	100	101719	2.5	254297.4	51.00
52	KH 10	SLO	230.025	100	23002.53	3.3	75908.35	60.23
		GRAND TOTAL					72854067	60.41

N.B- MR- MINERAL REJECT (Fe % >45 to <55)

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Summary of Geological Reserve as per the standard norms of UNFC as on 12.01.2021 is given below;

Resource Type	Total Tonnage @ +45% Fe (Threshold value)	Saleable Grade @ +55% Fe.	Mineral Rejects @ +45 % Fe to (–) 55 % Fe.
G1 (Detailed Exploration)	59592267.11 (61.69%)	54420150.86 (62.75%)	5172116.25 (50.52%)
G2 (General Exploration)	13261800 (54.68%)	5879990 (60.14%)	7381810 (50.33%)
G3 (Prospecting)	---	---	---
G4 (Reconnaissance)	---	---	---
Total	72854067.11 (60.41%)	60300140.86 (62.50%)	12553926.25 (50.41%)

(ii) Mineable Reserve:

Mineable Reserve has been calculated deducting the reserve that would be blocked under the pit slope, statutory barrier. The details section wise Mineable Reserve and Non-Mineable Remaining Resource are given below in tones as on 12.01.2021 are given below;

(i) Probable Mineral Reserve (121), above UPL @ >55% Fe

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of Influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade. (Fe %)
1	JJ-0.5	SLO	1432.37	50	71618.69697	3.3	236341.70	59.94
		HMO	600.908	50	30045.4	3.5	105158.90	62.00
2	JJ-1.0	SLO	1858.94	50	92946.84848	3.3	306724.60	60.06
		HMO	637.436	50	31871.8	3.5	111551.30	63.25
3	JJ-1.5	SLO	2873.28	50	143663.9697	3.3	474091.10	58.39
		HMO	832.564	50	41628.2	3.5	145698.70	61.32
4	JJ-2.0	SLO	5497.19	50	274859.4545	3.3	907036.20	59.93
		HMO	714.656	50	35732.8	3.5	125064.80	64.02
5	JJ-2.5	BLUE DUST	733.248	50	36662.39394	3.3	120985.90	62.33

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		SLO	1340.94	50	67046.84848	3.3	221254.60	60.90
		HMO	4939.38	50	246968.8	3.5	864390.80	60.73
6	JJ-3.0	BLUE DUST	524.779	50	26238.9697	3.3	86588.60	63.71
		SLO	706.342	50	35317.12121	3.3	116546.50	61.34
		HMO	2334.94	50	116746.8	3.5	408613.80	61.12
7	JJ-3.5	SLO	2822.75	50	141137.3939	3.3	465753.40	60.47
		HMO	1857.19	50	92859.4	3.5	325007.90	63.70
8	JJ-4.0	SLO	5011.56	50	250578.1515	3.3	826907.90	61.36
		HMO	681.624	50	34081.2	3.5	119284.20	62.34
9	JJ-4.5	SLO	7372.97	50	368648.4848	3.3	1216540.00	62.02
		HMO	2737.22	50	136861	3.5	479013.50	61.57
10	JJ-5.0	SLO	1742.34	50	87117.12121	3.3	287486.50	63.47
		HMO	5040.66	50	252032.8	3.5	882114.80	62.80
11	JJ-5.5	SLO	4873.75	50	243687.3939	3.3	804168.40	62.85
		HMO	7602.22	50	380111.1429	3.5	1330389.00	62.79
12	LL-6.0	SLO	1152.81	50	57640.54545	3.3	190213.80	58.12
		HMO	4595.72	50	229786	3.5	804251.00	60.99
13	LL-6.5	SLO	378.437	50	18921.84848	3.3	62442.10	57.44
		HMO	6207.91	50	310395.4286	3.5	1086384.00	61.08
14	LL-7.0	SLO	2341.94	50	117096.8485	3.3	386419.60	60.78
		HMO	6233.06	50	311653.1429	3.5	1090786.00	63.15
15	LL-7.5	SLO	70.6576	50	3532.878788	3.3	11658.50	57.44
		HMO	8614.38	50	430718.8571	3.5	1507516.00	62.19
16	LL-8.0	SLO	1013.25	50	50662.39394	3.3	167185.90	63.27
		HMO	6704.25	50	335212.5714	3.5	1173244.00	62.10
17	LL-8.5	SLO	561.748	50	28087.39394	3.3	92688.40	65.69
		HMO	5806.5	50	290325.1429	3.5	1016138.00	61.07
18	LL-9.0	BLUE	328.779	50	16438.9697	3.3	54248.60	62.96

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		DUST						
		SLO	988.748	50	49437.39394	3.3	163143.00	63.06
		HMO	3522.53	50	176126.6	3.5	616443.10	62.50
19	LL-9.5	SLO	722.311	50	36115.54545	3.3	119181.30	62.34
		HMO	2402.53	50	120126.6	3.5	420443.10	60.96
2	LL-10.0	HMO	4574.28	50	228714	3.5	800499.00	61.99
21	LL-10.5	HMO	2551.5	50	127575	3.5	446512.50	63.10
22	LL-11.0	HMO	572.908	50	28645.4	3.5	100258.90	65.73
23	LL-11.5	HMO	1440.69	50	72034.4	3.5	252120.40	64.96
24	LL-12.0	HMO	3535.44	50	176771.8	3.5	618701.30	64.22
25	LL-12.5	HMO	1187.38	50	59368.8	3.5	207790.80	63.59
26	GG-0.5	SLO	5.034	50	251.713	3.3	830.65	57.11
27	GG-1.0	SLO	5.591	50	279.554	3.3	922.53	57.11
28	GG-2.0	SLO	21.269	50	1063.471	3.3	3509.46	60.46
		HMO	8.183	50	409.171	3.5	1432.10	60.11
29	GG-2.5	BLUE DUST	4.549	50	227.443	3.3	750.56	63.58
		SLO	3.386	50	169.312	3.3	558.73	59.18
		HMO	0.184	50	9.219	3.5	32.27	60.01
30	GG-3.0	BLUE DUST	4.331	50	216.530	3.3	714.55	65.27
		SLO	0.090	50	4.513	3.3	14.89	59.20
31	GG-4.0	BLUE DUST	0.674	50	33.676	3.3	111.13	66.54
		SLO	3.093	50	154.637	3.3	510.30	65.85
32	GG-4.5	SLO	6.543	50	327.149	3.3	1079.59	57.11
		HMO	22.165	50	1108.244	3.5	3878.85	63.00
33	JL-6	SLO	1.902	50	95.116	3.3	313.88	57.50
		HMO	7.872	50	393.588	3.5	1377.56	61.90
34	JL-7.5	SLO	4.078	50	203.896	3.3	672.86	62.20
35	JL-8	SLO	11.361	50	568.047	3.3	1874.56	58.90
		HMO	1.851	50	92.526	3.5	323.84	61.20
36	JL-9.0	HMO	5.977	50	298.833	3.5	1045.91	63.50
39	AP-8	SLO	7135.19	50	356759.3939	3.3	1177306.00	60.47

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Rabindra Mohanty

40	AP-8.5	SLO	1172.5	50	58625	3.3	193462.50	59.40
41	AP-9	SLO	2500.75	50	125037.3939	3.3	412623.40	59.55
42	AP-9.5	SLO	5585.56	50	279278.1515	3.3	921617.90	60.71
		HMO	878.28	50	43914	3.5	153699.00	63.67
43	AP-10	SLO	4616.5	50	230825	3.3	761722.50	63.08
		HMO	621.688	50	31084.4	3.5	108795.40	62.15
44	AP-10.5	SLO	2969.75	50	148487.3939	3.3	490008.40	63.82
		HMO	717.5	50	35875	3.5	125562.50	64.97
45	AP-11	SLO	2540.45	100	254045.2727	3.3	838349.40	63.08
		HMO	164.172	100	16417.2	3.5	57460.20	62.96
46	AP-12	SLO	6327.23	100	632723.3333	3.3	2087987.00	62.65
		HMO	332.938	100	33293.8	3.5	116528.30	63.91
47	AP-13	SLO	8983.65	100	898365.36	3.3	2964605.69	62.74
		HMO	763.328	100	76332.8	3.5	267164.80	63.85
48	AP-14	SLO	2360.53	100	236053.1515	3.3	778975.40	64.04
		HMO	862.75	100	86275	3.5	301962.50	64.91
	GRAND TOTAL						34132767.90	62.08

(ii) Probable Mineral Reserve (121), above UPL (>45 % Fe to < 55 % Fe)

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of Influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade. (Fe %)
1	JJ-0.5	Laterite (MR)	204.092	50	10204.6	2.5	25511.5	51.91
2	JJ-1.0	Laterite (MR)	274.092	50	13704.6	2.5	34261.5	50.2
3	JJ-1.5	Laterite (MR)	7.2184	50	360.92	2.5	902.3	50.39
4	JJ-2.0	Laterite (MR)	267.092	50	13354.6	2.5	33386.5	52.25
5	JJ-2.5	Laterite (MR)	137.8104	50	6890.52	2.5	17226.3	52.25
6	JJ-3.0	Laterite (MR)	481.2528	50	24062.64	2.5	60156.6	47.01

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Rabindra Mohanty

7	JJ-3.5	Laterite (MR)	332.9368	50	16646.84	2.5	41[illegible]	[illegible]
8	JJ-4.0	Laterite (MR)	244.1264	50	12206.32	2.5	30515.8	46.81
9	JJ-4.5	Laterite (MR)	145.4712	50	7273.56	2.5	18183.9	47.57
10	JJ-5.0	Laterite (MR)	1587.6896	50	79384.48	2.5	198461.2	48.76
11	JJ-5.5	Laterite (MR)	414.092	50	20704.6	2.5	51761.5	52.2
12	LL-6.0	Laterite (MR)	1147.3448	50	57367.24	2.5	143418.1	52.18
13	LL-6.5	Laterite (MR)	3017.4368	50	150871.84	2.5	377179.6	51.04
14	LL-7.0	Laterite (MR)	427.4368	50	21371.84	2.5	53429.6	51.85
15	LL-7.5	Laterite (MR)	827.9712	50	41398.56	2.5	103496.4	52.03
16	LL-8.0	Laterite (MR)	133.2184	50	6660.92	2.5	16652.3	51.71
17	LL-8.5	Laterite (MR)	57.7528	50	2887.64	2.5	7219.1	52.25
18	LL-9.0	Laterite (MR)	191.6264	50	9581.32	2.5	23953.3	53.22
19	LL-9.5	Laterite (MR)	0.6552	50	32.76	2.5	81.9	52.25
20	LL-10.0	Laterite (MR)	423.2816	50	21164.08	2.5	52910.2	51.34
21	LL-10.5	Laterite (MR)	68.4712	50	3423.56	2.5	8558.9	52.25
22	LL-11.0	Laterite (MR)	40.0288	50	2001.44	2.5	5003.6	52.25
23	LL-11.5	Laterite (MR)	250.2528	50	12512.64	2.5	31281.6	52.25
24	LL-12.0	Laterite (MR)	1067.0632	50	53353.16	2.5	133382.9	52.25
26	GG-0.5	Laterite (MR)	1.048	50	52.415	2.5	131.04	48.04
27	GG-1.0	Laterite	0.021	50	1.045	2.5	2.61	47.76

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		(MR)						
29	GG-2.5	Laterite (MR)	2.034	50	101.694	2.5	254.24	52.25
30	GG-3.0	Laterite (MR)	0.050	50	2.492	2.5	6.23	52.25
31	JL-6	Laterite (MR)	27.329	50	1366.430	2.5	3416.07	51.2
32	JL-7.5	Laterite (MR)	2.884	50	144.188	2.5	360.47	49.3
33	JL-8	Laterite (MR)	3.389	50	169.450	2.5	423.62	45
34	JL-9.0	Laterite (MR)	3.209	50	160.446	2.5	401.11	54.3
35	AP-8	Laterite (MR)	3440.2816	50	172014.08	2.5	430035.2	50.56
36	AP-8.5	Laterite (MR)	1470.62	50	73531	2.5	183827.5	47.99
37	AP-9	Laterite (MR)	683.8104	50	34190.52	2.5	85476.3	49.49
38	AP-9.5	Laterite (MR)	1171.8448	50	58592.24	2.5	146480.6	49.02
39	AP-10	Laterite (MR)	341.6896	50	17084.48	2.5	42711.2	52.58
40	AP-11	Laterite (MR)	194.796	100	19479.6	2.5	48699	52.25
41	AP-12	Laterite (MR)	734.5632	100	73456.32	2.5	183640.8	52.18
42	AP-13	Laterite (MR)	3010.649	100	301064.88	2.5	752662	50.90
43	AP-14	Laterite (MR)	397.796	100	39779.6	2.5	99449	51.88
	GRAND TOTAL						3446528.9	50.70

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Rabindra Mohanty

(i) Probable Mineral Reserve (122), above UPL (>55% Fe)

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade. (Fe %)
1	AP-6	SLO	1748.03	100	174803.2	3.3	576850.4	60.56
2	AP-7	SLO	2143.31	100	214331.3	3.3	707293.3	61.03
	GRAND TOTAL						1284143.7	60.82

(ii) Probable Mineral Reserve (122), above UPL (>45% Fe to <55% Fe)

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade. (Fe %)
1	AP-6	Laterite (MR)	1542.41	100	154240.5	2.5	385601	49.34
2	AP-7	Laterite (MR)	3401.01	100	340101.4	2.5	850254	49.9
	GRAND TOTAL						1235854.9	49.73

(iii) Pre-Feasibility Mineral Resource (221), below UPL (>55% Fe)

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Mt	Grade. (Fe %)
1	JJ-0.5	SLO	855.245	50	42762.2684	3.3	141115.49	62.23
		HMO	358.792	50	17939.5816	3.5	62788.54	53.09
2	JJ-1.0	SLO	1109.939	50	55496.9337	3.3	183139.88	62.36
		HMO	380.602	50	19030.093	3.5	66605.33	49.64
3	JJ-1.5	SLO	1715.585	50	85779.2376	3.3	283071.48	60.62
		HMO	497.109	50	24855.4684	3.5	86994.14	63.67
4	JJ-2.0	SLO	3282.275	50	164113.762	3.3	541575.41	62.22
		HMO	426.709	50	21335.4284	3.5	74674.00	49.16
5	JJ-2.5	BLUE DUST	437.809	50	21890.4727	3.3	72238.56	64.71
		SLO	800.650	50	40032.4978	3.3	132107.24	63.02

Saroj Kumar Prusty

Rabindra Mohanty

		HMO	2949.215	50	147460.741	3.5	516112.59	63.05
6	JJ-3.0	BLUE DUST	313.337	50	15666.8288	3.3	51700.54	66.15
		SLO	421.745	50	21087.2339	3.3	69587.87	63.69
		HMO	1394.149	50	69707.4675	3.5	243976.14	63.46
7	JJ-3.5	SLO	1685.413	50	84270.6635	3.3	278093.19	62.78
		HMO	1108.894	50	55444.7198	3.5	194056.52	66.14
8	JJ-4.0	SLO	2992.316	50	149615.821	3.3	493732.21	63.71
		HMO	406.986	50	20349.287	3.5	71222.50	57.86
9	JJ-4.5	SLO	4402.269	50	220113.45	3.3	726374.39	64.39
		HMO	1634.346	50	81717.3037	3.5	286010.56	63.93
10	JJ-5.0	SLO	1040.322	50	52016.1058	3.3	171653.15	65.90
		HMO	3009.687	50	150484.366	3.5	526695.28	65.20
11	JJ-5.5	SLO	2910.029	50	145501.471	3.3	480154.85	65.25
		HMO	4539.149	50	226957.471	3.5	794351.15	65.19
12	LL-6.0	SLO	688.323	50	34416.1592	3.3	113573.33	60.34
		HMO	2744.024	50	137201.192	3.5	480204.17	63.32
13	LL-6.5	SLO	225.958	50	11297.904	3.3	37283.08	59.64
		HMO	3706.632	50	185331.623	3.5	648660.68	63.42
14	LL-7.0	SLO	1398.330	50	69916.4753	3.3	230724.37	63.11
		HMO	3721.654	50	186082.719	3.5	651289.52	65.57
15	LL-7.5	SLO	42.188	50	2109.41999	3.3	6961.09	59.64
		HMO	5143.492	50	257174.587	3.5	900111.05	64.57
16	LL-8.0	SLO	604.993	50	30249.6272	3.3	99823.77	65.69
		HMO	4002.992	50	200149.595	3.5	700523.58	64.48
17	LL-8.5	SLO	335.410	50	16770.4905	3.3	55342.62	68.20
		HMO	3466.956	50	173347.825	3.5	606717.39	63.41
18	LL-9.0	BLUE DUST	196.308	50	9815.4206	3.3	32390.89	51.29
		SLO	590.364	50	29518.2012	3.3	97410.06	65.47
		HMO	2103.242	50	105162.105	3.5	368067.37	57.27
19	LL-9.5	SLO	431.279	50	21563.959	3.3	71161.06	64.72
		HMO	1434.510	50	71725.4868	3.5	251039.20	63.29
2	LL-10.0	HMO	2731.222	50	136561.12	3.5	477963.92	64.36
21	LL-10.5	HMO	1523.456	50	76172.7959	3.5	266604.79	53.44
22	LL-11.0	HMO	342.073	50	17103.6661	3.5	59862.83	68.24
23	LL-11.5	HMO	860.210	50	43010.4774	3.5	150536.67	67.45

Saroj Kumar Prusty

Rabindra Mohanty

24	LL-12.0	HMO	2110.947	50	105547.343	3.5	369415.70	66.68
25	LL-12.5	HMO	708.961	50	35448.0696	3.5	124068.24	66.02
26	GG-0.5	SLO	174.760	50	8737.97624	3.3	28835.32	59.29
27	GG-1.0	SLO	194.089	50	9704.47182	3.3	32024.76	59.29
28	GG-2.0	SLO	738.349	50	36917.4462	3.3	121827.57	62.77
		HMO	284.080	50	14203.9948	3.5	49713.98	62.41
29	GG-2.5	BLUE DUST	157.909	50	7895.47479	3.3	26055.07	66.01
		SLO	117.550	50	5877.49888	3.3	19395.75	61.44
		HMO	6.401	50	320.036203	3.5	1120.13	62.31
30	GG-3.0	BLUE DUST	150.333	50	7516.6531	3.3	24804.96	67.77
		SLO	3.133	50	156.670821	3.3	517.01	61.46
31	GG-4.0	BLUE DUST	23.380	50	1169.0151	3.3	3857.75	69.09
		SLO	107.362	50	5368.09707	3.3	17714.72	68.37
32	GG-4.5	SLO	227.133	50	11356.6714	3.3	37477.02	59.29
		HMO	769.434	50	38471.6953	3.5	134650.93	49.92
33	JL-6	SLO	66.037	50	3301.86605	3.3	10896.16	59.70
		HMO	273.261	50	13663.0381	3.5	47820.63	64.27
34	JL-7.5	SLO	141.561	50	7078.05079	3.3	23357.57	64.58
35	JL-8	SLO	394.385	50	19719.2456	3.3	65073.51	61.15
		HMO	64.239	50	3211.94543	3.5	11241.81	63.54
36	JL-9.0	HMO	207.474	50	10373.7108	3.5	36307.99	65.93
39	AP-8	SLO	4260.298	50	213014.876	3.3	702949.09	62.78
40	AP-8.5	SLO	138.302	50	6915.1024	3.3	22819.84	67.45
41	AP-9	SLO	1493.153	50	74657.6358	3.3	246370.20	61.83
42	AP-9.5	SLO	3335.042	50	166752.088	3.3	550281.89	63.03
		HMO	524.406	50	26220.2795	3.5	91770.98	66.11
43	AP-10	SLO	2756.431	50	137821.561	3.3	454811.15	65.49
		HMO	371.199	50	18559.9503	3.5	64959.83	64.53
44	AP-10.5	SLO	1773.184	50	88659.2197	3.3	292575.42	66.26
		HMO	428.407	50	21420.3335	3.5	74971.17	67.46
45	AP-11	SLO	1516.860	100	151685.978	3.3	500563.73	65.49
		HMO	98.024	100	9802.4223	3.5	34308.48	65.37
46	AP-12	SLO	3777.882	100	377788.155	3.3	1246700.9	65.05

Saroj Kumar Prusty

Rabindra Mohanty

		HMO	198.791	100	19879.1443	3.5	69577.00	66.35
47	AP-13	SLO	3301.017	100	330101.747	3.3	1089335.76	66.26
		HMO	455.770	100	45576.9766	3.5	159519.42	66.29
48	AP-14	SLO	1409.432	100	140943.198	3.3	465112.55	66.49
		HMO	515.133	100	51513.29	3.5	180296.51	67.39
	GRAND TOTAL						20287382.96	63.88

(iv) Feasibility Mineral Resource (221), below UPL (>45% Fe to <55% Fe)

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of Influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade. (Fe %)
1	JJ-0.5	Laterite (MR)	107.1640	50	5358.198	2.5	13395.50	51.25
2	JJ-1.0	Laterite (MR)	143.9193	50	7195.967	2.5	17989.92	49.56
3	JJ-1.5	Laterite (MR)	3.7902	50	189.511	2.5	473.78	49.75
4	JJ-2.0	Laterite (MR)	140.2438	50	7012.190	2.5	17530.47	51.59
5	JJ-2.5	Laterite (MR)	72.3610	50	3618.052	2.5	9045.13	51.59
6	JJ-3.0	Laterite (MR)	252.6946	50	12634.732	2.5	31586.83	46.41
7	JJ-3.5	Laterite (MR)	174.8174	50	8740.868	2.5	21852.17	46.95
8	JJ-4.0	Laterite (MR)	128.1851	50	6409.255	2.5	16023.14	46.21
9	JJ-4.5	Laterite (MR)	76.3835	50	3819.177	2.5	9547.94	46.96
10	JJ-5.0	Laterite (MR)	833.6589	50	41682.943	2.5	104207.36	48.14
11	JJ-5.5	Laterite (MR)	217.4301	50	10871.504	2.5	27178.76	51.54
12	LL-6.0	Laterite	602.4441	50	30122.203	2.5	75305.51	51.52

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		(MR)						
13	LL-6.5	Laterite (MR)	1584.3859	50	79219.293	2.5	198048.23	50.39
14	LL-7.0	Laterite (MR)	224.4371	50	11221.856	2.5	28054.64	51.19
15	LL-7.5	Laterite (MR)	434.7484	50	21737.421	2.5	54343.55	51.37
16	LL-8.0	Laterite (MR)	69.9499	50	3497.494	2.5	8743.74	51.05
17	LL-8.5	Laterite (MR)	30.3247	50	1516.233	2.5	3790.58	51.59
18	LL-9.0	Laterite (MR)	100.6186	50	5030.928	2.5	12577.32	52.54
19	LL-9.5	Laterite (MR)	0.3440	50	17.202	2.5	43.00	51.59
2	LL-10.0	Laterite (MR)	222.2553	50	11112.766	2.5	27781.91	50.69
21	LL-10.5	Laterite (MR)	35.9526	50	1797.632	2.5	4494.08	51.59
22	LL-11.0	Laterite (MR)	21.0182	50	1050.910	2.5	2627.27	51.59
23	LL-11.5	Laterite (MR)	131.4019	50	6570.096	2.5	16425.24	51.59
24	LL-12.0	Laterite (MR)	560.2901	50	28014.503	2.5	70036.26	51.59
26	GG-0.5	Laterite (MR)	74.8898	50	3744.490	2.5	9361.23	47.43
27	GG-1.0	Laterite (MR)	1.4937	50	74.687	2.5	186.72	47.15
29	GG-2.5	Laterite (MR)	145.2984	50	7264.920	2.5	18162.30	51.59
30	GG-3.0	Laterite (MR)	3.5609	50	178.043	2.5	445.11	51.59
31	JL-6	Laterite (MR)	1952.3277	50	97616.385	2.5	244040.96	50.55
32	JL-7.5	Laterite (MR)	206.0124	50	10300.619	2.5	25751.55	48.67
33	JL-8	Laterite (MR)	242.1062	50	12105.308	2.5	30263.27	45.00
34	JL-9.0	Laterite	229.2418	50	11462.089	2.5	28655.22	53.61

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		(MR)						
35	AP-8	Laterite (MR)	1806.4118	50	90320.591	2.5	225801.48	49.92
36	AP-8.5	Laterite (MR)	99.3501	50	4967.506	2.5	12418.76	44.67
37	AP-9	Laterite (MR)	359.0529	50	17952.646	2.5	44881.62	48.86
38	AP-9.5	Laterite (MR)	615.3084	50	30765.422	2.5	76913.55	48.40
39	AP-10	Laterite (MR)	179.4133	50	8970.663	2.5	22426.66	51.91
40	AP-11	Laterite (MR)	102.2828	100	10228.285	2.5	25570.71	51.59
41	AP-12	Laterite (MR)	385.7020	100	38570.204	2.5	96425.51	51.52
42	AP-13	Laterite (MR)	163.8481	100	16384.809	2.5	40962.02	51.56
43	AP-14	Laterite (MR)	208.8734	100	20887.342	2.5	52218.36	51.22
	GRAND TOTAL						1725587.35	50.17

(v) Pre-feasibility Mineral Resource(222), below UPL (>55% Fe)

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of Influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource,Tonnes	Grade (Fe %)
1	AP-2	SLO	2674.61	100	267460.8	3.3	882620.58	62.17
2		HMO	559.277	100	55927.72	3.5	195747.01	63.39
3	AP-6	SLO	3883.5	100	388350.2	3.3	1281555.52	60.35
4	AP-7	SLO	4761.68	100	476167.6	3.3	1571353.046	57.49
5	AP-15	SLO	1783.82	100	178382.4	3.3	588661.79	61.15
6	KH 10	SLO	230.025	100	23002.53	3.3	75908.347	60.23
	GRAND TOTAL						4595846.3	59.95

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(vi) **Pre-feasibility Mineral Resource (222), below UPL (>45% Fe to <55% Fe)**

Sl. No	Section No.	Lithology	X-Sectional area, sq. M (m2)	Average length of influence (mtr)	Volume (Cu.M)	Litho logical Bulk Density	Resource, Tonnes	Grade (Fe %)
1	AP-1	Laterite (MR)	2898.193	100	289819.3	2.5	724548.3	54.08
2	AP-3	Laterite (MR)	794.3008	100	79430.08	2.5	198575.2	51.05
3	AP-4	Laterite (MR)	3368.842	100	336884.2	2.5	842210.6	50.06
4	AP-6	Laterite (MR)	1970.623	100	197062.3	2.5	492655.8	48.95
5	AP-7	Laterite (MR)	4345.238	100	434523.8	2.5	1086309.5	49.51
6	AP-15	Laterite (MR)	2885.757	100	288575.7	2.5	721439.3	50.08
7	AP-16	Laterite (MR)	7303.676	100	730367.6	2.5	1825919.0	50.18
8	KH 09	Laterite (MR)	1017.19	100	101719	2.5	254297.4	51.00
			GRAND TOTAL				6145955.1	50.46

Pre-Feasibility study was then carried out and the Reserves/Resources classified thereafter for the Jilling Langalota Iron Ore Block deposit as per UNFC category as on 12.01.2021 is given below.

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Summary of updated Reserve & Resource as on 12.01.2021 are given below.

Sl. No	Reserve Category (UNFC Classification)	Fe > 45 %		Fe >45 % to <55%		Fe > 55 %	
		Qty. in Tonnes	Grade (Fe%)	Qty. in Tonnes	Grade (Fe%)	Qty. in Tonnes	Grade (Fe%)
1	Proved Mineral Reserves (111)	NIL	NIL	NIL	NIL	NIL	NIL
2	Probable Mineral Reserves (121)	37579296.80	61.04	3446528.90	50.70	34132767.90	62.09
3	Probable Mineral Reserves (122)	2519998.60	55.37	1235854.90	49.73	1284143.7	60.82
A	Total reserve	40099295.40	60.68	4682383.80	50.44	35416911.60	62.04
3	Feasibility Mineral Resource (211)	NIL	NIL	NIL	NIL	NIL	NIL
	Pre-Feasibility Mineral Resource (221)	22012970.31	62.8	1725587.35	50.17	20287382.96	63.88
	Pre-Feasibility Mineral Resource (222)	10741801.39	54.51	6145955.1	50.46	4595846.3	59.95
4	Remaining measured resource (331)	NIL	NIL	NIL	NIL	NIL	NIL
5	Indicated Resource (332)	NIL	NIL	NIL	NIL	NIL	NIL
6	Inferred Resource (333)	NIL	NIL	NIL	NIL	NIL	NIL
7	Reconnaissance Resource (334)	NIL	NIL	NIL	NIL	NIL	NIL
B	Total resource	32754771.7	60.08	7871542.45	50.39	24883229.26	63.15
	Total reserve & resource (A+B)	72854067.1	60.4	12553926.25	50.4	60300140.86	62.49

Note: It may not be possible to quantify grade-wise reserves, as normally there is a considerable variation in size and grade distribution within the ore zone, which results in variable recovery factor and bulk density. Thus, tonnage arrived are tentative.

In case of change in bench parameter and technological interpretation in future, the blocked Reserve/Resource may be added in mineable reserve. Accordingly, the reserve may be changed.

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Justification in respect of UNFC Codification:

Degree of confidence is defined by supporting data for the axes of UNFC and accordingly, mineral reserve/resource is justified as follows:

Type and code as per UNFC	Economic axis (E1)	Feasibility axis (F2)	Geology axis (G1)
Proved Mineral Reserve (121)	• The mines are already operated by Essel Mining & Industries Limited. • Quantity reported in tones/volume with grade/quality • The land use pattern and working plan is already been designed. • The derivation of assumption made regarding projected capitals and operating costs have made. • Feasibility study was carried out , • Thus, Economic axis for such estimated reserves can be brought under E1 category.	• Geological axis is considered as G1 level based on Geological report received from GoO. • Samples have been analyzed by NABL Accredited laboratory. • The threshold value, >45% Fe has been considered as declared by IBM for calculation of Reserve. • The cut-off grade for Iron has been taken >55% Fe considering market demands. • The quantity of reserve have been taken above ultimate pit limit. • The mining operation was done by approved mining plan and thus recoveries and efficiencies have been estimated. • Infrastructure and resource are already available. • Forest Clearance from MoEF for total area was obtained by M/s Essel Mining & Industries Ltd. • Surface right permission was granted in favor of M/s Essel Mining & Industries Ltd. • Environmental Clearance for 6.28 TPA for production of Iron Ore was obtained by M/s Essel Mining & Industries Ltd. • Manpower and requirement of machineries have been estimated based on actual need. • Pre-Feasibility study has been carried out. • Thus, Feasibility axis for such estimated reserves can be brought under F2 category.	• 278 nos. core bore holes have been drilled in 100m x 100m & 100m x 50m m grid intervals. • Geological Mapping have been drawn in 1:2000 scale. • The proved zone has been extended for resource assessment depending on geological consideration supplement by geological continuity by mapping and limited to 50.mtrs i.e. 50% of the grid spacing of borehole points • The proved Reserve have been estimated based on the area covered by drill holes and existing quarry. • The quantities of reserve have been taken above ultimate pit limit. • The threshold value, >45% Fe has been taken for calculation of Reserve. • Thus, Geological axis for such estimated reserves can be brought under G1 category.

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Type and code as per UNFC	Economic axis (E1)	Feasibility axis (F2)	Geology axis (G1)
Probable mineral Reserve. (122)	• The materials have already been dispatched to the various consuming industries in past and present accordingly the grade of the ore is acceptable to the market demand at >55% Fe. • Quantity reported in tones/volume with grade/quality • The land use pattern and working plan is already been designed. • The derivation of assumption made regarding projected capitals and operating costs have made. • Feasibility study was carried out attached at Annexure-23. • Thus, Economic axis for such estimated reserves can be brought under E2 category.	• Geological axis is considered as G2 level. • Samples have been analyses by NABL Accredited laboratory. • The threshold value, >45% Fe has been considered as declared by IBM for calculation of Reserve. • The cut-off grade for Iron has been taken >55% Fe considering market demands. • The quantity of reserve have been taken above ultimate pit limit. • The mining operation was done by approved mining plan and thus recoveries and efficiencies have been estimated. • Infrastructure and resource are already available. • Forest Clearance from MoEF for total area was obtained by M/s Essel Mining & Industries Ltd. • Surface right permission was granted in favor of M/s Essel Mining & Industries Ltd. • Environmental Clearance for 6.28 TPA for production of Iron Ore was obtained by M/s Essel Mining & Industries Ltd. • Manpower and requirement of machineries have been estimated based on actual need. • Confidence of Geology axis considered as 70%. • Pre-Feasibility study has been carried out, • Thus, Feasibility axis for such estimated reserves can be brought under F2 category.	• 69 nos. of bore holes have been drilled in 200m x 100 m grid intervals. • Geological Mapping have been drawn in 1:2000 scale. • The proved zone has been extended for resource assessment depending on geological consideration supplement by geological continuity by mapping and limited to 50 mtrs i.e. 50% of the grid spacing of borehole points • The proved Reserve have been estimated based on the area covered by drill holes and existing quarry. • The quantity of reserve have been taken above ultimate pit limit. • The threshold value, >45% Fe has been taken for calculation of Reserve. • Thus, Geological axis for such estimated reserves can be brought under G2 category.

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Type and code as per UNFC	Economic axis (E1)	Feasibility axis (F2)	Geology axis (G1)
Feasibility Mineral resource (221)	• The derivation of assumption made regarding projected capitals and operating costs have made. • Feasibility study was carried out , attached at Annexure-23 • Quantity reported in tones/volume with grade/quality demonstrated by a feasibility study in order of increasing accuracy but not justified extraction under technological economy and the ore which will be blocked and cannot be extracted due to pit slope and statutory barrier have been put under this category. • Thus, Economic axis for such estimated resource can be brought under E2 category.	• Geological axis is considered as G1 level based on Geological report received from GoO. • Samples have been analyzed by NABL Accredited laboratory. • The threshold value, >45% Fe has been considered as declared by IBM for calculation of Reserve. • The cut-off grade for Iron has been taken >55% Fe considering market demands. • The quantity of reserve have been taken above ultimate pit limit. • The mining operation was done by approved mining plan and thus recoveries and efficiencies have been estimated. • Infrastructure and resource are already available. • Forest Clearance from MoEF for total area was obtained by M/s Essel Mining & Industries Ltd. • Surface right permission was granted in favor of M/s Essel Mining & Industries Ltd. • Environmental Clearance for 6.28 TPA for production of Iron Ore was obtained by M/s Essel Mining & Industries Ltd. • Manpower and requirement of machineries have been estimated based on actual need. • Pre-Feasibility study has been carried out. • Thus, Feasibility axis for such estimated reserves can be brought under F2 category.	• 278 nos. core bore holes have been drilled in 100m x 100m & 100m x 50m m grid intervals. • Geological Mapping have been drawn in 1:2000 scale. • The proved zone has been extended for resource assessment depending on geological consideration supplement by geological continuity by mapping and limited to 50 mtrs i.e. 50% of the grid spacing of borehole points • The proved Reserve have been estimated based on the area covered by drill holes and existing quarry. • The quantity of resource have been taken below the ultimate pit limit. • The threshold value, >45% Fe has been taken for calculation of Reserve. • Thus, Geological axis for such estimated reserves can be brought under G1 category.

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Type and code as per UNFC	Economic axis (E1)	Feasibility axis (F2)	Geology axis (G2)
Pre-feasibility Mineral resource (222)	• Quantity reported in tones/volume with grade/quality demonstrated by a feasibility study in order of increasing accuracy but not justified extraction under technological economy and the ore which will be blocked and cannot be extracted due to pit slope and statutory barrier have been put under this category. Thus the resource can brought in to E2 category.	• Geological axis is considered as G2 level. • Samples have been analyses by NABL Accredited laboratory. • The threshold value, >45% Fe has been considered as declared by IBM for calculation of Reserve. • The cut-off grade for Iron has been taken >55% Fe considering market demands. • The quantity of reserve have been taken above ultimate pit limit. • The mining operation was done by approved mining plan and thus recoveries and efficiencies have been estimated. • Infrastructure and resource are already available. • Forest Clearance from MoEF for total area was obtained by M/s Essel Mining & Industries Ltd. • Surface right permission was granted in favor of M/s Essel Mining & Industries Ltd. • Environmental Clearance for 6.28 TPA for production of Iron Ore was obtained by M/s Essel Mining & Industries Ltd. • Manpower and requirement of machineries have been estimated based on actual need. • Confidence of Geology axis considered as 70%. • Pre-Feasibility study has been carried out, • Thus, Feasibility axis for such estimated reserves can be brought under F2 category.	• 69 nos. core bore holes have been drilled in 200m x 100 m grid intervals. • Geological Mapping have been drawn in 1:2000 scale. • The proved zone has been extended for resource assessment depending on geological consideration supplement by geological continuity by mapping and limited to 50 mtrs i.e. 50% of the grid spacing of borehole points • The proved Resource have been estimated based on the area covered by drill holes and existing quarry. • The quantity of resource have been taken below the ultimate pit limit. • The threshold value, >45% Fe has been taken for calculation of Reserve. • Mineral resource which cannot be excavated • Thus, Geological axis for such estimated reserves can be brought under G2 category.

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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 present proposal is a fresh Mining Plan submitted after reservation, allocation and execution of the mining lease deed in favour of Odisha Mining Corporation Ltd. The existing quarries, waste dump, stock yards, infrastructures etc are detailed below.

Details of existing Quarry Position:

As per fresh survey conducted in the Jilling Langalotta Iron Ore Block, following quarry locations have been identified.

Sl. No	Name of the Pit/ Block	Location (Grid)	Size of Pit (In m)		Surface Area Covered (In Ha.)	Top Bench RL, mRL	Bottom Bench RL, mRL	Over all pit slope	Total no. of Benches	
			Length	Breadth					Ore	OB
01	Jajang - Langalota	2427630.788-2428752.089N 337741.652-338362.561E	1099 (NS)	420(EW)	67.04 H	535	473	45^0	6	0
02	Jilling-Gngaigora	2428824.733-2429837.838N 337914.952-338522.365E	830 (NS)	330(EW)	75.54H	593	486	45^0	7	0
03	Khuntpani	2431271.725-2431451.08N 338923.1-339138.012E	170(NS)	110(EW)	2.0H	580	546	45^0	4	0
04	Appahatti & Behera Quarry	2431434.5358-2430588.0006N 337254.0584-336861.7755E	830(NS)	380(EW)	37.66H	611	580	45^0	6	0

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Details of the existing Waste Dumps

As per fresh survey conducted in the ML area following waste dump locations have been identified in Jilling Langalotta Iron Ore Block.

Name of Dump	Block	Location	Length (max) in m	Breadth (max) in m	Area occupied		Grade
					(m^2)	(Ha)	
Waste Dump-1	Appahatu	2430471.199-2430929.022N 337216.068-337406.607E	370	80	41172.236	4.11	<45% Fe
Waste Dump-1	Langlotta	2427759.386-2428143.83N 337741.136-337855.695E	300	50	9755.249	0.9	<45% Fe
Waste Dump-6	Langlotta	2427482.895-2427736.882N 337747.931-338121.469E	340	85	49138.732	4.91	<45% Fe
Waste Dump-1	Langlotta	2427759.386-2428143.83N 337741.136-337855.695E	145	30	9755.249	0.9	<45% Fe
Waste Dump	Jilling	2429688.657-2430016.63N 338243.817-338420.932E	350	80	36425.763	3.64	<45% Fe

Proposed Mining Method:

The Jilling Langalotta Iron Ore Block is to be considered under Category-A (Fully Mechanized Opencast category) as per the IBM guidelines. The mine is proposed to be worked by mechanized opencast mining engaging HEMMs with deep hole drilling and blasting. The annual production capacity envisaged is 10 MTPA during the last 3 years. Three quarries namely Jajang Langalotta, Jilling-Gangaigora and Appahatu are proposed within the ML area. The advancement in Jajang Langalotta block will be in easterly as well as westerly direction and in Gangaigora Block the advancement will be in North & NE direction. The height and width of the benches will be maintained at 10 and 10-15 m respectively. Average bench slope proposed is 80^0-85^0. Drill hole diameter is proposed to be 115 to 150mm. Blasting is proposed to be carried out with emulsion/slurry explosive. NONEL is proposed to be used to control ground vibration & better optimization in blasting.

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The blasted ROM is proposed to be fed to crusher & screening plants for further sizing and screening to CLO (10-40 mm) and fines (-10 mm). The output is proposed to be sent to designated stack yards for selling in domestic markets.

Proposed Mine Design Parameter:

	Jajang Langalotta	Jilling-Gangaigora	Appahatu
Maximum Bench Height, mtr	10	10	10
Minimum Bench Width, mtr	10	10	10
Bench Slope Angle	80^0	80^0	80^0
Overall Pit Slope Angle	45^0	45^0	45^0
Depth of Mine	80	80	60
Maximum Gradient of Haul Road	1 in 16	1 in 16	1 in 16

Proposed Drilling & Blasting: Blast holes drilling are proposed by DTH drill of 115/150 mm dia. Single or multi row drilling with hole to hole delay are proposed. Proper charging, stemming and control blasting by using NONEL of different delay interval are proposed to reduce ground vibration.

Proposed Loading & Transportation: Waste/ ROM material is proposed to be loaded into 25 - 30t capacity dumpers using 2.5 - 4.5 m^3 excavators which in turn is to be transported to dump yard or crushing & screening units. ROM after processing in crushing and screening plants isto be stacked in the designated stockyards within the lease hold area for selling to buyers. The finished ore is to be transported outside the ML area through tipper and by rail.

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

The mine was a operating opencast mine of previous lessee. There are three quarries well developed within the mining lease. During the proposed plan period, opencast mining over the existing opencast quarries and other mineralised area have been proposed.

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I. **In-situ Tentative Excavation**

The year-wise in-situ tentative excavation for the first five years is given below.

Year	Quarry	Total Tentative Excavation	Top Soil	OB/SB/IB	ROM (M Cu. m)		
					Ore	Mineral Rejects	Waste : ROM
		M cu. m	M cu. m	M cu. m	M cu. m	M cu. m	cu. m: cu. m
1st Year (11.01.2021 to 31.03.2021)	Jajang - Langalotta	1.074	0.000	0	0.849	0.037	1:0
	Jilling-Gangalgora	0.049	0.000	0	0.027	0.009	1:0
Sub Total		**1.123**	**0.000**	**0**	**0.876**	**0.047**	**1:0**
2nd Year 2021-22	Jajang - Langalotta	3.890	0	2.073	1.579	0.426	1:1
	Jilling-Gangaigora	0.031		0.036	0.008	0.000	1:4.68
Sub Total		**3.921**	**0**	**2.109**	**1.586**	**0.426**	1:1.03
3rd Year 2022-23	Jajang – Langalotta	1.454	0	0.144	1.142	0.168	1:0.11
	Appahatu	2.393		0.435	1.809	0.149	1:0.22
Sub Total		**3.847**	**0**	**0.579**	**2.951**	**0.316**	1:0.18
4th Year 2023-24	Jajang – Langalotta	6.497	0	1.547	4.859	0.091	1:0.31
	Appahatu	1.845		0.776	0.868	0.202	1:0.73
Sub Total		**8.342**	**0**	**2.323**	**5.727**	**0.292**	1:0.39
5th Year 2024-25	Jajang – Langalotta	5.743	0	2.199	3.173	0.371	1:0.62
	Appahatu	1.898		0.635	1.135	0.128	1:0.50
Sub Total		**7.641**	**0**	2.834	4.308	0.499	1:0.59
Grand Total		**24.875**	**0.000**	**7.845**	**15.448**	**1.581**	**1:0.46**

अनुमोदित
APPROVED

क्षेत्रीय खनन नियंत्रक
Regional Controller of Mines
भारतीय खान ब्यूरो
Indian Bureau of Mines
भुवनेश्वर/Bhubaneswar

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Note: Tentative tonnage of the ore has been arrived by computing approximate bulk density and recovery factor as these data are variable and may be established on time series. At present in this document, the tonnage factor and recovery factor has been considered as per exploration input from the drilled bore-hole data and time series data as below:

Ore Recovery Factor :

Saleable Ore	Recovery Factor of Ore	100%
	Grade	+ 55% Fe
Mineral Rejects	Recovery factor	100%
	Grade	+ 45% - 55% Fe

Tonnage Factor/ Av Bulk Density:
(Based on time series data as well as bulk density test report by NABL accreditated laboratory -- Annexure-14 of Geological Report)

Sl. No.	Ore Type	Bulk Density, t/cu.m
1	Saleable ore	3.4 t/ cum
2	Mineral rejects	2.5 t/ cum
3	Waste	2.0 t/cum

Recovery Factor:
Recovery Factor of 100 % for Saleable Ore (+55 % Fe) & Mineral Rejects (+45 % Fe to -55 % Fe) have been considered for calculation of production as per Geological Report received from State Government.

The year wise development & production quantity in million tonnes for the first five years is given below.

Year	Quarry	ROM Production Quantity in million Tonnes	Saleable Ore Production Quantity in million Tonnes	Mineral Reject Production Quantity in million Tonnes	Waste (OB/IB) Development Quantity in Million Cum.	Stripping Ratio (Cum/Tonne)
1st Year (21.01.2021 to 31.03.2021)	Jajang - Langalota	0.45	0.357	0.093	0	1:0
	Jilling-Gangaigora	0.05	0.026	0.024	0	1:0
Sub Total		0.5	**0.066**	**0.011**	**0**	**1:0**
2nd Year 2021-22	Jajang - Langalota	6.255	5.189	1.066	2.073	1:0.33
	Jilling-Gangaigora	0.025	0.025	0	0.036	1:1.46
Sub Total		**6.280**	**5.214**	**1.066**	**2.109**	**1:0.34**
3rd Year 2022-23	Jajang - Langalota	5.000	4.580	0.420	0.144	1:0.03
	Appahatu	5.000	4.629	0.371	0.435	1:0.09
Sub Total		**10.000**	**9.209**	**0.791**	**0.579**	1:0.06
4th Year 2023-24	Jajang - Langalota	6.000	5.432	0.568	1.547	1:0.26
	Appahatu	4.000	3.496	0.504	0.776	1:0.19
Sub Total		**10.000**	8.927	1.073	2.323	1:0.23
5th Year 2024-25	Jajang - Langalota	6.000	5.560	0.440	2.199	1:0.37
	Appahatu	4.000	3.679	0.321	0.635	1:0.16
Sub Total		10.000	9.239	0.761	2.834	1:0.28
	Grand Total	**36.78**	**32.972**	**3.808**	**7.845**	1:0.21

Excavation Proposal

A summary of yearly proposed excavation proposal for the first five years is given below.

Jajang - Langalota

Particular for the year :		1st Year (11.01.2021 to 31.03.2021)	2nd Year (2021-22)	3rd Year (2022-23)	4th Year (2023-24)	5th Year (2024-25)
Name of Quarry						
Bench Geometry	Height (in m)	10	10	10	10	10
	Width (in m)	10-15	10-15	10-15	10-15	10-15
	Individual bench slope angle	80°	80°	80°	80°	80°
Quarry Development	Location (Quarry Name)	Jajang - Langalota				
	Extent of Development (in UTM coordinate)	2428040-2428425 N 337840 - 338360 E	2427880-2428700N 337710-338360E	2427730-2428750N 337715-338360E	2427470-2428760N 337650-338320E	2427470-2428760N 337690-338320E
	Sections considered for development	LL6.0,LL6.5,LL-7.0,LL-7.5,LL-8.0,LL-8.5,LL-9.0	JJ-4.5,JJ-5.0,LL-5.5,LL-6.0,.LL-6.5,LL-7.0,LL-7.5,LL-8.0,LL-8.5,LL-9.0,LL-9.5,LL-10,LL-10.5,LL-11,LL-11.5,LL-12	JJ-3.0,JJ-3.5,JJ-4.0,JJ-4.5,JJ-5.0,JJ-5.5,LL-6.0,.LL-6.5,LL-7.0,LL-7.5,LL-8.0,LL-8.5,LL-9.0,LL-9.5,LL-10,LL-10.5,LL-11,LL-11.5 ,LL-12,LL-12.5	JJ-0.5,JJ-1.0,JJ-1.5,JJ-2.0,JJ-2.5,JJ-3.0,JJ-3.5,JJ-4,JJ-4.5,JJ-5.0,LL-5.5,LL-6.0,.LL-6.5,LL-7.0,LL-7.5,LL-8.0,LL-8.5,LL-9.0,LL-9.5,LL-10,LL-10.5,LL-11,LL-11.5,LL-12,LL-12.5	JJ-0.5,JJ-1.0,JJ-1.5,JJ-2.0,JJ-2.5,JJ-3.0,JJ-3.5,JJ-4,JJ-4.5,JJ-5.0,LL-5.5,LL-6.0,.LL-6.5,LL-7.0,LL-7.5,LL-8.0,LL-8.5,LL-9.0,LL-9.5,LL-10,LL-10.5,LL-11,LL-11.5,LL-12,LL-12.5
	Number of benches	1	3	6	8	6
	Benches considered for development with RL	520 MRL to 510 MRL	520 MRL to 490 MRL	530 MRL to 470 MRL	530 MRL to 450 MRL	530 MRL to 450 MRL
	Top RL(mRL)	520	520	530	530	530
	Bottom RL(mRL)	510	490	470	450	450
	Direction of advancement	East-West	North-South	North-South	North-South	North-South

Dimension of the quarry at the end of the year including existing benches	220x200	520x350	660x560	1180x700	1180x700
Area Occupied (in Sqm)	53077.314	266334.692	407110.223	458443.819	458443.819
Over all Quarry Slope angle	45^0	45^0	45^0	45^0	45^0
Production of Ore (in Million Tonnes)	0.357	5.389	4.580	5.432	5.560
Av Grade of Saleable Ore (Fe %)	>55 % Fe	>55 % Fe	>55 % Fe	>55 % Fe	>55 % Fe
Generation of Mineral rejects ore from quarry (in Million Tonnes)	0.093	1.066	0.420	0.568	0.440
Av Grade of Mineral Reject (Fe %)	>45% Fe & <55% Fe	>45% Fe & <55% Fe	>45% Fe & <55% Fe	>45% Fe & <55% Fe	>45% Fe & <55% Fe
Production of ROM (Ore +Mineral Reject) in Million Tonnes	0.450	6.255	5.000	6.000	6.000
Av Grade of ROM (Fe %)	58.46	61.05	58.6	58.6	58.6
Total Generation of waste (in Million cum)	0	2.073	0.144	1.547	2.199
Waste Dumping Location	NA	2429360-2429780N 337905 - 338460 E Jilling Backfill &Dump	2429360-2429780N 337905 - 338460 E Jilling Backfill &Dump	2429360-2429780N 337905 - 338460 E Jilling Backfill &Dump	2429360-2429780N 337905 - 338460 E Jilling Backfill &Dump
Backfilling Location	NA	2429360-2429780N 337905 - 338460 E Jilling Backfill &Dump	2429360-2429780N 337905 - 338460 E Jilling Backfill &Dump	2429360-2429780N 337905 - 338460 E Jilling Backfill &Dump	2429360-2429780N 337905 - 338460 E Jilling Backfill &Dump
Storage of Mineral Reject	No storage. To be blended with High grade ore.				

Jilling-Gangaigora

Particular for the year :		1st Year (11.01.2021 to 31.03.2021)	2nd Year (2021-22)	3rd Year (2022-23)	4th Year (2023-24)	5th Year (2024-25)
Name of Quarry		Jilling-Gangaigora				
Bench Geometry	Height (in m)	10	10	NA	NA	NA
	Width (in m)	10-15	10-15	NA	NA	NA
	Individual bench slope angle	80°	80°	NA	NA	NA
Quarry Development	Location (Quarry Name)	Jilling-Gangaigora				
	Extent of Development (in UTM coordinate)	2429500-2429685N 338405-338525 E	2428920-2429390N 338010-338440E	NA	NA	NA
	Sections considered for development	JL-7.5,JL-8,JL-8.5 & JL-9	GG-1.5,GG-2.0,GG-2.5,GG-3.0,GG-3.5,GG-4.0,GG-4.5,GG-5.0,GG-5.5 JL-6	NA	NA	NA
	Number of benches	1	6	NA	NA	NA
	Benches considered for development with RL	590 MRL to 580 MRL	560 MRL to 480 MRL	NA	NA	NA
	Top RL(mRL)	590	560	NA	NA	NA
	Bottom RL(mRL)	580	480	NA	NA	NA
	Direction of advancement	North-South	North-South	NA	NA	NA
	Dimension of the quarry at the end of the year including existing benches	70 x 40	150x90	NA	NA	NA
	Area Occupied (in Sqm)	7242.68	67553.167	NA	NA	NA
	Over all Quarry Slope angle	45^0	45^0	NA	NA	NA
	Production of Ore (in Million Tonnes)	0.026	0.025	NA	NA	NA
	Av Grade of Saleable Ore (Fe %)	>55 % Fe	>55 % Fe	NA	NA	NA

	Generation of Mineral rejects ore from quarry (in Million Tonnes)	0.024	0	NA	NA	NA
	Av Grade of Mineral Reject (Fe %)	>45% Fe & <55% Fe	NA	NA	NA	NA
	Production of ROM (Ore +Mineral Reject) in Million Tonnes	0.050	0.025	NA	NA	NA
	Av Grade of ROM (Fe %)	56.34	59.71	NA	NA	NA
	Total Generation of waste (In Million cum)	0	0.036	NA	NA	NA
Waste Dumping Location		NA	2429360-2429780N 337905 - 338460 E Jilling Backfill &Dump	NA		
Backfilling Location		NA	2429360-2429780N 337905 - 338460 E Jilling Backfill &Dump	NA		
Storage of Mineral Reject		No storage. To be blended with High grade ore.				

Appahatu:

Particular for the year :		1st Year (11.01.2021 to 31.03.2021)	2nd Year (2021-22)	3rd Year (2022-23)	4th Year (2023-24)	5th Year (2024-25)
Appahatu:						
Name of Quarry		Appahatu				
Bench Geometry	Height (in m)	NA	NA	10	10	10
	Width (in m)	NA	NA	10-15	10-15	10-15
	Individual bench slope angle	NA	NA	80°	80°	80°
Quarry Development	Location (Quarry Name)	Appahatu				
	Extent of Development (In UTM coordinate)	NA	NA	2430880-2431260N 336860-337185E	2430480-2431270N 336850 - 337225E	2430440-2431010N 336855-337225E
	Sections considered for development	NA	NA	AP-12,AP-13,AP-14	AP-7,AP-8,AP-8.5,AP-9,AP-9.5,AP-10,AP-10.5,AP-11,AP-12,AP-13,AP-14,AP-15	AP-7,AP-8,AP-8.5,AP-9,AP-9.5,AP-10,AP-10.5,AP-11,AP-12
	Number of benches	NA	NA	6	7	5
	Benches considered for development with RL	NA	NA	620 MRL to 560 MRL	630 MRL to 540 MRL	620 MRL to 560 MRL
	Top RL(mRL)	NA	NA	620	630	620
	Bottom RL(mRL)	NA	NA	560	540	560
	Direction of advancement	NA	NA	North-South	North-South	North-South

Dimension of the quarry at the end of the year Including existing benches	NA	NA	280x200	700x200	748mx240
Area Occupied (in Sqm)	NA	NA	96485.709	218952.868	219066.742
Over all Quarry Slope angle	NA	NA	45^0	45^0	45^0
Production of Ore (in Million Tonnes)	NA	NA	4.629	3.496	3.679
Av Grade of Saleable Ore (Fe %)	NA	NA	>55 % Fe	>55 % Fe	>55 % Fe
Generation of Mineral rejects ore from quarry (in Million Tonnes)	NA	NA	0.371	0.504	0.321
Av Grade of Mineral Reject (Fe %)	NA	NA	>45% Fe & <55% Fe	>45% Fe & <55% Fe	>45% Fe & <55% Fe
Production of ROM (Ore +Mineral Reject) In Million Tonnes	NA	NA	5.000	4.000	4.000
Av Grade of ROM (Fe %)	NA	NA	+60 %Fe	+60 %Fe	+60 %Fe
Total Generation of waste (in Million cum)	NA	NA	0.435	0.776	0.635
Waste Dumping Location	NA		2431180-2431460N 336870-337340E Appahatu DumpA	2431180-2431460N 336870-337340E Appahatu DumpA	2430010-2430370N 337220-337645E Appahatu DumpB
Backfilling Location	NA		NA	NA	NA
Storage of Mineral Reject	No storage. To be blended with High grade ore.				

Details of calculations of ROM, Saleable Ore, Mineral Reject and Waste for the first five years is enclosed at Annexure 17.

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Year	ROM Production Quantity in million Tonnes	Waste (OB/IB) Development Quantity in Million Cum.	Stripping Ratio (Tons/Cum.)
1st Year (11.01.2021 to 31.03.2021)	0.500	0.00	1:0.0
2nd Year (2021-22)	6.280	2.109	1:0.34
3rd Year (2022-23)	10.000	0.579	1 : 0.06
4th Year (2023-24)	10.000	2.323	1 : 0.23
5th Year (2024-25)	10.000	2.834	1 : 0.28
Total	36.780	7.845	1 : 0.21

Year-wise pit development plans are shown in Plate No 06 A to F. The year-wise pit development sections are shown in Plate No 07 A to F.

II. Dump re-handling (for the purpose of recovery of mineral):

There is no proposal for waste dump re-handling (for the purpose of recovery of mineral) during the proposed Mining Plan period.

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

Mining Method: The Jiling Langalotta Iron Ore Block is to be considered under Category-A (Fully Mechanized Opencast category) as per the IBM guidelines. The mine is proposed to be worked by mechanized opencast mining engaging HEMMs with deep hole drilling and blasting. Three quarries namely Jajang_Langlotta, Jilling-Gngaigora and Appahatu & Behera are proposed within the ML area. The advancement in Jajang-Langalota block will be in easterly as well as westerly direction and in Gangaigora Block the advancement will be in North & NE direction. The height and width of the benches will be maintained at 10 x 10-15 m.

Working Regime: Mine has been proposed to be operated in three shifts. Each shift will be of 8 hours duration. Number of working days per year will be 300 days.

Mine Design Parameters: The proposed bench height within Jajang-Langalota, Jilling-Gngaigora and Appahatu & Behera quarry would be 10m and width 12m to 15m respectively. The bench height has been considered based on the capacity of the excavator proposed. At Jajang-Langalota quarry, the minimum bench width in the working benches proposed is 12m while in the ultimate stage, the bench width shall be reduced to 9m. In Jilling-Gngaigora quarry, the bench width proposed is 12m and at ultimate stage it will be reduced to 9m.

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In Appahatu quarry the minimum bench width in the working benches proposed is 14m wide. In the ultimate stage, the bench width shall be reduced to 10m.Thus all quarry will have a final pit slope of 45^0 and individual bench slope will be maintained at 80^0-85^0.

The layout of roads for haulage of ore/ waste and access to different installation in the mine will be developed complying with the statutory regulations stipulated in the Metalliferrous Mines Regulations, 1961. Overburden will be transported to the dumping yard sites located in the lease area.

The width of main haul road will be kept at 20m in Jajang-Langalota quarry and 14m in Jilling-Gngaigora & Appahatu quarry respectively. The haul road will be developed in the lease area as per need at a gradient up to 1:16. However, in the ramp the gradient will be maintained at 1:10. Regular maintenance of haul road will be done to protect the road from damages. Motor graders with tilting blade facility shall be deployed to maintain smooth haul roads and pit floors.

Drilling & Blasting: Blast holes drilling are proposed by DTH drill of 115/150 mm dia. Burden of 3.0 m &spacing of 3.5 m with single or double row drilling with hole to hole delay shall be adopted. Powder factor is considered to be 12t/kg. Proper charging, stemming and control blasting by using NONEL of different delay interval are proposed to reduce ground vibration.

Loading & transportation: Waste/ ROM material is proposed to be loaded into 25 - 30t capacity dumpers using 2.5 -4.5 m3 excavators which in turn is to be transported to waste dump yard / crushing & screening units. ROM will be fed to crushing and screening plant for segregating the CLO (+10-40mm)& fines (-10mm). If required the ROM may be fed directly to screen plant for segregation the CLO (+10-40mm), fines (-10mm) and oversize (+40 mm). The oversize is to be fed to crusher directly for further size reduction to CLO and fines. The CLO & fines generated after screening and crushing, will be transported to the designated stack yard for sale.The finished ore is to be transported outside the ML area through tipper and by rail.

Salient parameters of proposed mine working at the end of first five years of the Mining Plan period from the date of opening of the mine is given below.

Sl. No.	Parameters	Quarry		
		Jajang-Langalota	Jilling-Gangaigora	Appahatu
1.	Quarry Size (L x W x D)	1200 x 400 x 80	900 x410x110	950x270x100
2.	Total No. of Benches	6	3	10
3	Top Bench RL	530	590	630
4	Bottom Bench RL	450	480	530
5	Average Bench Height	10	10	10
6	Average Bench Width	12	12	12
7	Average Bank Slope	80^0	80^0	80^0
8	Average Pit Slope	45^0	45^0	45^0

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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.**

The year wise pit development plans & sections for the first 5 years of the plan period are shown in Plate No 06 A to F & Plate No 07 A to F.

The Surface Plan of the mine as on 31.12.2029 is shown as Plate No 3. During the first 5 years of the plan period, mining operation have been proposed in Jajang-Langalota quarry, Jilling-Gngaigora quarry, and Appahatu quarry . The mine has been proposed to be worked in open pit method with a maximum bench height of 10 mtr & width of 15 mtr. Approach road with avg. width of 20 m at a gradient of 1 in 16 exists up to the proposed waste dump &mineral reject sites. These approach roads along with main access road will be regularly graded & compacted using motor graders to avoid formation of pot holes. Cross sloping of roads will be maintained at approximately 4% to facilitate easy drainage. The entire waste dumping site is selected beyond UPL.

The layout of faces to be developed is mentioned in detail as follows:

Name of Pit	Description	1st Year (11.01.2021 to 31.03.2021)	2nd Year (2021-22)	3rd Year (2022-23)	4th Year (2023-24)	5th Year (2024-25)
Jajang-Langalota	Face Rl. (Top & Bottom)	520 mRL &510mRL	520 mRL & 490 mRL	530mRL & 470mRL	530mRL & 450mRL	530mRL & 450mRL
	Length of Face (Mtr avg.)	220	520	660	1180	1180
	Direction of advancement	East-West	North-South	North-South	North-South	North-South
Jilling-Gangaigora	Face RL (Top & Bottom)	590 mRL & 580 mRL	560 mRL & 480 mRL	NA	NA	NA
	Length of Face (Mtr avg.)	70	150	NA	NA	NA
	Direction of advancement	North-South	North-South	NA	NA	NA
Appahatu	Face RL (Top & Bottom)	NA	NA	620mRL & 560mRL	630mRL & 540mRL	620mRL & 560mRl
	Length of Face (Mtr avg.)	NA	NA	280	700	700
	Direction of advancement	NA	NA	North-South	North-South	North-South

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f) **Conceptual Mine planning upto 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.**

Jilling Langalotta Iron Ore Block comes under Category – A (fully mechanized category) as per the IBM guidelines. Therefore, conceptual plan of Jilling Langalotta Iron ore Block has been prepared on the basis of life of the deposit considering the proved existence of the mineral up to 520mRL in Appahatu quarry, 430mRL in Jajang-Langalota quarry, and 480mRL in Jilling-Gngaigora quarry . Conceptual mining plan has been prepared following the guidelines of IBM, keeping in view the present knowledge of the deposit, topography of the area, surface drainage pattern, mineable reserves available, mining technology and selection of the sites for waste disposal etc.

The area contains iron ore of all grades. The iron ore is mainly friable laminated comprising of hard laminated ore, soft laminated ore and powdery ore. Occasionally, hard massive ore of cherry red colour is also found to occur. Grade of the iron ore is (+) 58% Fe. The various structural imprints observed and recorded are in the BHJ and laminated ore.

Presently, as the the Geological Report received from GoO, the mine is having a reserve/resource of 79.122 million tons as on 01.04.2019. After depletion of mineable reserve of 6.26 million tons by the previous lessee, the remaining resource is around 72.85 million tons. Considering pit barrier, safety zone and railway acquired area, the probable reserve is around 40.102 Million Tonne of probable category (UNFC code 121& 122). During the Plan Period, further exploration will be proposed, which will augment the reserve potential of Jilling Langalotta Iron ore Block. During the initial 5 years of the plan period, systematic & scientific development the mine has been proposed to achieve the optimum production.

A part of the mined-out pit will be backfilled in the ultimate stage with the mine waste where non persistence of ore has been proved. Keeping into consideration the drainage pattern of the area and the prior knowledge of the areas which are supposed to be backfilled at a later stage, adequate length of parapet walls/ garland drains & settling tanks will be designed.

Considering the present level of exploration, the ultimate pit bottom will be at 448 mRL at Southern part, which will change depending upon the change in technology and scientifical studies.

A safety barrier of 7.5 m width all along inside the lease area has been kept as per the provisions of the statutes. The ROM ore produced will be screened & sized to produce the lumps & fines fractions within the lease. Jilling Langalotta Iron ore Block will be mined at a maximum rated capacity of 10 million tonnes per year. The wastes generated from the Jilling Langalotta Iron ore

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Block will be dumped in Appahatu waste dump A & Appahatu waste dump B & [illegible] with some of the waste material shall be utilized for development of haul road.

Life of Mine:

The maximum production rate planned for the mine is 6.28 MTPA up to 2nd year and 10 MTPA from 3rd year onwards. Considering 40.102 Million Tonne of probable category (UNFC code 121 & 122) ,the expected life of the mine at the above-mentioned rated capacity will be around 6 years including existing plan period. However, further exploration has been proposed during the plan period, which will augment the resource thus exceeding the life of mine beyond lease period.

Disposal of Mineral Rejects:

Material containing 45-55% Fe has been considered as mineral rejects. A total of 4.68 million tonnes of mineral reject will be generated up to conceptual stage. Year-wise generation of sub grade is given below.

In million tonnes

Year	Jajang-Langalota	Jilling-Gangaigora	Appahatu	Total
First 5 Years of the Plan Period (2020-21 to 2024-25)	2.588	0.024	1.197	3.808
In Conceptual beyond Plan		0.872		
Total up to conceptual		4.680		

All the generated mineral rejects will be blended with high grade ore for sustainability and optimum use of mineral resources. Hence separate stacking of mineral reject is not required. If required Mineral Rejects/Sub grade ore can be sold directly, as per market requirement in future. However, a space has been designated for mineral reject within the lease hold area for temporary storage.

Waste Disposal:

The waste generated during mining operation comprises of laterite, shale and overburden (OB) occurring at the top profile of ore zone. These waste materials are dumped at the earmarked non-mineralized areas in a retreating manner by forming number of terraces and compacting it by use of dozer. No toxic and hazardous elements are reported to be present in the waste materials of the area. However, precautionary measures like retaining walls, garland drains, settling ponds, plantation on matured slopes of waste dumps, mineral stacks etc have been proposed. Presently, there are two waste dumps present in the lease area.

Dump-sites selected for disposal of the waste have been considered after considering the following criteria.

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1. All dump sites have been located outside the mineralized zone beyond ultimate pit limit.
2. Topography features have been taken into account, particularly in the context of water drainage and availability of relatively flat ground.
3. Initially the natural depression has been planned to be leveled upto adjoining ground level & then terracing will be carried out.

A total of 8.59 MCum of wastes will be generated from entire Jilling Langalotta Iron Ore Block upto conceptual stage.

The height & width of individual terrace has been considered as 20 m & 20 m respectively with a bench slope angle of 37^{0}. Year-wise waste generation up to end of mine life is given below.

In million CuM

Year	Jajang-Langalota	Jilling-Gngaigora	Appahatu	Total
First 5 Years of the Plan Period	5.963	0.036	1.846	7.845
In Conceptual after Plan Period	0.745			
Total up to conceptual	8.59			

A total of 11.59MCum of wastes will be generated from entire Jilling Langalotta Iron ore Block up to conceptual stage including rehandling quantity of 3 million cum from Langalotta waste dump 6. The waste shall be dumped during plan period in the backfill of Jilling-Gangaigora Block and Appahatu waste dump A & Appahatu waste dump B.

Out of the total 11.59 MCum of waste generated up to conceptual, 20% of these materials (around 1 MCum) shall be utilized for development and remaining waste will be dumped at proposed dump location during the conceptual period.

Backfilling: It is proposed to backfill the mined out Jilling-Gangaigora Block up to 520MRL during 2nd year and up to 480 to 540MRL during 4th year onwards. Total volume of 0.9325 million CuM of waste will be back filled. The remaining waste will be dumped over the backfill.

The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. A series of settling pits will be provided to arrest the wash-off solid particles. The retaining walls will be of 1.5m height and 1.2 m width at the top and around 1.5m at the base. Besides, it is also proposed to stabilize the existing dead waste dump with bio-degradable coir geo textile made of coconut fibre or husk. It facilitates new vegetation by absorbing water and preventing topsoil from drying out.

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Seeding or plantation is done after blanketing the coir matting on the dump slope. They provide dump soil good support allowing natural vegetation to become established.

The 08 dumps areas will be compacted and afforestation will be carried out on the terraces as well as along the slopes after spreading a layer of top soil over it before rehabilitation. The location of the external dump is marked on Conceptual Plan. Refer Plate No 08. Top soil being generated during mining shall be used for rehabilitation & also for avenue plantation.

Waste dumps will be afforested/ re-grassed to check wash off. Waste dumps will be guarded with retaining walls at their toes along the lower contours. Following the retaining wall a garland drain will be developed for carrying water to the natural drainage system. Settling pits have also been proposed in the drains to arrest solid particles.

Exploration:

Based on the Geological Report attached at annexure-26 received from Govt. of Odisha, the entire Mining lease area are converted in to G1 & G2 category covering 347 nos. of boreholes. Mineralised and Non-Mineralised area are marked on the Geological Plan. But during the plan period, a portion i.e. north Jilling-Gangaigora Quarry will be exhausted in 1st year of excavation proposal. Subsequently, it is planned to dump waste material (over burden) in the exhausted Quarry from 2nd year onwards and reclaim the area. Before commencement of dumping, 20 nos. boreholes have been proposed at 100m x 100m @ 100m depth of each borehole to prove the barrenness of the area. Further, complying rule 12(3) of MCDR'2017, additional 188 nos of boreholes are proposed to convert G1 level of exploration from G2 level (potential Mineralised area).

Environmental Monitoring:

Noise, air, water and other environmental parameters will be monitored periodically to have a close check on the environmental parameters. Spraying of water on haul roads, use of wet drilling techniques & prevention of vibration by utilization of minimum quantity of explosive per delay will be carried out.

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Land Use Planning:

The land use pattern at the start of the Plan period, at the end of first five of the mine plan period and at the end of conceptual period is given in the below table.

Sl No	Description	Area put to use at the start of plan period, Ha	Total area at the end of first 5 years of Plan Period, Ha	Land use by End of Conceptual Period, Ha
1	Area under Mining	107.798	124.522	124.522
2	Storage of topsoil	0.00	0.00	0.00
3	Waste Dump Site	26.447	76.551	76.551
4	Mineral storage	16.843	25.817	42.414
5	Infrastructure	4.039	23.799	23.799
6	Roads	4.482	10.366	10.366
7	Railways	15.755	15.840	15.84
8	Tailing pond	0.00	0.00	0.00
9	Effluent Treatment Plant	0	0.00	0.00
10	Mineral Separation Plant	17.608	22.185	6.301
11	Township area	3.599	3.599	3.599
12	Others (Magazine)	0.713	0.713	0.000
	Others (Water Harvesting)	0.693	0.693	0.693
	Others (Green Belt/ Safety Zone)	10.314	10.314	10.314
	Others (Nala with safety zone)	11.899	11.899	11.899
	Others (NH with safety zone)	10.982	10.982	10.982
	Others (HT line)	3.102	3.102	3.102
	SE Railway	34.967	34.967	34.967
Total area of utilization		269.241	375.349	375.349
13	Other Unutilized Area	186.859	80.751	80.751
Grand Total		456.100	456.100	456.100

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Post Mining Land-Use

The post mining land use pattern is described in the table below.

Sl No	Land Use	Land use by end of Conceptual Period, in Ha	Post Mining Land Use
1	Area under Mining	124.522	A portion of mined-out Jilling quarry shall be backfilled and plantation shall be done over it. The mined-out quarry in Jajang and Apahatu quarry shall bedeveloped into a water reservoir.
2	Waste Dump site	76.551	Plantation shall be developed over the waste dump in a phased manner.
3	Mineral storage	42.414	A portion shall be regrassing over the area after cessation of mining activities.
4	Infrastructure	23.799	This area shall be left as it is for future utilisation by concerned authorities or will be dismantled.
5	Roads	10.366	The area shall be left as it is for future utilisation by concerned autjorities.
6	Safety Zone and Green Belt	10.314	Status shall be maintained.
7	Mineral separation plant	6.301	Regrassing shall be developed over the area after cessation of mining activities.

B. UNDERGROUND MINING

Not applicable

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C. Extent of Mechanization

The maximum rated production from Jilling Langalotta Iron Ore Block is envisaged at 6.28 MTPA during initial 4 years of the Plan period from the date of opening of the mine and thereafter the production will be enhanced to 10 MTPA. Accordingly, the details of HEMM, Plant and machinery have been calculated.

a. Drilling Machine

Specification of Drilling Machine		For 6.28 MTPA	For 10 MTPA
Diameter of blast hole drill	:	115 - 150 mm	115 - 150 mm
Air consumption	:	12.5 CuM/min	12.5 CuM/min
Pressure supplied up to	:	14.5 kg f/sq.cm.	14.5 kg f/sq.cm.
Drilling parameters			
Dia. of blast hole (D)	:	115 -150 mm	115 -150 mm
Height of the bench	:	12 m	12 m
Additional drilling required (Subgrade Drilling) (A)	:	1.2 m	1.2 m
Length of the hole (H + A)	:	13.2 m	13.2 m
Burden (B)	:	2.5 m	2.5 m
Spacing (S) (SPACING= 1.5 x Burden)	:	3.75 m	3.75 m
Volume of earth to be broken/loosen per hole	:	B x S x H = 2.5 x 3.75 x 13.2= 123.75 Cu M	B x S x H = 2.5 x 3.75 x 13.2= 123.75 Cu M
Meterage of drilling per drill for primary blasting in ore zone			
Total volume of material (Max in any year)	:	2576136.17 CuM	4102127.7 CuM
Drilling & Blasting required (40% of total volume)	:	1030454.47 CuM	1640851.1 CuM
Number of holes to be drilled	:	1030454.47 ÷ 123.75 = 8327 holes	1640851.1 ÷ 123.75 = 13259 holes
Number of holes to be drilled per day of 300 working days in a year	:	8327 ÷300 = 28	13259 ÷300 =44
Total meter of drilling per day (length of blast hole = 13.2 m)	:	28 x 13.2 =366 m	44 x 13.2 =583m
Requirement of drills			
Drilling penetration rate of the wagon drill on average	:	10 m / hr	10 m / hr
Effective drilling hr / shifts (6 hrs / shift) X 2 shift	:	12 hrs	12 hrs
Meterage of drilling to be effected / day	:	10 x 12 = 120 m	10 x 12 = 120 m
Number of drills required	:	366 ÷ 120= 3	583 ÷ 120= 5
Total numbers of Drills required for the Mine	:	3+1 (standby)=4 numbers	5+2 (standby)=7 numbers
Total numbers of Compressor required for the Mine	:	4 numbers	7 numbers

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b. Excavators

Specification of Excavator		For 6.28 MTPA	For 10 MTPA
Bucket capacity (C1)	:	4.3 CuM	4.3 CuM
Bucket fill factor (F)	:	0.8	0.8
Time cycle pass at 900 swing (T1 and T2)	:	50 sec	50 sec
Swell factor (S)	:	0.8	0.8
Production efficiency factor (e)	:	0.8	0.8
Job management factor (f)	:	0.8	0.8
Time scheduling			
Working days per year	:	300 days	300 days
Number of working shifts per day	:	3 shifts	3 shifts
Working hours per shift	:	8 hrs	8 hrs
Effective working hours per shift	:	6 hrs	6 hrs
Effective working hours per three shift	:	18 hrs	18 hrs
Seconds in hour	:	3600 sec	3600 sec
Output /4.3 CuM shovel/annum	:	[C1 x F x S x e x f x 3600 x 18 x 300] ÷ T1 = [4.3 x 0.8 x 0.8 x 0.8 x 0.8 x 3600 x 18 x 300] ÷ 50 = 684785 CuM per year in 3 shifts.	[C1 x F x S x e x f x 3600 x 18 x 300] ÷ T1 = [4.3 x 0.8 x 0.8 x 0.8 x 0.8 x 3600 x 18 x 300] ÷ 50 = 684785 CuM per year in 3 shifts.
Number of excavators required			
Maximum excavation in any year		2576136.17 CuM	4102127.7 CuM
Total excavation by one 4.3 CuM capacity shovel per annum	:	684785 CuM	
Requirement of 4.3 CuM capacity excavators	:	2576136.17 / 684,785 CuM = 4nos.	4102127.7 /684,785 CuM=6 nos.
To excavate the maximum in any of the years, the requirement of excavator including stand by (30%) will be	:	4+1=5 numbers of 4.3 CuM capacity	6+2=8 numbers of 4.3 CuM capacity

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c. Dumpers

i. **Dumpers Required For 6.28 MTPA**

Sl.No.	Parameters	ROM Handling	OB Handling	Product Handling, CLO/Fines	Unit of Measurement
1	Total Handling Requirement	6280000	675210	6280000	tonnes
2	Dumper Capacity	35	35	35	tonnes
3	Pay load	28	20	28	tonnes
4	Speed of Uphaul	18	18	18	km/h
5	Speed of downhaul	20	20	20	km/h
6	Lead (Uphaul)	2	2	2	Km
7	Lead (downhaul) 2	2	2	2	Km
8	Swings required to load a dumper	7	7	6	Nos.
9	Loading time	175	175	175	secs
10	Hauling time (loaded)	500	700	700	secs
11	Hauling time (Empty)	450	630	630	secs
12	Positioning time	60	60	60	secs
13	Total cycle (9+10+11+12)	1185	1565	1565	secs
14	Theoretical Handling/hr./dumper	85	60	85	tonnes/hour/dumper
16	Actual handling/dumper/hour,(80% of Theoretical handling)	68	48	68	tonnes/hour/dumper
18	Availability	80	80	80	%
19	Utilization	80	80	80	%
20	Net Utilization	64	64	64	%
21	Effective run. Hrs/dumper/annum	3456	3456	3456	hours
22	Handling/annum/dumper	235008	165888	235008	Tonne/dumper
23	Dumper Required for Operation	27	4	27	Nos.
24	Actual Dumper Fleet Required	28	7	28	Nos.

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ii. **Dumpers Required For 10 MTPA**

Sl.No.	Parameters	ROM Handling (in tones)	OB Handling (in cum)	Product Handling, CLO/Fines (in tones)	Units of Measurement
1	Total Handling Requirement	1000000	774901	10000000	
2	Dumper Capacity	35	35	35	tonnes
3	Pay load	28	20	28	tonnes
4	Speed of Uphaul	18	18	18	km/h
5	Speed of downhaul	20	20	20	km/h
6	Lead (Uphaul)	2	2	2	Km
7	Lead (downhaul) 2	2	2	2	Km
8	Swings required to load a dumper	7	7	6	Nos.
9	Loading time	175	175	175	secs
10	Hauling time (loaded)	500	700	700	secs
11	Hauling time (Empty)	450	630	630	secs
12	Positioning time	60	60	60	secs
13	Total cycle (9+10+11+12)	1185	1565	1565	secs
14	Theoretical Handling/hr./dumper	85	60	85	tonnes/hour/dumper
16	Actual handling/dumper/hour.(80% of Theoretical handling)	68	48	68	tonnes/hour/dumper
18	Availability	80	80	80	%
19	Utilization	80	80	80	%
20	Net Utilization	64	64	64	%
21	Effective run. Hrs/dumper/annum	3456	3456	3456	hours
22	Handling/annum/dumper	235008	165888	235008	Tonne/dumper
23	Dumper Required for Operation	43	5	43	Nos.
24	Actual Dumper Fleet Required	48	8	48	Nos.

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d. Loaders

Sl.No	Purpose	For 6.28MTPA	For 10 MTPA
1	Capacity, CuM	4.5	4.5
2	Annual running hours	3456	3456
3	Productivity, TPH	400	400
4	Production per loader per year,Tonne(2*3)	1382400	1382400
5	Max. handling , Mt	6280000	10000000
6	Loaders required to operate, Nos.	5	7
8	Loaders required, Nos.	5+1=6	7+2=9

Proposed Fleet of Major HEMM & Auxiliary Mining Equipment

Sl.No.	HEMM TYPE	CAPACITY	No (units)	
			For 6.28 MTPA	For 10 MTPA
1	Drill Machine	115-150 mm	4	7
2	Compressor	450 CFM	4	7
3	Excavator	4.3CuM	5	8
4	Dumper	35 tonner	63	104
5	Loader	4.5CuM	6	9
6	Diesel Tanker	12KL	1	2
7	Water Sprinkler	28KL	1	2
8	Dozer	10CuM	1	2
9	Motor Grader	250TPH	1	2
10	Diesel Generator	Variable capacity	7	10
11	Dewatering Pumps	Variable capacity	4	6
12	Rock Breaker	Variable capacity	2	4
13	Tower lights	Variable capacity	12	15

The proposed equipment shall be sufficient for the smooth operation of the Mine for the proposed capacity of 6.28 MTPA of ROM ore during first 2 years of the mining plan period and 10 MTPA thereafter. Additional requirement of machinery shall be deployed as and when necessary. However, exact specification, capacity & numbers of HEMM proposed may be changed based on requirement.

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Proposed Crushing & Screening Plant

Sl. No.	PLANT TYPE	No (units)	
		For 6.28 MTPA	Additional Plant for 10 MTPA
1	Railway siding towards Jajang section of the mine lease area		1 number of 2000 TPH stationary multi stage crushing & screening plant
2	Stationary Crusher Plant (In pit plant)	1 x 300 TPH	
3	Stationary Crusher Plant (OCU-1)	1 x 300 TPH	
4	Stationary Crusher Plant (OCU-2)	1 x 200 TPH	
5	Stationary Crusher Plant (OCU-3)	1 x 300 TPH	
6	Stationary Crusher Plant (OCU-5)	1 x 200 TPH	
7	Mobile Crusher Plant	1 x 400 TPH	
8	Stationary Screening Plant	1 x 50 TPH	
9	Mobile Screening Plant	1 x 150 TPH	
10	Mobile Screening Plant	1 x 100 TPH	
11	Mobile Screening Plant	5 x 150 TPH	

Requirement of Explosive and Magazine

The most common types of explosives available readily such as Power gel 1, powergel 2, / Super dyne for Column charge and for booster charge Power gel C, Cast booster, Aquadyne shall be used in the mines.

Parameters	Hard Ore	Medium Hard Ore
Hole Diameter (mm)	150	115
Bench height (m)	10	10
Hole depth (m)	10	10
Sub grade drilling (m)	1.2	1.2
Drilling Pattern	Staggered / Rectangular	Staggered / Rectangular
Burden (m)	3.8	4
Spacing (m)	4.8	4.8
Drill factor (m^3/m)	18.24	19.2
Booster charge per hole (kg)	0.25% to 30% of column charge per hole	0.25% to 30% of column charge per hole

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Column charge per hole (kg) (SME)	164.7	157.6
Charge per hole (kg)	165.2	158.1
Charge length (m)	7	6.7
Stemming length (m)	3	3.3
Maximum Charge per delay (kg)	988	946
Initiation sequence	V-Pattern, Diagonal pattern	V-Pattern, Diagonal pattern
Delay Timing –Within the row (ms)	17,25	17.25
Delay Timing –between rows (ms)	17,25,42	17,25,42
Blasted Quantity in Tonnage (t)	575	605
Powder Factor (based on blasting experience in other mines), t/Kg	3.64	3.7

The existing capacity of explosive magazine is as follows:

Description of explosives	Class	Capacity
Nitrate mixture	Class 2	1500Kg
Safety fuse	Class 6 Division 1	4,50,000 Meters
Detonating Fuse	Class 6 Division 2	15,000 Meters
Detonators	Class 6 Division 3	44,000 Nos.
Cast Booster	Class 3 Division 2	500 kg

Blasting Procedure

In Jajang-Langalota, Jilling-Gngaigora and Appahatu13 m and 11m deep bore holes will be drilled respectively which consists of 12 m bench height and 10 m bench height. Diameter of the hole will be 115-150 mm. High explosives cartridges of base charge and booster cartridge tied with Cordox or Excel will be loaded to blast holes. Deck charging will be done at places where Hard and soft zones are encountered. The stemming length is proposed to be one third of the hole depth. The explosive column will be initiated by detonator & safety fuse. Single row blasting with hole to hole delay interval and/or double row blasting with row to row delay interval as well as hole to hole delay interval will be followed for controlling blast noise, vibration and fly rock as well as to get better fragmentation and better yield of ore.

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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

The topography of the area is undulating. Elevation ranges from 620 m AMSL to 470 m AMSL. The ground water table in the mining lease area is 481m AMSL in pre-monsoon and 487m AMSL in monsoon period.

Location	Ground mRL	Min mRL	Max mRL
Near Nursery	518.334	486.664	481.264
Near Khuntapani	525.759	505.719	499.019
Near Jajang Village	486.389	482.799	480.279

b) Indicate maximum and minimum depth of Workings.

The existing depth of the Quarries with their RLs and depth of the quarries at the end of plan/ conceptual period can be summarized below:

Name of the Quarry	Existing depth (mRL)		End of first 5 years of the Plan Period (mRL)		End of Conceptual Period (mRL)	
	Top	Bottom	Top	Bottom	Top	Bottom
Jajang - Langalota	530	470	530	450	530	430
Jilling-Gangaigora	590	480	590	480	590	480
Appahatu	620	570	630	540	620	520

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

There will be no intersection of ground water table the course of mining activity. The recorded average annual rainfall is 1497.6 mm. The likely quantity of water to be encountered will be as follows:

Aggregate quarry area	64523sq.m
Direct water fall by rain to quarry area is	64523 sq.m. x 0.032 m = 2064 cum
About 25% of water shall be leached in benches since those are mostly soft. About 25% shall be evaporated since the quarry is open to sun and wind.	
Thus 50% water will be entered the floor of the quarry	1032CuM

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Outside water will not be allowed to enter the quarries as there will be garland drain in the periphery of quarry top. Water shall be pumped out to keep the floor of the quarry dry.

One number of 100 HP pump with a stand by pump of 50 HP capacity shall be sufficient to pump out this water in case rain water accumulates in the pit. The pumped out water shall be discharged to outside the quarry and channeled through garland drains to check dams and settling ponds and shall be used for water sprinkling and gardening purpose.

Both surface and ground water quality monitoring shall be monitored periodically in core and buffer zones.

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.

The river Baitarani flowing in S-N direction is located at a distance of 1 Km towards east. On the western side of the lease area a perennial Dalco nala is flowing from a spring near Jalahuri village outside the lease. The spring is situated at a distance of 1.7 km at southwest outside the lease area. A small tributary to Dalco nala is also flowing from south to north. Few water seepages are located towards south-west of the lease hold and discharging to Dalco Nala. These tributaries and streamlets are the source to meet the basic need of water to the nearby villages and mining colonies. The water table in the area is present at a shallow depth below valley floor i.e. around 15 meter evidenced from the wells.

The recorded average annual rainfall is 1497.6 mm. As described earlier, approximately, 1032CuM of rain water is expected to be accumulated in quarry floor. One number of 100 HP pump with a stand by pump of 50 HP capacity shall be sufficient to pump out this water in case rain water accumulates in the pit. The pumped out water shall be discharged to outside the quarry and channelized through garland drains to check dams and settling ponds and shall be used for water sprinkling and gardening purpose.

Outside water will not be allowed to enter the quarries as there will be garland drain in the periphery of quarry top. Water shall be pumped out to keep the floor of the quarry dry.

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4.0 STACKING OF MINERAL REJECT AND DISPOSAL OF WASTE

a) Indicate briefly the nature and quantity of top soil, overburden / waste and Mineral Reject to be disposed off.

No top soil will be generated during the first five years of the mining plan period from the date of opening of the mine. The nature of over burden are laterite, shale and overburden (OB) occurring at the top profile of ore zone followed by ROM (>45% Fe). Within the ROM, IB waste (<45% Fe) is occurring. In an fully mechanized mines IB can be segregated if the thickness is more than 1 m. Other-wise it is blended with ROM. Substantial quantity of side burdens (SB) analyzing <45% Fe are also excavated while forming benches to excavate the ore zone.

The details of existing mineral reject dumps are mentioned as follows:

Sl. No	Location	Stock Type	Co-ordinate
01	Jilling	Mineral Reject	2429684.929-2429965.463N 338318.497-338441.733E
02	Appahatu	Mineral Reject	2430650.934-2430862.985N 337191.689-337297.241E

Year-wise Mineral reject/Sub grade generation for first five years of the mine the Plan period:

In million tones

Year	Jajang - Langalotta	Jilling-Gangaigora	Appahatu
1st Year (11.01.2021 to 31.03.2021)	0.093	0.024	0
2nd Year (2021-22)	1.066	0	0
3rd Year (2022-23)	0.420	0	0.371
4th Year (2023-24)	0.568	0	0.504
5th Year (2024-25)	0.440	0	0.321

The mineral reject to be generated during the first 5 years of the plan period the mine plan is proposed to be blended with high-grade ore to make it saleable. It is also proposed to sell the mineral reject directly in the market if there is a demand.

The details of the qty. of top soil, over burden and mineral rejects generated & its disposal during the proposed plan period is given below: -

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Year	Top Soil Million CuM		Overburden Million CuM		Mineral Rejects Million Tonnes			
	Reuse/ spreading from the stored qty.	Storage	Back-filling	Storage	Back-filling	Storage	Blending	Beneficiation
1st Year (11.01.2021 to 31.03.2021)	NIL	NIL	NIL	NIL	NIL	NIL	0.117	NIL
2nd Year (2021-22)	NIL	NIL	1.56	0.549	NIL	NIL	1.066	NIL
3rd Year (2022-23)	NIL	NIL	Nil	0.579	NIL	NIL	0.791	NIL
4th Year (2023-24)	NIL	NIL	2.323	Nil	NIL	NIL	1.073	NIL
5th Year (2024-25)	NIL	NIL	2.199	0.635	NIL	NIL	0.763	NIL

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.**

The earmarked waste dump has been proven to be non-mineralized. Approximately 7.845million CuM of waste material will be generated during the first five years of the mining plan period, out of which 6.9125 million CuM will be disposed off in the proposed waste dump in retreating method and balance 0.9325million CuM will be backfilled in mined out Jilling quarry.

c) **Attach a note indicating the manner of disposal of waste, configuration and sequence of year wise buildup of dumps along with the proposals for protective measures.**

The waste which will be generated during the mining plan will be disposed off over the earmarked waste dump which has been proven to be non-mineralized.

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Qualified Person

The retreating method of waste dumping will be followed with overall slope of the waste dump not <28°. Terraces will be maintained at 20 meter height and 20 meter width. The maximum height of the dump will be maintained at 30 meter. A dumping plan has been given in Plate nos.6A to Year-wise generation, disposal, configuration and built up for the proposed 5 years of the Mining Plan period is given below.

Year	Waste Generation, Million CuM Jajang-Langalota	Waste Generation, Million CuM Jilling-Gngaigora	Waste Generation, Million CuM Appahatu	Waste Dump Destination	Waste Dump Location	Dumped Waste Quantity Million CuM	Area, Ha	Bottom RL	Top RL
1st Year (11.01.2021 to 31.03.2021)	Nil	Nil	Nil	NA	NA	Nil	NA	NA	NA
2nd Year 2021-22	2.073	0.036	Nil	Jilling Backfill &Dump	2429360-2429780N 337900-338460E	0.156 (backfill) 1.953 (dump)	8.81	510	57
3rd Year 2022-23	0.144	Nil	0.435	Jilling Backfill &Dump	2428880-2429085 N 337835 - 338382 E	0.144 Dump	8.81	510	53
				Appahatu DumpA	2431180-2431460N 336870-337340-E	0.435	6.3	520	53
4th Year 2023-24	1.547	Nil	0.776	Jilling Backfill &Dump	2428970-2429505 N 337860 - 338560 E	0.776 (backfill) 0.771 (dump)	30.68	480	5
				Appahatu DumpA	2431180-2431460N 336870-337340-E	0.776	6.3	520	57
5th Year 2024-25	2.119	Nil		Jilling Backfill &Dump	2428970-2429505 N 337860 - 338560 E	2.339 Dump	30.68	480	5
			0.635	Appahatu DumpB	2430010 2430370N 337220-337645E	0.635	6.4	520.	5
2024 25 up to conceptua		3.745		Jilling Backfil &Dump	2428970-2429505 N 337860 - 338560 E	3.745 Dump	31.6	570	5

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PROPOSED BACKFILLING

Year	Waste to be backfilled (in m3)	Area Nomenclature	Location of backfilling (coordinate)	Existing and Proposed area (m2)	Proposed backfilling	
2021-22	0.156	Jilling Backfill & Dump	2429860- 2429780N 337900- 338560E	Proposed (7342)	560mRL to 590mRL	5.6(11)
2023-24	0.776	Jilling Backfill & Dump	2428970-2429505 N 337860 -338560 E	Proposed (67551)	500mRL to 560mRL	5.0(11)

Proposed Environmental Protection Measures

1. Generated waste during course of mining will be kept over the proposed waste Dump.
2. Retreating method of dumping is being adopted for disposal of wastes over the waste Dump.
3. All the OB /Waste dumps are in non-mineralized area and away from the water bodies.
4. Proper terracing will be maintained in the dump.
5. Retaining walls/ stone barriers at the toe of the dumps will be made to prevent the soil erosion during monsoon.
6. Retaining walls have weep holes arrangement will be provided to allow water to flow down to garland drains.
7. Garland drains are to be made around OB /waste dump to arrest wash-off of fine particles during monsoon.
8. The accumulated water in the garland drains is to be passed through settling tanks/ sedimentation pond constructed at the corner of the garland drain to allow the silt to settle before final discharge.
9. At the out let of garland drains proper de-silting arrangements is to be made before onset of monsoon.
10. Two stage catch pits of adequate size have to be constructed at suitable places depending upon contour. Storm water is to be collected at the catch pit through a network of garland drains.
11. Settling pits and drains are to be cleaned periodically.
12. Inactive and dead part of the waste dumps is to be covered with geo-textile and subsequent plantation. Native and indigenous species are to be selected for plantation.

The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. A series of settling pits along with a main settling tank of 15 m length at the outlet of the garland drains will be provided to arrest the wash-off solid particles. The settling tank will be provided with three compartments each of around 5m width to arrest the suspended solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. The retaining walls will be of 1.5m height and 1.2 m width at the top and around 1.5m at the base.

The year-wise waste dumping plans & sections have been shown in Plate Nos 06 A to F and Plate Nos 07 A to F.

5.0 USE OF MINERAL AND MINERAL REJECT

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Qualified Person

5.0 USE OF MINERAL AND MINERAL REJECT

a) Describe briefly the requirement of end-use industry specifically in terms of physical and chemical composition.

The entire ore production including lumps and fines produced from Jilling Langalotta Iron Ore Block will be consumed in neighboring steel plants/sponge iron plants of Odisha and nearby states. To meet market demand with about 60 % Fe the ore produced can be sold after processing i.e. sizing and sorting. To meet market demand with 60% Fe, both ore and mineral reject produces are proposed to be blended. Market demand is there for both fines (<10 mm) and lump which are to be produced from the mines.

Quality parameters of lumps and fines as specified by the steel plants are as follows.

SNo	Parameters	Lump Ore	Fines Ore
i	Fe	62.0 % (min)	60.0 % (min)
ii	SiO_2	2.0 % (max)	2.0 % (max)
iii	Al_2O_3	2.0 % (max)	2.0 % (max)
iv	Total Gangue (Al_2O_3 + SiO_2)	4.0 % (max)	4.0 % (max)
v	Size	+10 - 40 mm (Over & under size: Max. 10% Each)	Size: - 10mm (with oversize 10% maximum)

Quality parameters of lumps and fines as specified by the sponge iron plants are as follows.

Fe	Al_2O_3	SiO_2	P	Moisture	LOI	Size
64% to 65%	2.52%	1.48	0.046%	2.9% Maximum	3% maximum	+5 to -18 mm as well as +10 to -40 mm

b) Give brief requirement of intermediate industries involved in up-gradation of mineral before its end-use.

The entire ore produced will be sold to long term buyers/state-based industries for their use.

c) Give detail requirements for other industries, captive consumption, export, associated industrial use etc.

The entire ore produced will be sold to long term buyers/state-based industries for their use.

d) Indicate precise physical and chemical specification stipulated by buyers

The entire ore production including lumps and fines produced from JhillingLangalotta lease will be consumed in sponge & steel plants of Odisha & nearby states. Quality parameters of lumps and fines as specified by the long-term buyers are as follows.

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SN	Parameters	Lump Ore	Fines Ore
i	Fe	62.0 % (min)	60 % (min)
ii	SiO_2	2.0 % (max)	2.0 % (max)
iii	Al_2O_3	2.0 % (max)	2.0 % (max)
iv	Total Gangue ($Al_2O_3 + SiO_2$)	4.0 % (max)	4.0 % (max)
v	Size	+10 - 40 mm	Size: - 10mm.
vi	Tolerance	+/- 10%	+/- 10%

e) Give details of processes adopted to upgrade the ROM to suit the user requirements.

All the ROM ore produced will blended at the mine site itself and sized to the desired range suitable for its use in the steel plants by crushing, screening in mobile/stationary crushing & screening plant. If required the mineral reject/sub-grade will be sold directly in market as per demand.

The useable mineral recovered from ROM may not be directly used in any industry and may need intermediate process to suit the user industry in terms of physical and chemical compositions.

All the ROM ore produced will be blended at the mine site itself and sized to the desired range suitable for its use in the steel plants by crushing, screening in mobile/ stationary crushing & screening plant. If required the mineral reject/sub-grade will be sold directly in market as per demand.

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6.0 PROCESSING OF ROM AND MINERAL REJECT

a) **If processing / beneficiation of the ROM or Mineral Reject is planned to be conducted, briefly describe nature of processing / beneficiation. This may indicate size and grade of feed material and concentrate (finished marketable product), recovery etc.**

Iron ore in the lease area mainly comprises hard and soft lumps, lateritic ore, blue dust etc with major part of the ROM is fines of variable grades.

Mineral processing practices is mainly by crushing and screening at different screens of +40 mm, -40 +18 mm, -18 mm +5 mm etc for industrial applications. The capacity and specifications of the screening and crushing plants proposed are as below.

Sl. No	Plant Type	Capacity	Nos	Feed Grade/size	Product
1	Stationary Crusher Plant (Inpit plant)	300 TPH	1	ROM ore/(- 250 mm)	Lumps (+40mm), -10 mm, 10 - 40 mm
2	Stationary Crusher Plant (OCU-1)	300 TPH	1	ROM ore/(- 250 mm)	Lumps (+40mm), -10 mm, 10 - 40 mm
3	Stationary Crusher Plant (OCU-2)	200 TPH	1	ROM ore/(- 500 mm)	Lumps (+40mm), -10 mm, 10 - 40 mm
4	Stationary Crusher Plant (OCU-3)	300 TPH	1	ROM ore & crushing of lumps(- 40 mm)	Lumps (+40mm), -10 mm, 10 - 40 mm
5	Stationary Crusher Plant (OCU-5)	200 TPH	1	ROM ore & crushing of lumps(- 40 mm)	Lumps (+40mm), -10 mm, 10 - 40 mm
6	Mobile Crusher Plant	400 TPH	1	Screened lumps (+ 80 mm) and (+ 40 m)	Lumps (+40mm), -10 mm, 10 - 40 mm
7	Stationary Screening Plant	50 TPH	1	Screened lumps (+ 80 mm) and (+ 40 m)	Lumps (+40mm), -10 mm, 10 - 40 mm
8	Mobile Screening Plant	150 TPH	1	Screened lumps (+ 80 mm) and (+ 40mm)	Lumps (+40mm), -10 mm, 10 - 40 mm
9	Mobile Screening Plant	100 TPH	1	Screened lumps (+ 80 mm) and (+ 40mm)	Lumps (+40mm), -10 mm, 10 - 40 mm
10	Mobile Screening Plant	150 TPH	5	Screened lumps (+ 80 mm) and (+ 40 m)	Lumps (+40mm), -10 mm, 10 - 40 mm
11	Stationary Integrated Multi Stage Crushing & Screening Plants	2000 TPH	1	0 to 750mm	Lumps (+40mm), -10 mm, 10 - 40 mm

b) **Give a material balance chart with a flow sheet or schematic diagram of the processing procedure indicating feed, product, recovery, and its grade at each stage of processing.**
The same is given in Annexure 18.

c) **Explain the disposal method for tailings or reject from the processing plant.**
Not applicable

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d) **Quantity and quality of tailings /reject proposed to be disposed, size and capacity of tailing pond, toxic effect of such tailings, if any, with process adopted to neutralize any such effect before their disposal and dealing of excess water from the tailings dam.**
Not applicable

e) **Specify quantity and type of chemicals if any to be used in the processing plant.**
Not applicable

f) **Specify quantity and type of chemicals to be stored on site / plant.**
Not applicable

g) **Indicate quantity (cum per day) of water required for mining and processing and sources of supply of water, disposal of water and extent of recycling. Water balance chart may be given.**

The water requirement of the mine shall be met from bore wells and surface water bodies. Pumps with power supply have to be provided. From this place water supply to different points will be done through water tanker and pipe lines. Effective storm water collection network will be provided to collect the rain water from the mining and screening plant areas. The collected rainwater will be diverted to the rainwater harvesting pits for recharging the ground water. Water harvesting structures can be developed for storage of rain water for use. Similarly, rain water collected in opened up pits can be pumped for settling and used afterwards.

Requirement of water for domestic, industrial and other is expected to be approximately 2000 KLD. Same shall be supplied from existing bore wells and surface water bodies.

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7.0 OTHER

Site Services

Site services such as office, explosive magazine, first aid centre, store room, rest sheds, blasting sheds, and canteen for staff and executives will be set up as per the statute. Shall bus and ambulance etc. will be provided. These services will be enhanced/modified and continued during the future mining operations as per necessity. Few site services envisaged above are available in the Jilling Langalottairon Ore Block. Further additional requirements if any, shall be developed.

Other Support Facilities:

All the statutory facilities such as crèche, canteen, first-aid center, vocational training center etc. will be set up as per statute. To take care of the drinking water needs at different working areas, water tankers have been envisaged for the mine. The rest shed-cum-lunch rooms will be set up near quarry site. First aid facilities and toilet will be attached to the rest shed. Portable blasting sheds of one end open type will be provided at the mine site for giving protection to the blasters during blasting. These blasting sheds are made up of steel and are shifted in accordance with the shifting of blast hole locations. Few support facilities envisaged above are available in the Jilling Langalotta Ore Block. Further additional requirements if any, shall be provided.

b) Employment Potential:

The details of the employment and manpower requirement in the mine are mentioned below.

Category of staff/ Workers		No. of Persons		
		Departmental	Contractor	Total
Admn. & Technical	Mines Manager	1	-	1
	1st Class Mines Manager	2	1	3
	2nd Class Mines Manager	5	4	9
	Mechanical Engineer	3	1	4
	Electrical Engineer	1	1	2
	Civil Engineer	1	-	1
	Manager (Quality Control)	1	-	1
	Geologist	5	-	5
	Surveyor	3	3	6
	Medical Officer	2	-	1
	Other	14	25	39
Open cast	Foreman & Mate	15	30	45
	Electrical Supervisor, Electrician, Mechanic Foreman, JE Electrical, JE Civil & Shotfirer	12	15	27
	Face Workers & Loader	-	136	136

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Category of staff/ Workers			No. of Persons		
			Departmental	Contractor	Total
	(Deployed HEMM operator/ Helper				
	Other face workers (Supervisors)		-	30	30
	Others	In pit Beneficiation	-	18	18
		Other Worker	-	12	12
Above Ground	Clerical & Supervisory staff	Time office/ Store/ VT/ WB/ QC/Medical/Security/HSD	35	81	116
	Workers in attached work shop/ mineral dressing plant		17	30	47
	Others	QC Staff	15	-	15
		Security Guards	50	20	70
		Canteen	15	20	35
		Other worker	30	30	60
Grand Total			229	457	686

It is envisaged that some of the services like light vehicle operation, cleaning, canteen facilities etc. shall be outsourced. Indirect employment is expected in transportation activities, vehicle repair & maintenance, service providers for the enlarged work-force etc. Increased awareness for education and skill development opportunity will facilitate employment generation.

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8.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 OF MCDR' 2017

8.1 Environment Base line information:

The leasehold area is located in the villages of Baushapani, Bholabeda, Jajanga, Jalahari, Jatari, Khuntapani & Baitarani Reserved forest. The lease area is 456.037 Ha (as per DGPS)/ 456.100 Ha (as per RoR).

As present proposal is for "Mining Plan", so a fresh study for base line data will be undertaken by M/s OMC Ltd in due course of time to ascertain the Environmental base line information in the core, 500mtr from the lease boundary and buffer zone of the mining lease area on water regime, quality of air, ambient noise level, flora, climatic conditions and Surface water regime.

Existing land use pattern indicating the area already degraded due to mining, roads, processing plant, workshop, township etc.

The existing land use pattern at start of Mine Plan period is shown in the table below:

Sl No	Description	Area put to use at the start of plan period, Ha
1	Area under Mining	107.798
2	Storage of topsoil	0.00
3	Waste Dump Site	26.447
4	Mineral storage	16.843
5	Infrastructure	4.039
6	Roads	4.482
7	Railways	15.755
8	Tailing pond	0.00
9	Effluent Treatment Plant	0.00
10	Mineral Separation Plant	17.608
11	Township area	3.599
12	Others (Water Harvesting)	0.693
	Others (Green Belt/ Safety Zone)	10.314
	Others (Magazine)	0.713
	Others (SE Railway acquired Area)	34.967
	Others (Nalla with safety zone)	11.899
	Others (NH with safety zone)	10.982
	Others (HT line)	3.102
Total area of utilization		269.241
13	Other Unutilized Area	186.859
Grand Total		456.100

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Water regime

The river Baitarani flowing in S-N direction is located at a distance of 1 Km towards east. On the western side of the lease area a perennial Dalco nala is flowing from a spring near Jalahari village outside the lease. The spring is situated at a distance of 1.7 km at southwest outside the lease area. A small tributary to Dalco nala is also flowing from south to north.

Few water seepages are located towards south - west of the lease hold and discharging to Dalco Nala. These tributaries and streamlets are the sources to meet the basic need of water to the nearby villages and mining colonies. The water table in the area is present at a shallow depth below valley floor, i.e. around 15 meter evidenced from the wells.

Since the rock strata of the area do not contain high concentration of metals (except for iron) or sulphide, which has the potential to generate acid mine drainage, therefore, its impact on water quality is insignificant. The only factor that contributes to the pollution of the Baitarani river is the sediment load that the surface runoff carries from the broken up areas to the perennial nala during the rainy season.

Ground water regime

The geological set up, rainfall distribution and the degree of secondary porosity in the geological formations for storage and movement of groundwater controls the hydro- geological regime of the area. The area has undergone several phases of intense tectonic deformations, which has been responsible for the development of deep-seated intersecting fracture plain. These structural elements chiefly control the occurrence and movement of groundwater. The major set i.e. lineament NW-SE trending is the conduit for groundwater movement. The wells located in the vicinity of this lineament records copious yield. In the study area aquifers are recharged by water from direct precipitation and seepage from surface water bodies.

Quality of air

Air quality of the mine will be established after a fresh study for base line data is undertaken by M/s OMC Ltd in due course of time to ascertain the Environmental base line information in the core and buffer zone of the mining lease area.

Ambient noise level

Ambient noise level of the mine will be established after a fresh study for base line data is undertaken by M/s OMC Ltd in due course of time to ascertain the Environmental base line information in the core and buffer zone of the mining lease area.

Fugitive dust

Fugitive dust in the mine will be established after a fresh study for base line data is undertaken by M/s OMC Ltd in due course of time to ascertain the Environmental base line information in the core and buffer zone of the mining lease area.

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Climatic conditions

Secondary information on the prevailing climate of the area was obtained from the District Statistical Handbook and based on observations made by Indian Meteorological Department (IMD). The climate of the study area is characterized by an oppressively hot summer with high humidity. Summer generally commences in the month of March. Temperature begins to rise rapidly attaining the maximum in the month of May. During summer, the maximum temperature goes up to 45°C. The weather becomes more pleasant with the on-set of the monsoon in June and remains as such up to the end of October. The temperature in the month of December is lowest. Sometimes it even drops down to 4.6°C. The average annual rainfall is 1497.6 mm.

Human settlements

Human settlement & residential areas of local villagers as well as Company's residential colony exists within the lease area.

Public buildings, places of worship and monuments

Public buildings exist within the lease hold area. The lease area (Core Zone) and the area within 5km radius of the M.L area (Buffer Zone) do not have the places of archeological, historical, cultural, monumental and aesthetic and important residential as well as official buildings.

Indicate any sanctuary is located in the vicinity of leasehold

There is no national park/wild life sanctuary/biosphere reserve/ tiger reserve/ elephant reserve in the core (M.L area) and buffer zone (5 km radius of the M.L area).

Proposed Environmental Monitoring Parameters and Stations:

The monitoring of various environment parameters as per relevant statute shall be conducted. The details of proposed monitoring stations are shown in Environment Plan (Plate No ***).

	Within Core one	Within Buffer Zone	Remark
Ambient Air Quality	7nos	4nos	Refer Envlronment Plan
Fugitive Air Quality	9nos	Nil	
Noise Quality	11nos	4nos	
Surface Water Quality	6 nos	Nil	
Ground Water Quality	2nos	5nos	

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8.2 Impact Assessment: Attach an Environmental Impact Assessment Statement describing the impact of mining and beneficiation on environment on the following

i) Land area indicating the area likely to be degraded due to quarrying, dumping, roads, workshop, processing plant, tailing pond/dam, township etc.

The land use in stages is given below: -

Sl No	Description	Area put to use at the start of plan period, Ha	Total area at the end of first 5 years of Plan Period, Ha	Land use by End of Conceptual Period, Ha
1	Area under Mining	107.798	124.522	124.522
2	Storage of topsoil	0.00	0.00	0.00
3	Waste Dump Site	26.447	76.551	76.551
4	Mineral storage	16.843	25.817	42.414
5	Infrastructure	4.039	23.799	23.799
6	Roads	4.482	10.366	10.366
7	Railways	15.755	15.840	15.84
8	Tailing pond	0.00	0.00	0.00
9	Effluent Treatment Plant	0	0.00	0.00
10	Mineral Separation Plant	17.608	22.185	6.301
11	Township area	3.599	3.599	3.599
12	Others(Magazine)	0.713	0.713	0
	Others (Water Harvesting)	0.693	0.693	0.693
	Others (Green Belt/ Safety Zone)	10.314	10.314	10.314
	Others (nala with safety zone)	11.899	11.899	11.899
	Others (NH with safety zone)	10.982	10.982	10.982
	Others (HT line)	3.102	3.102	3.102
	SE Railway	34.967	34.967	34.967
Total area of utilization		269.241	375.349	375.349
13	Other Unutilized Area	186.859	80.751	80.751
Grand Total		456.100	456.100	456.100

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i) **Air quality**

Method of mining will be mechanized with the deployment of DTH drills, Excavators, Dumpers etc. Therefore, there will be emission of noxious gases like NOX, SOx, CO etc. due to mining operation. As such, there will also be generation of dust during movement of loaded or empty trucks, excavation and dumping affecting the condition of ambient air quality (AAQ). Periodic monitoring will be conducted to check the status of air quality.

Following measures are proposed for management of air quality: -

- Water sprinkling on haul roads at regular intervals.
- Installing of permanent water sprinkers at strategic places.
- Dense plantation along the safety zone/avenue plantation.
- No overloading of tippers/ Dumpers.
- Ore shall be covered with tarpaulin during transportation from stackyard to outwards.
- Provision of dust extractors with the drill machines/ wet drilling practices.
- Water spraying in the dump hopper of crusher.
- Provisions of dust masks to the persons exposed to dust.

ii) **Water quality**

Open cast mining of the iron ore will not generate any waste water. However, small quantities of waste water from domestic use and workshop will be released from the mines site and the following management plan will be practiced.

Wastewater from workshop will be treated for oil removal and treated water to be used for green belt development. The generated sewage from worker colony will be treated through STP and treated water will be used in afforestation area.

Impact on Ground Water Quality

The downward movement of the toxic substances from the stacks, dump and exposed quarry faces during seepage and percolation of ground water normally affects the ground water quality adversely in mining area. The water table in the area is comparatively at a greater depth (6m to 9m below the general surface level) which will not be touched during the plan period as well as beyond the plan period. Therefore chances of ground water pollution are not anticipated.

The domestic sewage from the canteen and toilets will be routed to septic tanks followed by soak pits. The workshop effluent will be routed through oil and grease trap and treated to the discharge standards and reused in the workshop.

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Proposed Environmental Protection Measures

Following environmental protection measures have been proposed for dump stabilization & water quality management.

Year	Location	Garland drain		Retaining wall	
		Name	Length, m	Name	L x W x H, m
1st Year (11.01.2021 to 31.03.2021)	NA	-	-	-	-
2nd Year (2021-22)	NA	-	-	-	-
3rd Year (2022-23)	Appahatu Dump A	D1	750	R1	750x1.5x1.5
	Jilling backfill & Dump .	D1	500	R1	500x1.5x1.5
4th Year (2023-24)	NA	-	-	-	-
5th Year (2024-25)	Appahatu DumpB	D1	1300	R1	1300x1.5x1.5

iii) Noise levels

Due to operation of the HEMM & plant, ambient noise level is likely to increase but the same will be managed through proper maintenance of the plant & machineries & use of personal protective equipment. Provision of sound insulted chambers for the workers deployed on machines(HEMM).Periodic monitoring will be conducted to check the status of noise level.

iv) Vibration levels (due to blasting)

The blast induced ground vibrations will be controlled through limiting the charge per delay and use of in-hole delay by NONEL means of initiation. The blasting frequency will be limited to 3-4 times per week.

v) Acid mine drainage

Not applicable

vi) Surface subsidence

Not applicable

vii) Socio-economics

The mining employment will greatly increased the income levels of the local population and indirectly will generate employment in tertiary services like transport and repair shops. The impact of mining operations in the area on socio-economic will be a positive one. The infrastructure of the area roads, public transport and electricity supply will also improve after continuation of the mining operation in the area.

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viii) Historical monuments etc.

There are no historical monuments or places of archeological interest within 5 km radius of the lease.

8.3 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.

8.3.1. 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".

Jilling Gangoigora quarry will be exhausted after 1st year of the proposed plan period. The same shall be backfilled thereafter. The Reclamation Plan is enclosed as Plate No 11.

Year	Backfilling in Million CuM
1st Year (11.01.2021 to 31.03.2021)	NIL
2nd Year (2021-22)	1.56
3rd Year (2022-23)	Nil
4th Year (2023-24)	2.323
5th Year (2024-25)	2.199

8.3.2 Topsoil Management:

Major part of the mine area is devoid of topsoil. The thickness of the top soil in the mining area is very insignificant as it occurs very thinly over the rocks and soil cover. If any quantum of topsoil is recovered during mining operation, then it will be accumulated & will be utilized for afforestation purpose.

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.

Not applicable

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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 may be provided as per the following table.

Summary of year-wise proposal for item no. 8.3 for first 5 years of the Plan Period

Items	Details	Proposal				
		1st Year (11.01.2021 to 31.03.2021)	2nd Year 2021-22	3rd Year 2022-23	4th Year 2023-24	5th Year 2024-25
Dump Management	Area afforested (Ha)	Nil	Nil	Nil	1	2.55
	No of saplings planted	Nil	Nil	Nil	2000	6000
	Cumulative no of plants	Nil	Nil	Nil	2000	8000
	Cost including watch and care during the year.	Nil	Nil	Nil	Nil	Nil
Management of worked out benches	Area available for rehabilitation (Ha)	Nil	Nil	Nil	Nil	Nil
	Afforestation done (Ha)	Nil	Nil	Nil	Nil	Nil
	No of saplings planted in the year	Nil	Nil	Nil	Nil	Nil
	Cumulative no of plants	Nil	Nil	Nil	Nil	Nil
	Any other method of rehabilitation (specify)	Nil	Nil	Nil	Nil	Nil
	Cost including watch and care during the year	Nil	Nil	Nil	Nil	Nil
Reclamation and Rehabili-tation by backfilling	Void available for backfilling (L x B x D) pit wise/ stop wise	Nil	170x 60	NA	300 x 280	300x280
	Void filled by waste /tailings, milllon CuM	Nil	1.56	Nil	2.323	2.199
	Afforestation on the backfilled area	Nil	Nil	Nil	Nil	Nil
	Rehabilitation by making water reservoir	Nil	Nil	Nil	Nil	Nil
	Any other means (Specify)	Nil	Nil	Nil	Nil	Nil
Rehabilitation of waste land within lease	Area available (Ha)	Nil	Nil	Nil	Nil	Nil
	Area rehabilitated (Ha)	Nil	Nil	Nil	Nil	Nil
	Method od rehabilitation	Nil	Nil	Nil	Nil	Nil
Others specify	Retaining Wall	Nil	Nil	1250	Nil	1300
	Garland Drain	Nil	Nil	1250	Nil	1300

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Qualified Person

Rabindra Mohanty
Qualified Person

8.4 Disaster Management and Risk Assessment:

As far as the nature of deposit & method of mining is concerned, there is no possibility of landslides, subsidence, flood, fire and tailing dam failure. Map of seismic zone in India indicates that Odisha falls under seismic zone-I, II & III. In Odisha, minor earth quakes have been felt many often but none is severe. Lessee will need the help of nearest state fire department located at Koira for rescue, if any high risk accident occurs in the area.

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. Lease area is planned to operate for iron ore continuously over a period of next 10 years.

However, there may be temporary discontinuance during the course of mining due to unforeseen causes such as -Court order; Statutory Requirements; Accidents in the Mine, Natural Calamities, Local issues and any other unforeseen circumstances. Therefore, an emergence plan is necessary to re-open the mine which will include:

1. Intimation to local mine and legal administrative authorities concerned (IBM, DGMS, Directorate of Mines, Circle Mining Office etc.) regarding temporary discontinuance.
2. Explanation to the local community regarding the cause of temporary discontinuance and possibility of reopening of mine in future.
3. Listing and proper storing of the Machines, Materials, Assets and Documents.
4. Care and maintenance of machinery as per the machine operating manuals.
5. Employment and tightening of the security for proper watch and ward to keep the machine and materials in safe and secure.
6. Repair and maintenance of haul road.
7. Regular monitoring of Air, Water, Noise etc. in the permitted area.
8. Monitoring of status of mining operation in respect of bench height, width, individual bench slope angle, overhang, undercut, or any other parameters whose levels either in form of higher side or lower side is dangerous for further mine working.
9. Preparation of plan and sections of discontinued mining operation.
10. Projection of benches in plan and sections which is safe for further working.
11. Formation of safe benches as per plan and sections.
12. Intimation to the concerned authorities for reopening once the mine is risk free.

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8.6 FINANCIAL ASSURANCE:

Financial assurance calculation as per Rule 27(1) of MCDR 2017 is given in the table below:

Sl.No	Head	Area of Land Use (In Ha)		Total Area (Ha)	Area considered as fully reclaimed & rehabilitated (Ha)	Net area considered for calculation (Ha)
		Area put on use at the start of Plan Period (Ha)	Additional requirement during Plan Period (Ha)			
(a)	(b)	(c)	(d)	(e)=(c)+(d)	(f)	(g)= (e)-(f)
1	Area under mining	107.798	16.724	124.522	0.00	124.522
2	Storage for Topsoil	0.000	0.000	0.000	0.00	0.000
3	Waste Dump Site	26.447	50.104	76.551	0.00	76.551
4	Mineral Storage	16.843	8.974	25.817	0.00	25.817
5	Infrastructure (workshop, admin building etc)	4.039	19.76	23.799	0.00	23.799
6	Road	4.482	5.884	10.366	0.00	10.366
7	Railways	15.755	0.085	15.840	0.00	15.840
8	Tailing Pond	0.000	0.000	0.000	0.00	0.000
9	Effluent Treatment Plant	0.000	0.000	0.000	0.00	0.000
10	Mineral Separation Plant	17.608	4.577	22.185	0.00	22.185
11	Township area	3.599	0.000	3.599	0.00	3.599
12	Others(Magazine)	0.713	0.000	0.713	0.00	0.713
	Others (Water Harvesting)	0.693	0.000	0.693	0.00	0.693
	Others (Green Belt/ Safety Zone)	10.314	0.000	10.314	0.00	10.314
Grand Total		208.291	106.108	314.399	0.00	314.399

APPROVED

Regional Controller of Mines
Indian Bureau of Mines

Total Financial Assurance payable till the end of plan period, i.e. up to 31.03.2025 is calculated to be Rs. 9,43,19,700/- (Rupees Nine Crores Forty Three Lakhs Nineteen Thousand and Seven Hundred Only) for Category-A fully mechanized mines calculated at Rs. 3,00,000/- per hectare for an area of 314.399 Ha of ML area put to use. Financial Assurance Plan for Jilling Langalotta Iron Ore Block is given in Plate no- 12.

Lessee has already submitted financial assurance for Rs. 9,11,75,100/- (Rupees Nine Crores Eleven Lakhs Seventy Five Thousand One Hundred Only) in shape of Bank Guarantee no. 0004121BG0000020, valid up to 31.03.2025 to IBM. Refer Annexure -23.

The differential amount of Rs. 31,44,600/- (Rupees Thirty One lakhs Forty Four Thousand and Six Hundred Only) towards financial assurance in the form of Bank Guarantee is enclosed as Annexure 23.

Saroj KumarPrusty

Rabindra Mohanty