MODIFICATION OF MINING PLAN

(PREPARED UNDER RULE *17(3) OF THE* MINERALS (OTHER THAN ATOMIC AND HYDRO CARBONS ENERGY MINERALS) CONCESSION RULES, 2016)

WITH

PROGRESSIVE MINE CLOSURE PLAN

(Under Rule-23 of MCDR 2017)

OF

Kalamang West (Northern Part) Block Iron Ore Mines

OVER 92.875 HA. OR 229.494 ACRES IN VILLAGES KALAMANG, GHODABUDAN & GANDAI PADA, TAHASILS KOIDA & BARBIL OF SUNDARGARH & KEONJHAR DISTRICTS, ODISHA.

Status of the lease area

Category	Forest land	Non-Forest Land	Total lease area	Lease period
A - FM	*42.608 Ha*	*50.267 Ha*	*92.875 Ha*	*50 years*

Applicant – M/s Tata Steel BSL Ltd.

Regd Office:	**Regional Office:**
Ground Floor, Mira Corporate Suites Plot No.1&2, Mathura Road Ishwar Nagar, New-Delhi – 110065, Tel; 91 11 3919 4000 Fax: 91 11 4101 0050 Email: tsbsl@tatasteel.co.in	Narendrapur, PO-Kusupanga, Via- Meramandali, Dist- Dhenkanal, 759121, Odisha, India Tel +91 6762300000, 66002 Email: tatasteelbsl.co.in, ccs.office@tatasteelbsal.co.in Website : www.tatasteelbsl.co.in

Prepared by

Chandrabhanu Das,
Qualified Person

M/s Geo Consultants Pvt. Ltd.
Bhubaneswar
Phone/Fax- 0674 2575702

VOLUME – I (TEXT)

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

150 YEARS OF CELEBRATING THE MAHATMA

REGD. PARCEL
Phone: 0674-2352463
Tele Fax: 0674-2352490
E-mail: ro.bhubaneshwar@ibm.gov.in
Plot No.149, Pokhariput
BHUBANESWAR-751020

No. MPM/A/11-ORI/BHU/2020-21/947 Date: 24.08.2020

सेवामे

Shri Manikanta Naik, Power of Attorney Holder,
M/s Tata Steel BSL Ltd, Narendrapur,
Po-Kuspanga, Via-Meramundali,
Dist- Dhenkanal, Odisha-759121

विषय: Approval of Modification of Mining Plan of Kalmang west (North Part) Iron Ore Mine along with Progressive Mine Closure Plan (PMCP), over an area of 92.875 ha in Keonjhar & Sundargarh district of Odisha State, submitted by M/s Tata Steel BSL Ltd under Rule 17(3) of Mineral Concession Rules, 2016.

संदर्भ: -i) Your letter No. Nil dated 22.07.2020 received on 27.07.2020.
ii) This office letter of even no. dated 27.07.2020.
iii) This office letter of even no. dated 27.07.2020 addressed to Director of Mines, Government of Odisha copy endorsed to you.
iv) This office letter of even no. dated 01.08.2020.
v) Your letter No. Nil dated 17.08.2020.

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 Modification of Mining Plan including Progressive Mine Closure Plan of Kalmang west (North Part) Iron Ore Mine over an area of 92.875 ha of M/s Tata Steel BSL Ltd in Keonjhar & Sundargarh district of Odisha State submitted under Rule 17(3) of Mineral Concession Rules, 2016. This approval is subject to the following conditions:

I. The Modification of 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 Modification of 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. Validity of excavation proposal of this document shall expire within 5 (five) year from execution of the mining lease.

भवदीय / yours faithfully,

Encl: - One copy of Modification 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 Modification of Mining Plan by **REGISTERED PARCEL**.
2. Shri Chandrabhanu Das, M/s Geo Consultants Pvt. Ltd, 853, Gobind Prasad (Medical Lane), Mahavir Nagar, Laxmisagar, Bhubaneswar – 751006.

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

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Chandrabhanu Das
Qualified Person

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Chandrabhanu Das
Qualified Person

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Chandrabhanu Das
Qualified Person

INTRODUCTION

Government of Odisha, pursuant to the Mines and Minerals (Development & Regulation) Act, 1957 (the "Act") and the Mineral (Auction) Rules, 2015 (the "Rules"), issued the notice inviting tender dated 7.03.2017 (Annexure X) to commence the auction process for grant of mining lease for Kalamang West (Northern Part) Iron Ore Block located in Sundargarh & Keonjhar Districts of Odisha for specified end use as per Clause 3.5 of the Tender Document (Annexure X). The e-auction process was conducted in accordance with the tender document for the said mineral block and Bhushan Steel Limited was declared as the "Preferred Bidder" under Rules 9(4)(b)(iii) of the Mineral Auction Rules, 2015 vide Government of Odisha, Dept. of Steel & Mines, Letter No.4571/SM, dtd.25th May, 2017 for captive use in its steel plant with rated capacity of 5.6 MTPA and located at Narendrapur, Kusupanga, Meramandali, Dist- Dhenkanal of Odisha.

अनुमोदित
APPROVED

The profile of the mining lease area and the Preferred Bidder till date is summarised below:

8/2021/2020
क्षेत्रीय खान नियंत्रक
REGIONAL CONTROLLER OF MINES
भारतीय खान ब्यूरो
INDIN BUREAU OF MINES
भुवनेश्वर/ BHUBANESWAR

Sl. No.	Status
1.	As required under Rule 10(1) of the Mineral Auction Rules, 2015 and the tender document for the said mineral block, Bhushan Steel Limited has made payment of the first instalment, being ten percent of the upfront payment of Rs. 4,46,69,460/- (Rupees four crore forty six lakh sixty nine thousand four hundred and sixty) in shape of e-chalan through Treasury dated 01.06.2017 to become the Preferred Bidder (Annexure VII & VIII). The preferred bidder has also deposited a BG of Rs 8,93,38,919/- (Rupees eight crore ninety three lakh thirty eight thousand nine hundred nineteen only) to Govt of Odisha towards Bid Security (Annexure VII). The Government of Odisha had issued Letter of Intent (LoI) vide Govt. letter No.5285/SM dt.24.06.2017 as per Rule 10(2) of the Rules for grant of Mining Lease for Kalamang West (Northern Part) Iron Ore Block in village Kalamang, Ghodabudhani in District Sundargarh and village Gandhalpada in District Keonjhar over an area of 92.00 ha to M/s Bhushan steel ltd. This LoI was again modified by Steel and Mines Department, Government of Odisha

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	vide letter no.6287/SM dt.27.07.2017 revising the earlier mentioned area of 92.0 Ha to 92.875 Ha (Annexure IX). As the clearances like Environmental clearance and Forest clearances are yet to be obtained, the mining lease has not been executed.
2.	The Corporate Insolvency Resolution Process("CIRP") was initiated against the Company by way of an application under section 7 of the Insolvency and Bankruptcy Code, 2016 ("IBC") by one of its financial creditors i.e. State Bank of India, which culminated into the approval of the Resolution Plan as submitted by Tata Steel Ltd ("**TSL**") by the Adjudicating Authority under National Company Law Tribunal, Principal Bench, New Delhi ("**Adjudicating Authority**") vide its order dated May 15, 2018. Pursuant to the Order dated May 15, 2018, Tata Steel Ltd through its wholly owned subsidiary namely Bamnipal Steel Limited, took over the management of the Company in accordance and compliance with the terms of the approved Resolution Plan and provisions of the IBC ("New Management") on May 18, 2018 i.e. the **Closing Date**. That subsequent to the approval of the Resolution Plan, and coming of the New Management in terms of the order dated May 15, 2018, the following changes have taken place with the Company: (i) The name of the Company has changed from Bhushan Steel Ltd to Tata Steel BSL Ltd. The change of name has been duly approved by the Registrar of the Companies New Delhi, and a fresh Certificate of Incorporation dated 27th November 2018, for change of name has also been issued (copy of this and the Profile have been enclosed as Annexure I) and a copy of Board of Directors of the company along with their details has been enclosed as Annexure II. The board has nominated the Managing Director Mr Rajeev Singhal as the Owner of the company under the Mines Act 1952 (copy of extract enclosed as Annexure III). The Nominated Owner has rendered the POA to Sri Manikanta Naik, Chief Corporate Services, for dealing day to day activities of the auctioned ML area (copy enclosed as Annexure IIIA).

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	(ii) That Dept. of Steel of Mines, Govt of Odisha vide letter No 1409/SM dt 27.02.2019 has taken a note of the change of name. (iii) That the registered address of the Company has also changed w.e.f. 1st December, 2018. The new and current Registered office of the Company is as follows: ***"Tata Steel BSL Limited,*** ***Ground Floor, Mira Corporate Suites,*** ***Plot No 1 & 2,Ishwar Nagar,*** ***Mathura Road New Delhi,*** ***South Delhi, 110065 INDIA".***
3	The Tata Steel BSL Limited (formerly known as Bhushan Steel Ltd) is a public limited Company incorporated in India with its registered office in Ground Floor, Mira Corporate Suites, Plot No. 1&2, Ishwar Nagar, Mathura Road, New Delhi-110065, India. The company is listed on the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSF). Backed with more than 27 years of experience, the company is now India's one of the largest Integrated Steel producer with an overall steel producing capacity of 5.6 million tonne per annum from its existing major facility in Meramandali, Dist. Dhenkanal, Odisha and two medium facilities in Sahibabad, Dist. Ghaziabad, Uttar Pradesh and Khopoli in Maharashtra. It has India's largest Cold Rolled Steel Plant and is one of the largest suppliers of automotive grade and high carbon special steel in the country. Tata Steel BSL recorded a gross revenue of US $ 3004.49 Million (INR 20,892 crore) in FY 18-19. The organisation is spread across India with an employee base of over 5,700. On May 18, 2018, the then BSL was acquired by Tata Steel Limited through its wholly owned subsidiary Bamnipal Steel Limited. Tata Steel BSL has been felicitated with several awards including for best practices in Environment, Health and Safety (EHS) by CII,

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	Odisha State Council 2020, Odisha State Energy Conservation Award (Energy conservation initiatives and carbon abatement projects) under CPP, 9th Icon SWM Excellence Award 2019 for industries (Overall environment excellence award –Category waste management), 15th CII- EHS Award Odisha Chapter (Overall excellence in Environment , Health and Safety, National Energy Management Award 2019 by CII for Khopoli unit for Energy Efficient Unit for its Khopoli unit.
4	In partial fulfilment of the terms and conditions of the said letter of intent, the mining plan was prepared by Bhushan steel on the basis of geological information furnished by the Government of Odisha on the iron ore deposit available in the area and was duly approved by the RCOM, IBM, Bhubaneswar vide letter No MP/OTFM/09-ORI/BHU-17-18 dated 31.08.2017.
5	Now Tata Steel BSL Ltd being a subsidiary of Bamnipal Steel limited under Tata Steel has taken ownership of M/s Bhushan Steel Limited. Planning for a maximum production from the mines at 5MTPA was made by Bhushan Steel Ltd. In this changed scenario, the Preferred Bidder i.e. Tata Steel BSL Ltd wants to modify the approved mining plan for which the present document has been prepared.
6	**REASONS FOR MODIFICATION**
i **(Change in the name of the lessee)**	TheGovernment of Odisha had issued Letter of Intent (LoI) for grant of Mining Lease for Kalamang West (Northern Part) Iron Ore Block in village Kalamang, Ghodabudhani in District Sundargarh and village Gandhalpada in District Keonjhar over an area of 92.875 ha to M/s Bhushan Steel Limited for captive use. Now Tata Steel BSL Ltd being a subsidiary of Bamnipal Steel limited has taken ownership of M/s Bhushan Steel Limited. So the name of the Preferred Bidder mentioned in the approved mining plan has to undergo change in

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	the name of Tata Steel BSL Ltd.
ii(**Production planning**)	Previously when it was Bhushan Steel Ltd, planning was made in the approved mining plan for maximum production from the mines at 5MTPA (Annexure V). Now Tata Steel BSL Ltd, being a subsidiary of Bamnipal Steel limited is already fed by other captive mines of Tata Steel. The production planning in Kalamang mine needs to be done in such a manner that best product mix can be optimized for ultimate use in the plant in a sustainable manner. Kalamang ore contains high silica with an average of 5% SiO2 which is deleterious to the steel plants. This can be mitigated by blending the high siliceous ore of this mine with low silica ore from other mines of Tata Steel at required proportion at the end use plant site and accordingly the production plan has been prepared keeping in view of mineral conservation and scientific mining. Mineable Reserve of iron ore at cut-off grade of 55% Fe is only 66.66 million tons which is very low for a 50 years mining lease period with production plan of 5 MTPA. For the purpose Director of Mines, Odisha has issued a NOC to reduce the production of iron ore which is attached as Annexure XI. Excavation planning has been modified with respect to mining& dump locations and excavation quantities. The peak production in the approve mine plan is 5MTPA which is reduced to 2.95 MTPA of RoM in this modification. As the rated capacity of the steel plant is 5.6 MTPA, iron ore to the tune of 5.6 x 1.6= 8.96 MTPA is required for the plant out of which a quantity of 2.95 MTPA will be supplied from this mine after opening of the mine and the rest iron ore would be obtained from different mines of the Group.

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iii(**Logistics**)	Evacuation of 5-million-tonnes ore per annum with existing road rail network is difficult. Also planning for setting up conveyor belt or slurry pipeline with huge CAPEX is not feasible for this small deposit. Hence, the Suggested Ore Transport Mode would be SOTM3 as per recommendation by NEERI, since maximum production of RoM is capped at 2.95 MTPA (<3MTPA). *SOTM 3 (Between 1 and <3MTPA): Minimum 70% by public railway siding and maximum 30% by road -direct to destination or by other public railway siding or above options*
iv(**Exploration**)	Based on MCDR 2017 and MEMC 2015, the exploration proposal has been kept same as that of the approved mining plan excepting some minor changes in the locations of the proposed boreholes to bring the deposit under G1 category. Accordingly, the proposed depths have been deciphered from corresponding sections.
V **(Resurvey)**	As per the recent topographic survey, some changes have been made at relevant places including the surface plan.
7	The modified mining plan envisages the following production level during the initial five years of the mining lease: First Year – 1.01 million tons Second Year – 2.95 million tons Third Year – 2.95million tons Fourth Year – 2.95 million tons Fifth Year – 2.94 million tons
	Diversion of Forest Land
8	The area of the mining lease (to be granted) includes 42.608 ha of forest land. Village-wise break-up of forest land is as follows: Kalamang – 3.331 ha Ghodabudhani – 22.619 ha Gandhalpada – 16.658 ha --- **Total - 42.608 ha** Before execution of the lease this forest area needs to be diverted as per Forest Conservation Act, 1980 and is under process by the Preferred Bidder bearing State Sl. No.OR-031/2017, dtd.27.07.2017.

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	Environment Clearance
9	The highest production level production of iron ore being of the order of 2.95 million tons as has been projected in this mining plan for the plan period, the lessee will seek environment clearance for an annual production of 2.95 million tons per annum. Based on the EC the CtE and CtO will be taken by the company.
	Surface Right
10	The applicant will take necessary steps for grant of surface right over the entire area of the mining lease after of the lease deed.

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1.0 GENERAL

a) Name of the applicant/lessee/Rule 45 registration No. --

M/s Tata Steel BSL Ltd.

Nominated Owner- Mr Rajeev Singhal

POA Holder- Mr Manikanta Naik (Pl refer Annexure III & IV)

Address:

Regd Office:

Tata Steel BSL Limited,
Ground Floor, Mira Corporate Suites,
Plot No 1 & 2, Ishwar Nagar,
Mathura Road, New Delhi,
South Delhi, 110 065.

Tel; 90-11-39194000, Fax: 91-11-41010050

Email: tsbsl@tatasteel.co.in

Regional/Plant Office:

Office of Chief Corporate Service,
Narendrapur, PO-Kusupanga, Via- Meramandali,
Dist- Dhenkanal. 759 121, Odisha, India.
Tel +91 6762 300000, +91 6762 660002
Email: tatasteelbsl.co.in, ccs.office@tatasteelbsal.co.in
Website : www.tatasteelbsl.co.in

As the mining lease is yet to be granted and executed, the Applicant has no Registration under Rule 45 (1) of MCDR 2017.

b) Status of the applicant/Lessee – PublicLimited Company

c) Mineral(s) which is / are included in the prospecting license (for fresh grant)-Not applicable as it is an auctioned source for mining of iron ore.

d) Mineral(s) which is / are included in the letter of intent/lease deed – Iron ore

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

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f) Name of the Qualified person under Rule 15 of Minerals (Other than Atomic and Hydrocarbon energy minerals) Concession Rules, 2016.

Name - Chandrabhanu Das

Address - Geo Consultants Pvt. Ltd.,
Plot No-853, Gobinda Prasad (Medical Lane),
Infront of Reliance fresh (Radhika Complex),
Bhubaneswar-751006

Phone /Fax - 0674-2575702, Mobile -9437019019

Email - consultants_geo@yahoo.co.in

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2.0 LOCATION AND ACCESSIBILITY

a) Lease Details (the mining lease in respect of which letter of intent has been issued):

i) **Name of the mine**–Kalamang West (Northern Part) Iron Ore Mine over an area of 92.875 Ha. in village Kalamang, Ghodabudhani of Sundargarh District and village Gandhalpada of Keonjhar District, Odisha. ii) **Latitude and Longitude-** The block comes under SOI toposheet No 73G/5 and bounded by latitudes 21^0 56' 47.757" to 21^0 57' 32.347" and longitudes from 85^0 17' 06.658" to 85^0 17' 57.531".

iii) **Date of grant of lease**-The Steel and Mines Deptt., Govt. of Odisha, has issued Letter of Intent (LoI), vide their Letter No.IV(MISC)SM-53/2017/5285/SM, dtd.24.06.2017 as per Rule 10(2) of the Rules and an amendment for change of name of company to this effect vide their Letter No.1409/SM, Bhubaneswar, dtd. 27.02.2019 for grant of Mining Lease for Kalamang West (Northern Part) Iron Ore Block in village Kalamang, Ghodabudhani of Sundargarh District and village Gandhalpada of Keonjhar District over an area of 92.875 Ha.

iv) Period/ Expiry date: The mining lease is for a period of 50 years and would be valid from the date of registration of the lease deed.

v) Name of the leaseholder:

M/s Tata Steel BSL Ltd.

Nominated Owner- Mr Rajeev Singhal

POA Holder- Mr Manikanta Naik

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vi) Postal address:

Regd Office:

Tata Steel BSL Limited,
Ground Floor, Mira Corporate Suites,
Plot No 1 & 2, Ishwar Nagar,
Mathura Road, New Delhi,
South Delhi, 110 065.

Tel; 90-11-39194000, Fax: 91-11-41010050

Email: tsbsl@tatasteel.co.in

Regional/Plant Office:

Office of Chief Corporate Service,
Narendrapur, PO-Kusupanga, Via- Meramandali,
Dist- Dhenkanal. 759 121, Odisha, India.
Tel +91 6762 300000, +91 6762 660002
Email: tatasteelbsl.co.in, ccs.office@tatasteelbsal.co.in
Website : www.tatasteelbsl.co.in

b) **Details of applied/lease area with location map (Fresh area/ mine) :**

The Steel and Mines Deptt., Govt. of Odisha, has issued Letter of Intent (LoI), vide their Letter No.IV(MISC)SM-53/2017/5285/SM, dtd.24.06.2017 as per Rule 10(2) of the Rules and an amendment for change of name of company to this effect vide their Letter No.1409/SM, Bhubaneswar, dtd. 27.02.2019 for grant of Mining Lease for Kalamang West (Northern Part) Iron Ore Block in village Kalamang, Ghodabudhani of Sundargarh District and village Gandhalpada of Keonjhar District over an area of 92.875 Ha.

Forest (Ha.)		Non-Forest (Ha.)	
i) Deemed forest(DLC)	42.608 Ha.	i) Govt. land	29.687 Ha.
		ii) Private land	20.580 Ha.
Total	**42.608 Ha.**	**Total**	**50.267 Ha.**

(Please refer Land Schedule as Annexure VI)

Location map has been submitted as Plate No I.

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Total lease/applied area - 92.875 Ha.

District and State– Keonjhar & Sundargarh, Odisha.

Sub-division - Champua Sub-Divn. of Keonjhar District & Bonai Sub-Divn. of Sundargarh District

Tahasil – Badbil Tahasil of Keonjhar District and Bonai Thasil Of Sundargarh District

PS –Badbil PS of Keonjhar District & Koira PS of Sundargarh District

Village - Kalamang, Ghodabudhani of Sundargarh District and village Gandhalpada of Keonjhar District

Whether the area falls under Costal regulation Zone (CRZ)? If yes, details there of – No.

Existence of public road/railway line, if any nearby and approximate distance– The area is situated at a distance of 8 km west of the nearest town, Koira. Koira is the block head quarter of Sundargarh District of Odisha. Koira town lies by the side of National Highway No. 215 connecting Panikoili- Rajamunda with Rourkela and the highway passes via Kendujhar, Joda, Badbil and Koira. The State capital Bhubaneswar is at a distance of 360 kms by road from Koira. The nearest rail head is at Banspani Railway Siding, which is 25 km away from the area. Brabli Railway station is at a distance of 30 km from the said area, lying on Tatanagar Badbil section of the South-Eastern railway.

Toposheet No. with latitude and longitude of all corner boundary point/pillar-

Toposheet No. - Toposheet no 73G/5.

The co-ordinates (Latitude & Longitude) of the boundary pillars area as follows:

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Pillar Number	Latitude	Longitude	Easting	Northing
A	21° 56' 50.038"	85° 17' 21.453"	323335.02	2427972.33
B	21° 56' 53.352"	85° 17' 27.449"	323508.23	2428072.33
C	21° 56' 47.757"	85° 17' 31.002"	323608.23	2427899.12
D	21° 56' 57.698"	85° 17' 48.993"	324127.84	2428199.12
E	21° 56' 52.104"	85° 17'52.545"	324227.84	2428025.92
F	21° 56' 54.858"	85° 17' 57.531"	324371.85	2428109.06
G	21° 56' 58.284"	85° 17' 57.123"	324361.31	2428214.56
H	21° 57' 07.891"	85° 17' 51.021"	324189.5	2428511.97
I	21° 57' 08.637"	85° 17' 52.526"	324232.95	2428534.44
J	21° 57' 11.905"	85° 17' 49.264"	324140.48	2428635.98
K	21° 57' 11.378"	85° 17' 39.788"	323868.43	2428622.79
L	21° 57' 11.829"	85° 17' 36.452"	323772.85	2428637.72
M	21° 57' 12.522"	85° 17' 33.720"	323694.72	2428659.92
N	21° 57' 12.918"	85° 17' 30.930"	323614.81	2428673.01
O	21° 57' 18.007"	85° 17 '33.752"	323697.5	2428828.61
P	21° 57' 18.974"	85° 17' 34.219"	323711.25	2428858.18
Q	21° 57' 22.143"	85° 17' 36.009"	323763.69	2428955.09
R	21° 57' 25.352"	85° 17' 37.805"	323816.32	2429053.2
S	21° 57' 30.047"	85° 17' 40.391"	323892.11	2429196.78
T	21° 57' 32.347"	85° 17' 41.645"	323928.88	2429267.13
U	21° 57' 13.308"	85° 17' 06.658"	322918.56	2428692.76
V	21° 57' 09.619"	85° 17' 09.019"	322985.02	2428578.55

c) **Location Map with access routes: -**

Location map (Key Plan) of the area on 1: 50,000 scale has been enclosed vide Plate No. I.

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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 was prepared in partial fulfilment of the terms and conditions of the letter of intent issued by Government of Odisha vide letter No. 5285/SM dt.24.06.2017 for grant of mining lease. The above said mining plan was approved by IBM, Bhubaneswar vide letter No MP/OTFM/09-ORI/BHU-17-18 dated 31.08.2017 (Annexure V).

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

Does not arise

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

The first mining plan of the area was approved by vide letter no-MP/OTFM/09-ORI/BHU-17-18 by IBM Bhubaneswar on dated 31.08.2017 for five years.As the Mining Lease is yet to be executed no mining or allied activities have been undertaken within the area. Hence, review of proposals does not arise.

3.4 Status of compliance of violation pointed out by IBM-

Nil.

3.5 Details of any suspension/closure/prohibitory order issued by any Government agency under any rule or court of law. -

Does not arise, since mining operation has not been commenced in the area.

3.6 In case the MP/SOM is submitted under rule 17(3) of the Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016 for approval of modification, reason and justification for modification under these rules.-

The approved mining plan is being submitted now under rule 17(3) of the Minerals (Other than Atomic and Hydro Carbons Energy Minerals)

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Concession Rules, 2016 for approval of modification. The reasons of modification are as follows:

i **(Change in the name of the lessee)**	The Government of Odisha had issued Letter of Intent (LoI) for grant of Mining Lease for Kalamang West (Northern Part) Iron Ore Block in village Kalamang, Ghodabudhani in District Sundargarh and village Gandhalpada in District Keonjhar over an area of 92.875 ha to M/s Bhushan Steel Limited for captive use. Now Tata Steel BSL Ltd being a subsidiary of Bamnipal Steel limited has taken ownership of M/s Bhushan Steel Limited. So the name of the Preferred Bidder mentioned in the approved mining plan has to undergo change in the name of Tata Steel BSL Ltd.
ii**(Production planning)**	Previously when it was Bhushan Steel Ltd, planning was made in the approved mining plan for maximum production from the mines at 5MTPA (Annexure V). Now Tata Steel BSL Ltd, being a subsidiary of Bamnipal Steel limited is already fed by other captive mines of Tata Steel. The production planning in Kalamang mine needs to be done in such a manner that best product mix can be optimized for ullimate use in the plant in a sustainable manner. Kalamang ore contains high silica with an average of 5% SiO2 which is deleterious to the steel plants. This can be mitigated by blending the high siliceous ore of this mine with low silica ore from other mines of Tata Steel at required proportion at the end use plant site and accordingly the production plan has been prepared keeping in view of mineral conservation and scientific mining. Mineable Reserve of iron ore at cut-off grade of 55% Fe is only 66.66 million tons which is very low for a 50 years mining lease period with production plan of 5 MTPA. For the purpose Director of Mines, Odisha has issued a NOC to reduce the production of iron ore which is attached as Annexure XI.

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	Excavation planning has been modified with respect to mining & dump locations and excavation quantities. The peak production in the approve mine plan is 5MTPA which is reduced to 2.95 MTPA of RoM in this modification. As the rated capacity of the steel plant is 5.6 MTPA, iron ore to the tune of 5.6 x 1.6= 8.96 MTPA is required for the plant out of which a quantity of 2.95 MTPA will be supplied from this mine after opening of the mine and the rest iron ore would be obtained from different mines of the Group.
iii**(Logistics)**	Evacuation of 5-million-tonnes ore per annum with existing road-rail network is difficult. Also planning for setting up conveyor belt or slurry pipeline with huge CAPEX is not feasible for this small deposit. Hence, the Suggested Ore Transport Mode would be SOTM3 as per recommendation by NEERI, since maximum production of RoM is capped at 2.95 MTPA (<3MTPA). *SOTM 3 (Between 1 and <3MTPA): Minimum 70% by public railway siding and maximum 30% by road -direct to destination or by other public railway siding or above options*
iv**(Exploration)**	Based on MCDR 2017 and MEMC 2015, the exploration proposal has been kept same as that of the approved mining plan excepting some minor changes in the locations of the proposed boreholes to bring the deposit under G1 category. Accordingly, the proposed depths have been deciphered from corresponding sections.
V **(Resurvey)**	As per the recent topographic survey, some changes have been made at relevant places including the surface plan.

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PART-A

1.0 GEOLOGY AND EXPLORATION

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

a.1 Topography- The area is a highly rugged terrain with elongated hills trending in ENE-WSW direction, low mounds and narrow valleys. The highest elevation is 690mabove MSL forms the ridge and the lowest elevation is 585 m above MSL, which forms the valley floor in this block.

a.2 Drainage pattern-

A dendritic type of drainage pattern is generally displayed by the area. Because of the hilly topography, there is only one seasonal drainage channel found in the western part of the area. Suna nadi is a perennial river flowing from South to North outside the area at a distance of 2km in the South-East and it becomes West-East from Malda and debouch into river Baitarani. The drainage channel originating in the western part of the area traverses through the area towards South.

a.3 Vegetation - The forest growth available is the Northern Tropical Dry Deciduous Forests. Sal is the most dominant tree with Mahul, Asun, Char, Kendu, Barkoli, Kusum, Dimiri etc. as common associates. The leasehold area contains 42.608 Ha of forest land.

a.4 Climate-The leasehold area lies in tropical region where climate is characterized by very hot summer and cool winter. Summer is typically from April to July when monthly temperature ranges from a maximum of 42^{0}C during day time to a minimum of 15^0 C at night. Winter is from November to February when the maximum temperature during day goes up to 37^0 C and minimum temperature at night becomes as low as 8^{0}C.

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a.5 Rainfall data-The average rainfall recorded at IMD observatory at Keonjhar is 1269.1mm. The south-west monsoon lasts from mid-June to mid-September and the area gets more than 80% of the annual rainfall during this period.

b. Brief description of Regional Geology with reference to location of lease/applied area;

Regional geology - The inter-relationship between the different formations has been updated by several workers since it was originally profounded by Jones and Dunn.

(b.1) Regional stratigraphy-

The regional stratigraphic sequence of South Singhbhum & Bonai area is as follows:-

The Stratigraphy as per Murthy and Acharya (1975) is given below:

Kolhan Group	Sandstone, Conglomerate, Breccia
----------Unconformity----------	
Mixed Facies Formation	Basic Lava, tuffs and tuffites of Volcanic facies Iron , Manganese, lenses of iron formation , chert, small dolomite patches of chemical facies, Minor lenses of sandy and silty shale of clastic facies
Banded Shale Formation	Banded shale member Black shale member Black shale-chert member
Koira Group	
Banded Iron Formation	Finely banded Jaspilite member Coarsely banded Jaspilite member
VolcanicFormation	Tuffaceous shale Basic lava

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Basal sandstone, Gritty sandstone, Iron Conglomeratic at places with inter-bedded lava at top

----------Unconformity----------

Singhbhum Granite with enclaves of older meta-basic and meta-sedimentary rocks.

(b.2)Regional Structural Set-up-

The horse-shoe shaped iron ore deposits of Joda-Koira sector form a northerly plunging synclinorium. The hill ranges broadly delineate the folded limbs of the synclinorium. Superimpositions of several phases of deformations in the area have resulted in a complex fold system.

(b.3) Mineralization

The closure and both the eastern and western limbs of the geosynclines, spreading over 60 km of length and 20 km of width, have resulted in enrichment of the richest Iron Ore deposits in the country in Bonai-Keonjhar-Singhbhum belt. The manganese deposits are preserved in its cores in the hill slopes and valleys. Besides, there are also economic mineral deposits like bauxite in peneplained hill top in both Eastern and Western limbs of the synclinorium.

c. Detail description of Geology of the area such as shape and size of mineral/ore deposit, disposition of various litho-units indicating structural features, if any etc.

Local Geology - The local stratigraphic succession as worked out in the study area tentatively belongs to Upper Shale Formation [of Murthy & Acharya (1975)] and is given as below and shown in the compiled Geological Map (Plate No.IV).

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Local Stratigraphy as encountered in the area:

Group/ Formation	Lithology
Recent	Soil/ Alluvium cover
Cenozoic	Laterites (Fe-Laterite)
Upper Shale Fromation	Ferruginous Shale Unit: Shale of different coloration like pink, cream and yellow, variegated with inter beds of Iron ore.
	Iron Ore Unit: powdery ore, soft laminated Ore (SLO) and Hard laminated Ore/ Lateritised Hard Laminated Ore with shaly intercalation
	Shale (mainly yellowish limonitized variegated/ cherty/ tuffaceous Shale)
BIF Formation	BIF (BHJ/BHQ/BHC and chert), coarsely banded jaspellite followed up by finely banded jaspellite.

Description of rock types:

The various litho types observed in the course of large scale and detailed mapping in the area are BHJ, ferruginous shale, banded shale, iron ore, lateralized hard laminated ore, laterite/ Fe-laterite, float ore and soil.

(i) Banded Iron Formation

The 'Banded Iron Formation' is represented by BHJ (Banded Hematite jasper)/BHQ (Banded Hematite Quartzite)/ BHC (Banded Hematite Chert), inter- bedded black or green shale and banded ferruginous chert. The BHJ/BHQ mostly exposed south of the present area serve as an important marker horizon. Major iron ore bodies are closely associated with these litho-units. Megascopically, BHJ/BHQ comprises alternate bands (laminations less than 5mm thick) of hematite and dark brown to red jasper/ white or grey quartzite. Near Kolamang village, BHJ in isolated pockets and is highly brecciated, ferrugenised with presence of numerous thin quartz veins.

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BHJ bands within the synclinal valley are exposed around Gandhamadi village. They are discontinuously exposed along strike for a maximum length of 100m in a single outcrop. The BHQ bands in the valley area are affected by shearing showing unevenness of the jasper bands. Megascopically, the individual jasper bands /laminations are seen to be much thicker as compared to that of the iron oxide rich bands / laminations within the BHJ. The jasper contains small discrete aggregates of quartz, opaque grains and ferruginous materials. The quartz occurs as anhedral to subhedral grains. Hematite forms anhedral grains and masses. Thickness of BIF varies from 0.2m (OSKN-19)to 68.35m (SKN- 18).

(ii) Ferruginous Shale (Fe-shale):

It is represented by a finely laminated rock having varied shades of colour ranging from white, maroon, dark gray, brownish and purple to green etc. The colouration of the shale is largely dependent on the mineral composition (Murthy & Acharya, 1975). It is mostly composed of clayey micaceous minerals mainly sericite and occasional presence of biotite along the fracture or slip plane, with lenses of chert. The lower shale is brownish in colour and rich in iron and very often contains intercalated bands of chert. The upper shale contains several unmappable units such as carbonaceous shale, banded shale, sandy claystone, shales and mudstones etc. The brownish red coloured ferruginous and banded shale units also include inter-bands of BIF. Most of the area containing this unit is lateritised extensively. In Kalamang area, laterite is mostly rich in iron. Thickness of shale varies from 2.0m (OSKN-56)to 102.4m (SKN- 13).

(iii) Iron ore:

The thinly laminated, Hematitic ore bodies exposed in the area are very often lateritised near surface. However, in-situ boulder outcrops of hard and soft laminated, massive ores ore found at the identified blocks. 'Canga' zones occur near to the iron ore bodies within the hard

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lateritised duricrust and contain mostly iron ore floats. At places like iron, mostly Hard Laminated Ore (HLO) is partly or heavily lateritized developing the lateritised iron ore/ lateritised HLO. The thickness of the ore zone varies from 6.30 m in SKN-4 to 135.10 m in OSKN-25 including low grade ore zone.

(iv) Laterites:

South-western, South-eastern and north-western part of the area is covered by laterite of various types. The laterite has developed mostly over the shale unit of the area and depending upon the composition of the shale, different types of laterite have developed. Lateralisation has also taken place over the iron ore body also. Thickness of laterite varies from 7.1m (OSKN-39)to 7.0m (SKN- 16).

(v)Alluvial soil:

The low lying areas are filled up with alluvial soil. It is ferruginous in nature and reddish brown in colour in most of the covered area; but grey to light brown coloured soil is also observed over the cultivable land. In most of the area, the soil is moderately coarse in nature whereas it is loamy in the cultivation land. Since the area is devoid of any perennial nala or river, the soil has been deposited in the valley area mostly from the low order nala or from the slope wash of the nearby hillock occupied by the Iron Ore Group of rocks. Thus it has been derived mainly from is upper reach source rocks like BIF, iron ferruginous shale ore laterite, which controls the characteristics of the soil. Thickness of soil/lateritic soil varies from 0.5m (OSKN-57) to 16m (OSKN- 46).

c.1 Structure:

The primary sedimentary structures are prominent in the BHJ and BHQ, which includes banding, bedding, ripple mark, linear markings etc. The laminated ore body mostly shows banding and folds similar to the underlying BHJ and BHQ.

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Bedding is the prominent structure with B.I.F, as well as in the litho members of Upper shale sequence in this area and is characterized by color banding as well as compositional banding (in BHJ). The attitude of S_0 is measured as 40°-220°/ 25°NW, whereas S_1 is measured as 50°-230°/ 60°NW, i.e. the strike of S_0 is almost parallel to S_1; S_2 is observed in the form of crenulations cleavage as well as axial planar cleavage in the mesoscopic antiformal closure of the D_2 fold, measured as 160°-340°/75° NE. Joints and fractures are well developed within the BHJ, along which both silicification, as well as ferruginisation is reported.

Surface indication of mineralization is continuous except some lateritisation, soil formation or minor alteration along the strike of the ore body in the northern ridge. The ore body is exposed either as insitu in some places or as fragmentary ore forming the local anticlinal dome with NE-SW trend (Plate – IV). The ore body is going down towards north westerly below the upper shale horizon following the regional dip. Extensive lateritization has taken place over the mineralized zone as well as over the shale. The float ore is present along the fringes of the pediment part in this block. In extreme south western part of the block, a small ore body is exposed in continuation with the adjacent Ghorhaburhani block

d. i) Name of the prospecting/exploration agency-

Geological Survey of India

ii) State Unit Odisha, Bhubaneswar. CRP - DAV Rd, near passport office, Nilakantha Nagar, Nayapalli, Bhubaneswar, Odisha 751012

iii) Email and Tel: ddg.suod@gsi.gov.in, 0674 2562565

e. Details of prospecting/exploration already carried out-

(e.1) Geological mapping:

Detailed geological mapping on 1:2000 scale in Kalamanga West Block was carried out. Detailed mapping was carried out by using Total station, DGPS and Theodolite. During the detailed mapping, the base line was fixed parallel to the regional trend of the ore body i.e. N60°E-S60°W by considering the topographical features as well as ore geometry. The strike parallel grid lines were placed at 100 m interval. The cross section

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lines were laid at 100m interval perpendicular to the base line. These are named as W-1, W-2,W-3 to W-10.

The Exploration for iron ore in Kalamang west Block (northern part) was carried out in G-2 stage (prospecting) under G-axis of UNFC classification. In this stage, exploration involves systematic process of searching for a mineral deposit by narrowing down areas of promising enhanced mineral potential. The iron ore deposit in this block characteristically belongs to stratiform and tabular/ folded deposit of irregular habit of UNFC category. The methods adopted are outcrop identification, geological mapping, petrographic/ mineragraphic studies, technological studies like drilling and pitting & trenching and indirect methods such as geochemical studies. Limited pitting and trenching, drilling and sampling have been carried out to understand the geometry of the ore disposition. The objective was to identify the deposit which would be target for further exploration. Estimated quantities are indicated based on interpretation of geological and geochemical results.

(e.2) Contouring by M/s Geo Consultants Pvt Ltd.

The entire area was surveyed again in RF 1:2,000 by the consulting Geologist along with his survey team through total station so as to make a very comprehensive Mine Planning & future excavation program.. For the purpose the RL was carried from a nearby point and a bench mark was fixed at boundary point B of the ML area, the RL of which is 599.30m. After acquisition of the area by Tata Steel BSL Ltd, the total area was resurveyed including the borehole points and based on the acquired data, contouring of the area has been modified. In the process, the collar RLs mentioned for boreholes drilled by GSI vary with the present contouring. For the purpose of calculation of resource/reserve, cross-sections have been prepared considering the presently surveyed RLs and contours.

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

Information on the sub-surface behavior i.e. both vertical and lateral persistency of the iron ore bodies of the mapped area was obtained through trial excavation i.e., pitting and trenching on location between two discontinuous ore bodies covered with float ore zone by GSI. A total of 50 cum. of excavation was made based on favourable surface indications out of which 25 cum was carried out in the overall large scale mapping (LSM) area and rest 25 cu m was carried out in detailed mapping (DM) area. However, none of them falls inside the auctioned block boundary.

(ii)Number of boreholes indicating type (core/RC/DTH), diameter, spacing, inclination, collar level, depth etc with standard borehole log duly marking on Geological Plan/sections:

Drilling of boreholes plays a vital role in mineral exploration, especially at the stage of establishment of the dimension of an ore deposit. In present area of investigation, rotary core drilling method was used by GSI to drill the boreholes for better recovery of the core for further chemical and technical studies. In case of soft formation like shale, powdery ore, SLO dry drilling with TC bit was adopted carried out to ensure better core recovery. Wet drilling with diamond impregnated bit was used where hard formations like HLO, BHJ/BHQ/BHC, and chert etc are encountered.

A total of 75 coring boreholes have been drilled by GSI within the block. Summary of the drilling is as below:

Total No of boreholes drilled by GSI	Grid interval (m x m)	Maximum depth of drilling(m)/ BH No	Minimum depth (m)/ BH No	Level of exploration
79 out of which 4 namely OSKN 44, 47, 48 & 51 could not be drilled.	100 x 100	151m / OSKN 26	45.8m/ OSKN 50	G2

Borehole logs have been annexed as Annexure XIII.

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The details of category wise explored area are as below:

Total Lease area (in Ha.)- 92.875						Remarks/Com-ments including reasons for not carrying out the exploration as per UNFC Norms.
Item of Information	Lease area explored as per UNFC norms (in Ha.) as on 25.07.20					
	Total lease area- A + B + C + D + E					
	G1 Level	G2 Level	G3 Level	Non-mineralised area (Ha) with level of exploration	unexplored area	
	A	B	C	D	E	F
Area as per level of exploration	-	92.875	-	12.028 (G2)	Nil	This is an auctioned block explored by GSI in G2 category. Future exploration has been proposed in 50m x 50m grid to bring the block to G1 category.
No of BHs drilled	-	75	-	10	-	
No of BHs considered for resource	-	65	-	10	-	
Meterage drilled	-	4707.25	-	679.4	-	
Grid Interval	-	100m x 100m	-	100m x 100m	-	
Scale of Mapping	-	1:2000	-	1:2000	-	
Reserve estimated after above exploration as on 25.07.2020						71.89 million ton
Remaining Resource estimated after above exploration as on 25.07.2020						92.97 million ton
Total Resource/Reserve estimated after above exploration as on 25.07.2020						Nil

(iii)Details of sample analysis indicating type of sample (surface/sub-surface from pits/trenches/boreholes etc):

The area has been explored by GSI mainly through core drilling in a grid pattern of 100m x 100m excepting some grid points. Core samples of these boreholes from the mineralized zone have been analysed by GSI and has been annexed as Annexure XI.

(iv) Expenditure incurred in various prospecting operations:

The total area has been explored departmentally by GSI.

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 10m depending upon the topography and size of the area duly marked by grid lines showing all features indicated under Rule 32 (1) (a) of MCDR 2017.

Surface plan (Plate No III) has been prepared in 1:2000 scale with contour intervals of 5 m. All existing surface features have been depicted

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in the plan. For reference, local grid as well as UTM grids have been shown in the plan.

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 explorations already carried out along with supporting data for existence of mineral, locations of proposed exploration, various litho-units along with structural features, mineralised/ore zone with grade variation if any, may be marked on Geological plan along with other features indicating under Rule 32 (1)(b) of MCDR 2017.**

Geological Plan depicting all surface and geological features has been prepared in 1:2000 scale (Plate IV).

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

A total of 10 cross-sections across the trend of the ore body at interval of 100 m and one longitudinal section have been prepared from boundary to boundary of the ML area.

Findings of exploration:

The findings of exploration carried out so far are as follows:

i) One considerable thick high grade iron ore (average 61.80%Fe) band in the form of hard laminated ore (HLO), lateritized and fragmented ore is exposed at northern part of the explored area and it continues up to 133.70m depth. The same ore body is further extended in the same trend towards the Gandhalpada South-east and already mined by the earlier lessee M/s KJSA at its north and eastern part.

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ii) The strike of the ore band is 60⁰ to 240⁰ and dip is varying gently to steep (15⁰ to 55⁰) at places depending on the superposition of folds. Overall the interference of folding in the BIF gives a pattern of dome and basin structure. Therefore, gradually the band has gone down towards south as well as north (towards Gandhalpada South-east) following the regional folding pattern of the area. The strike length of the ore body is 900m and across the strike, the length of the ore body is 600m as exposed in the surface and interpreted as intersected in the boreholes within the area.

iii) Further in the southern part of the area, high grade zone (average 61.5% Fe) has been intersected through borehole. The ore zone consists of mainly powdery ore, soft and hard laminated ore and occasionally hard lateritised ore intercalated with variegated shale and ferruginous shale. It has a strike length of 700m and across the strike, the length of the ore body is 200m.

iv) Mineralization of iron ore is controlled both by stratigraphically and structurally in this belt. The iron ore mineralization in this area is stratiform and is associated with banded iron formations/ shale formation of Precambrian age (Late Archaean to Early Proterozoic age). The iron ore bands are found as alternate layers within the ferruginous shale at the top and bottom of the ore zone. Also the bottom of the ore zone is sometimes terminated at as well as occurred with the intercalated sequence of BFC/BHJ/BHQ/Chert. Structurally the disposition is mainly deciphered by pinch and swell structure both along and across the strike due to superposition of F2 & F3 folds, which has led to elongated dome and basin structure and it controls the iron ore deposits in this belt.

v) The total resource estimated by rule of nearest point under cross section method at 45% Fe cut-off is 92.97 million tons with 60.72% total Fe over an area of 0.92 sq. km. The strike length of the ore body is 900m and the resource has been estimated up to a maximum depth of 149.80m.

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vi) Out of 0.929 sq. km area,, 0.809sq.km area is mineralized area and 0.120sq.km is non-mineralized area

vii) As per UNFC guidelines, the resource estimated may be considered as 'Indicated Resource' confirming to G2 level of exploration.

viii)The outcome of the calculation is as below:

Level of Exploration	Resource in million tons	Grade
G1- Detailed exploration	Nil	-
G2- General exploration	84.26	>55% Fe
	8.71	45-55% Fe
	92.97	**Total**
G3- Prospecting	Nil	-
G4- Reconnaissance	Nil	-

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

The status of exploration already carried out by GSI in the area is categorized in G2 level. The geological information so generated is sufficient for successful conduct of mining operation in the area. However, to bring the exploration to G1 category, the total area has been geologically mapped in 1:2000 and proposal of exploratory drilling has been proposed in 50m x 50m grid in line with Rule 12(3) of MCDR, 2017 and the already approved mining plan. In the process, a total of 216 coring/RC boreholes are proposed in the last four years of the present plan period as mentioned below to bring the exploration to G1 category. The depth mentioned against each borehole has been extrapolated from corresponding cross-section and may vary during actual drilling based on observations and will be continued till the end of mineralisation. The total area has been proposed to be covered in 50m x

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50 m grid drilling. Samples of these proposed boreholes would be chemically analysed for Fe content by NABL accredited laboratories.

FUTURE EXPLORATION PROGRAMME

YEAR	BH ID	NORTHING	EASTING	COLLAR RL (m)	DEPTH (m)	GRID (m X m)
2ND YEAR	BH-1	2429191	323856	686.8	100	50 x 50
	BH-2	2429164	323814	687.2	100	50 x 50
	BH-3	2429111	323729	688.4	70	50 x 50
	BH-31	2429069	323756	692.2	170	50 x 50
	BH-32	2429096	323798	690.7	105	50 x 50
	BH-33	2429122	323841	695	100	50 x 50
	BH-34	2429027	323783	692.4	100	50 x 50
	BH-135	2428164	323264	603.5	100	50 x 50
	BH-136	2428191	323306	601.7	90	50 x 50
	BH-137	2428218	323348	598.8	80	50 x 50
	BH-159	2428176	323375	598.8	150	50 x 50
	BH-160	2428122	323291	603.5	150	50 x 50
	BH-175	2428038	323344	599.5	90	50 x 50
	BH-188	2428351	324211	586.4	90	50 x 50
	BH-189	2428244	324042	589.5	90	50 x 50
	BH-204	2428282	324196	580	110	50 x 50
	BH-205	2428309	324238	590.7	90	50 x 50
	BH-207	2428266	324265	589.4	90	50 x 50
	BH-209	2428171	324207	596.6	90	50 x 50
	BH-212	2428182	324318	593.4	80	50 x 50
3RD YEAR	BH-4	2429057	323645	679.5	70	50 x 50
	BH-5	2429004	323560	666.2	90	50 x 50

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BH-6	2428950	323476	663.4	90	50 x 50
BH-7	2428897	323392	658.8	100	50 x 50
BH-8	2428843	323307	649.8	100	50 x 50
BH-9	2428790	323223	626.1	110	50 x 50
BH-10	2428736	323138	616.6	110	50 x 50
BH-11	2428683	323054	614.7	100	50 x 50
BH-12	2428629	322969	612.5	100	50 x 50
BH-13	2428586	322994	611.2	45	50 x 50
BH-14	2428614	323038	609.4	100	50 x 50
BH-15	2428640	323081	610.3	82	50 x 50
BH-16	2428667	323123	614	90	50 x 50
BH-17	2428694	323165	625	75	50 x 50
BH-18	2428721	323207	630.7	110	50 x 50
BH-19	2428747	323250	634.6	27	50 x 50
BH-20	2428774	323292	638.6	130	50 x 50
BH-21	2428801	323334	645.8	90	50 x 50
BH-22	2428828	323376	649.4	130	50 x 50
BH-23	2428854	323418	652.2	80	50 x 50
BH-24	2428881	323461	654	130	50 x 50
BH-25	2428908	323503	657.6	90	50 x 50
BH-26	2428935	323545	661.7	105	50 x 50
BH-27	2428962	323587	671	150	50 x 50
BH-28	2428988	323630	676.7	95	50 x 50
BH-29	2429015	323672	684.2	130	50 x 50
BH-30	2429042	323714	690	75	50 x 50
BH-35	2428973	323699	685.8	130	50 x 50

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BH-36	2428919	323614	668	130	50 x 50
BH-37	2428866	323530	651.8	90	50 x 50
BH-38	2428812	323445	648.1	80	50 x 50
BH-39	2428759	323361	644.2	90	50 x 50
BH-40	2428705	323276	634.7	30	50 x 50
BH-41	2428652	323192	616.2	90	50 x 50
BH-42	2428598	323107	608	70	50 x 50
BH-43	2428545	323023	606.2	90	50 x 50
BH-44	2428502	323050	608.5	100	50 x 50
BH-45	2428529	323092	607.3	100	50 x 50
BH-46	2428556	323134	607.9	110	50 x 50
BH-47	2428583	323176	608	75	50 x 50
BH-48	2428609	323219	611.8	100	50 x 50
BH-49	2428636	323261	620.1	115	50 x 50
BH-50	2428663	323303	635	100	50 x 50
BH-51	2428690	323345	640.2	85	50 x 50
BH-52	2428717	323387	641.2	100	50 x 50
BH-53	2428744	323430	642	115	50 x 50
BH-54	2428770	323472	640.8	100	50 x 50
BH-55	2428797	323514	643.3	90	50 x 50
BH-56	2428824	323556	651.3	90	50 x 50
BH-57	2428851	323599	664.1	95	50 x 50
BH-58	2428877	323641	675.2	70	50 x 50
BH-59	2428904	323683	682.2	75	50 x 50
BH-60	2428931	323725	687.6	100	50 x 50
BH-61	2428862	323710	681.7	75	50 x 50

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		BH-62	2428835	323668	672.3	90	50 x 50
		BH-63	2428808	323625	658.2	75	50 x 50
		BH-64	2428782	323583	642.2	70	50 x 50
		BH-65	2428729	323499	628	100	50 x 50
		BH-66	2428674	323414	633.8	100	50 x 50
		BH-67	2428621	323330	631.2	100	50 x 50
		BH-68	2428567	323245	616.1	90	50 x 50
		BH-69	2428514	323161	601.7	100	50 x 50
		BH-70	2428460	323076	616.2	100	50 x 50
		BH-71	2428418	323103	612.8	80	50 x 50
		BH-72	2428445	323145	606	70	50 x 50
	4TH YEAR	BH-73	2428471	323188	601.8	80	50 x 50
		BH-74	2428498	323230	607.7	60	50 x 50
		BH-75	2428525	323272	614.2	80	50 x 50
		BH-76	2428552	323314	621	75	50 x 50
		BH-77	2428579	323357	625.7	100	50 x 50
		BH-78	2428605	323399	625.2	100	50 x 50
		BH-79	2428632	323441	622.5	100	50 x 50
		BH-80	2428659	323483	617.2	100	50 x 50
		BH-81	2428686	323525	615.1	105	50 x 50
		BH-82	2428712	323568	626.2	55	50 x 50
		BH-83	2428739	323610	624.8	90	50 x 50
		BH-84	2428670	323594	630	70	50 x 50
		BH-85	2428643	323552	615.8	90	50 x 50
		BH-86	2428590	323468	613.8	70	50 x 50
		BH-87	2428536	323383	619.2	70	50 x 50

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BH-88	2428483	323299	613.4	100	50 x 50
BH-89	2428429	323214	608	100	50 x 50
BH-90	2428376	323130	608.8	90	50 x 50
BH-91	2428333	323157	606.7	100	50 x 50
BH-92	2428360	323199	604.3	100	50 x 50
BH-93	2428387	323241	599.2	100	50 x 50
BH-94	2428414	323283	602.9	60	50 x 50
BH-95	2428441	323326	609	100	50 x 50
BH-96	2428467	323368	611.3	80	50 x 50
BH-97	2428494	323410	610	100	50 x 50
BH-98	2428521	323452	608.9	100	50 x 50
BH-99	2428548	323494	608.7	100	50 x 50
BH-100	2428574	323537	606.4	105	50 x 50
BH-101	2428601	323579	612.8	105	50 x 50
BH-102	2428628	323621	624.5	100	50 x 50
BH-103	2428655	323663	624.7	110	50 x 50
BH-104	2428639	323732	622	135	50 x 50
BH-105	2428613	323690	617.7	80	50 x 50
BH-106	2428559	323606	613.1	90	50 x 50
BH-107	2428505	323521	604.2	90	50 x 50
BH-108	2428452	323437	605.8	100	50 x 50
BH-109	2428398	323352	604.5	100	50 x 50
BH-110	2428345	323268	600.5	130	50 x 50
BH-111	2428291	323183	604.2	135	50 x 50
BH-112	2428249	323210	603.3	130	50 x 50
BH-113	2428276	323252	602	70	50 x 50

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	BH-114	2428302	323295	600.5	130	50 x 50
	BH-115	2428329	323337	596.5	65	50 x 50
	BH-116	2428356	323379	599.2	110	50 x 50
	BH-117	2428383	323421	601.1	90	50 x 50
	BH-118	2428410	323464	603.2	90	50 x 50
	BH-119	2428436	323506	600.7	145	50 x 50
	BH-120	2428463	323548	602	100	50 x 50
	BH-121	2428490	323590	605	120	50 x 50
	BH-122	2428517	323633	607.2	100	50 x 50
	BH-123	2428544	323675	608	140	50 x 50
	BH-124	2428570	323717	610.7	100	50 x 50
	BH-125	2428599	323758	614.8	135	50 x 50
	BH-126	2428609	323871	616.1	100	50 x 50
	BH-127	2428582	323828	611.8	100	50 x 50
	BH-128	2428528	323744	604.2	100	50 x 50
	BH-129	2428475	323659	602.9	100	50 x 50
	BH-130	2428421	323575	599.2	100	50 x 50
	BH-131	2428367	323490	598.7	100	50 x 50
	BH-132	2428314	323406	597	100	50 x 50
	BH-133	2428260	323321	598.6	100	50 x 50
	BH-134	2428207	323237	603.3	100	50 x 50
	BH-138	2428245	323390	597.7	70	50 x 50
	BH-139	2428271	323433	594.8	105	50 x 50
	BH-140	2428298	323475	595.8	100	50 x 50
5TH YEAR	BH-141	2428325	323517	593.2	160	50 x 50
	BH-142	2428352	323559	594.9	155	50 x 50

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BH-143	2428379	323602	596.2	150	50 x 50
BH-144	2428406	323644	597.8	140	50 x 50
BH-145	2428432	323686	597.4	160	50 x 50
BH-146	2428459	323728	598	150	50 x 50
BH-147	2428486	323770	597.8	145	50 x 50
BH-148	2428513	323813	599.4	135	50 x 50
BH-149	2428539	323855	602.5	105	50 x 50
BH-150	2428566	323897	605	100	50 x 50
BH-151	2428604	324051	599.7	100	50 x 50
BH-152	2428551	323966	597.8	100	50 x 50
BH-153	2428407	323882	593.2	100	50 x 50
BH-154	2428444	323797	592.8	100	50 x 50
BH-155	2428390	323713	594.4	100	50 x 50
BH-156	2428337	323628	593.8	100	50 x 50
BH-157	2428283	323544	594.5	100	50 x 50
BH-158	2428229	323459	597	100	50 x 50
BH-161	2428375	323782	590	135	50 x 50
BH-162	2428401	323824	587.8	130	50 x 50
BH-163	2428428	323866	589.6	125	50 x 50
BH-164	2428455	323908	586.5	105	50 x 50
BH-165	2428482	323951	589.4	95	50 x 50
BH-166	2428508	323993	588.8	100	50 x 50
BH-167	2428535	324035	589.1	90	50 x 50
BH-168	2428562	324077	589.8	90	50 x 50
BH-169	2428589	324120	580.8	90	50 x 50
BH-170	2428520	324104	587.7	90	50 x 50

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BH-171	2428467	324020	587.8	90	50 x 50
BH-172	2428413	323935	590.4	90	50 x 50
BH-173	2428359	323851	591	90	50 x 50
BH-174	2428226	323640	592.7	90	50 x 50
BH-176	2428505	324173	585.8	90	50 x 50
BH-177	2428462	324200	586.3	90	50 x 50
BH-178	2428328	323989	589.6	90	50 x 50
BH-179	2428221	323820	593.4	90	50 x 50
BH-180	2428114	323651	596.2	90	50 x 50
BH-181	2428061	323567	598	90	50 x 50
BH-182	2428018	323593	599.3	90	50 x 50
BH-183	2428045	323636	598.9	50	50 x 50
BH-184	2428072	323678	596.3	90	50 x 50
BH-185	2428099	323720	597.3	65	50 x 50
BH-186	2428419	324227	586.8	90	50 x 50
BH-187	2428378	324254	584.0	90	50 x 50
BH-190	2428137	323874	594.2	90	50 x 50
BH-191	2428083	323789	596.2	90	50 x 50
BH-192	2428056	323747	598.5	70	50 x 50
BH-193	2428030	323705	600	90	50 x 50
BH-194	2428003	323662	601.3	75	50 x 50
BH-195	2427976	323620	607.2	30	50 x 50
BH-196	2427955	323633	611.8	50	50 x 50
BH-197	2428007	323719	601.8	70	50 x 50
BH-198	2428041	323816	599.7	90	50 x 50
BH-199	2428068	323858	597.6	100	50 x 50

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	BH-200	2428094	323900	596.4	100	50 x 50
	BH-201	2428121	323942	595.2	80	50 x 50
	BH-202	2428148	323985	5991	90	50 x 50
	BH-203	2428228	324111	595.5	55	50 x 50
	BH-206	2428335	324280	518.2	90	50 x 50
	BH-208	2428213	324180	594.8	90	50 x 50
	BH-210	2428197	324249	592.8	70	50 x 50
	BH-211	2428224	324292	591.3	80	50 x 50
	BH-213	2428128	324234	596.6	80	50 x 50
	BH-214	2428086	324261	596.5	100	50 x 50
	BH-215	2428113	324303	594.7	105	50 x 50
	BH-216	2428140	324345	593.4	110	50 x 50
	Total				**20904**	

j. Reserves and Resources as per UNFC wrt the Threshold valu notified by IBM:

j.1) Parameters of reserve estimation:

(a) The geometry of the ore body has been reconstructed by correlation of the available boreholes intersection data with 100 m borehole spacing. The total lease area is mineralized excepting the non-mineralised patch situated in the south central part as per outcome of the drilled boreholes (Plate IV).

(b) The strike influence has been considered in most of the cases as 50 m on both the directions (i.e. 100 strike influence) along the strike for calculation of the volume of the ore body during estimation of resource, since borehole spacing is 100 m x 100 m.

(c) For the boreholes located adjacent to the leasehold boundary, the strike length is considered up to the leasehold boundary only and restricted

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length has been considered while calculating the volume. In this case resource has also been calculated by combining the individual dip influence of each borehole.

(d) As measured in field by the exploring agency GSI, the tonnage factor is considered as 3.5 gm/cc for Hard Laminated Ore (HLO), for high grade ore other than HLO (comprising of high grade powdery ore, soft laminated ore, minor HLO etc) 2.7 gm/cc and for low grade ore (comprising of powdery ore, soft laminated ore, lateritised HLO mixed with Fe-shale and BHQ/BHJ in between 45-55% Fe) as 2.5gm/cc.

(e) As per Geological report of GSI, based on the marketability, the cut-off grade of iron ore has been considered at + 55 % Fe. The mineral reject is considered at 45 to 55% Fe.

As per Geological report of GSI, a factor of 20% of the resource has been excluded towards accuracy in sampling and other variables. Therefore for calculation purpose 20% of the resource and reserve has been deducted from the calculated resource and reserve respectively. Recovery factor of 100% has been taken into account for estimation of reservesdue to the following reasons:

1 Kalanangairon deposit is bedded stratiform and tabular of regular/irregular habit with a lateritic cap and underlained by Banded hematite jasper or shale. Some interbands of waste material are found within the mineralized zones.

2. This will be a mechanized mine. Hence, it is not possible to segregate the small bands of waste material and also some contamination of waste material will happen at the bottom and top.

j.2 Method of reserve estimation:

Systematic geological cross sections are constructed with the surveyed ground profiles on which the drill hole inputs and average grade-wise analytical result of different ore zones are plotted and accordingly, the correlation of ore zones is interpreted with respect to grade.

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The cross sectional area is calculated and multiplied with the length of influence to reach at the volume. The cumulated tonnage of all sections is further multiplied with the recovery factor to reach at the final estimation of tonnage of resource/reserve.

The formula adopted to calculate the geological reserve is as follows.

Q=A x L x RF x BD

Where Q=Quantity of geological reserve in MT

A= Cross sectional area (sq m)

L= Length of influence

RF= Recovery factor

BD= Bulk Density(MT/m3)

Summary of the calculated resource is as below:

Level of Exploration	Resource in million tons	Grade
G1- Detailed exploration	Nil	-
G2- General exploration	84.26	>55% Fe
	8.71	45-55% Fe
	92.97	**Total**
G3- Prospecting	Nil	-
G4- Reconnaissance	Nil	-

j.3 Categorisation of reserves/resources under UNFC system:

As per the above parameters, the resources as per UNFC codification areas follows:The UNFCconsists of a three dimensional grid with following three axes

(i) Geological Assessment

(ii) Feasibility Assessment

(iii) Economic Viability

The parameters of the above axis are as follows

(i) Geological Axis (G)

- Detailed Exploration (1)
- General Exploration (2)
- Prospecting (3)
- Reconnaissance (4)

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(ii) Feasibility Axis

- Feasibility Study (1)
- Pre Feasibility Study (2)
- Geological Study (3)

(iii) Economic Axis

- Economic (1)
- Potentially Economic (2)
- Intrinsically Economic (3)

Justification of UNFC:

i) Probable Mineral Reserve (122)

The area has been prospected by Geological Survey of India and iron ore contents have been established. The prospecting operations include geological mapping in 1:2000scale followed by drilling of coring boreholes. Based on the information gathered from the boreholes, the ore body configuration was worked out and accordingly reserves were estimated. Thus, the geological axis can be brought under G2 category. On feasibility axis, a pre-feasibility report has been prepared and attached to the mining plan based on which the project is feasible. Manpower & machine requirement have been estimated based on actual need. Infrastructure resources are already available. However, the forest clearance is yet to be obtained. Thus, the resources can be brought under F2 category. On economic front, the saleability of iron ore has been assessed keeping in view the market demand for such ore and scope of utilization of the same by the applicant in his own industry. The grade of ore has been found suitable for meeting the demand of the plant. Land use pattern, working plan is already known or designed. Therefore, the reserves can be brought under E1 category. In view of the above considerations, reserves can be classified under 122 category.

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ii) Pre-feasible Mineral Resources (221 & 222)

The ore which will be blocked and cannot be extracted due to pit slope or safety zone has been put under this category. Probable reserve which cannot be mined out has been put under 222 category. This part of mineral reject is also classified as 222.

Classification UNFC code	Economic Axix	Feasibility Axix	Geological Axis
	E1 (Economic)	F2(Pre-feasibility study)	G2 (General exploration)
Probable Mineral Reserve (122)	1. Area is limited to exploratory boreholes drilled in grid 100 m x 100m and existence of old workings with ore occurrence. Mining plan approved. 2. Probable mineral reserve of 66.66 million tons (+55% Fe) and 5.23 million tons of mineral rejects (45% to 55% Fe) have been estimated in this area.	1. Geology is detailed. Position and availability of surface and ground water has been studied. 2. Pre Feasibility Report is annexed (Annexure XIV). 3. Crushing and screening facilities have been planned for processing of ore. 4. Reclamation and rehabilitation proposals have been proposed. 5. Site services such as office, first aid center, drinking water station, Rest shelters, sheds etc have been proposed. 6. Forest clearance of 42.608 ha is under process by the preferred bidder.	1. Gelogical mapping has been undertaken in 1:2000 RF. 2. Geological plan has been prepared showing the topographical, geological features., litho-contacts, ore zone, locations of exploratory boreholes etc. 3. Geological sections have been prepared showing the completed and proposed exploratory boreholes. 4. Probable mineral reserve estimated for the ore proved at depth by drilling and considering 100m influence of the exploratory boreholes. 5. Drilled samples have been collected from all positive boreholes and analysed.
	E2(Potentially Economic)	**F2(Pre-feasibility study)**	**G2 (General exploration)**
Pre Feasibility Mineral Resource (222)	1. Area is limited to exploratory boreholes drilled in grid 100 m x 100m with ore occurrence. Mining plan approved. 2. Geological interpretation has been done to have a detail idea about the reserve and grade of ore but the ore is blocked within the mining benches and 7.5 m safety zone. 3. Feasibility Mineral Resource of 17.6 million tons (+55% Fe) and 3.48 million tons of mineral rejects (45% to 55% Fe) have been estimated in	1. Local geology is detailed including ore types and geometry. Position and availability of surface and ground water has been studied. 2. Method of mining and development plan etc have been prepared. 3. Baseline data is generated and available as per the approved mining plan.	1. Gelogical mapping has been undertaken in 1:2000 RF. 2. Geological plan has been prepared showing the topographical, geological features., litho-contacts, ore zone, locations of exploratory boreholes etc. 3. Geological sections have been prepared showing the exploratory boreholes. 4. Probable mineral reserve estimated for the ore proved at depth by drilling and considering

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	this area. 4. The total resource is non-mineable.		100m [illegible] exploratory boreholes. 5. Drilled samples have been collected and analysed.

Category wise updated reserves as per UNFC classification as on 25.07.2020 are given below:

	UNFC Code	Qty. in million Tons	Grade (Fe %)
A Total Mineral Reserve		**71.89**	**+45%Fe**
Proved Mineral Reserves	111	-	-
Probable Mineral Reserves	121	-	-
]		66.66 (G) + 5.23 (MR) = 71.89	+55%Fe 45% to 55% Fe +45% Fe
Probable Mineral Reserves	122		
B. Total remaining resources		**21.08 (Blocked)**	**45% to +55%**
Feasibility Mineral Resource	211	-	-
Pre-Feasibility Mineral Resource	221	-	-
Pre Feasibility Mineral Resource	222	17.6 (G) + 3.48 (MR)= 21.08	+55%Fe 45% to 55% +45% Fe
Measured mineral resource	331	-	-
Indicated mineral Resource	332	-	-
Inferred mineral resource	333		
Reconnaissance Resource	334	-	-
Total Mineral Reserve + Resources		**92.97**	**+45%**

Note:

It is not possible to quantify grade wise reserves, as there is normally considerable variation in size and grade distribution within the ore zone, which results variable recovery factor and bulk density. Thus tonnage arrived are tentative. As per GSI the Recovery Factor considered is 80% and) bulk density is considered as 3.5gm/cc for Hard Laminated Ore (HLO), for high grade ore other than HLO (comprising of high grade powdery ore, soft laminated ore, minor HLO etc) 2.7 gm/cc and for low grade ore (comprising of powdery ore, soft laminated ore, lateritised HLO mixed with Fe-shale and BHQ/BHJ in between 45-55% Fe) as 2.5 gm/cc.

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

k. Furnish detail calculation of reserve/resources section-wise.

SECTION-WISE ESTIMATION OF GEOLOGICAL RESOURCE (Category of Exploration- G2)

SECTION/ BHs CONSIDERED	TYPE OF IRON ORE	X-SECTIONAL AREA OF ORE (m^2)	LoI (m)	VOL. OF ORE (m^3)	BULK DENSITY (MT/M^3)	TOTAL TONNAGE (MT)	X-SECTIONAL AREA OF WASTE (m^2)	VOL. OF WASTE (m^3)	SWELL VOL.OF WASTE (m^3)	STRIPPING RATIO (MT/ m^3)
	a	b	c	d = c x d	e	f = dxe	g	h=gx c	i= i x 1.6	j = i /g
W1/ OSKN-57, 41	HLO(>55% Fe)	5060	142	718520	3.5	2514820	13310	1890020	3024032	1:0.4
	OTHER THAN HLO(>55% Fe)	4449	142	631758	2.7	1705747				
	LOW GRADE(45-55% Fe)	731	142	103802	2.5	259505				
Sub-total				1454080		4480072	13310	1890020	3024032	1:0.4
W2/ OSKN-56, 59,28,54,45 SKN-15,16,17	HLO(>55% Fe)	7456	100	745600	3.5	2609600	26013	2601300	4162080	1:0.3
	OTHER THAN HLO(>55% Fe)	12132	100	1213200	2.7	3275640				
	LOW GRADE(45-55% Fe)	5736.04	100	573604	2.5	1434010				
Sub-total				2532404		7319250	26013	2601300	4162080	1:0.3
W3/ OSKN-55,58,29,42 ,46,52	HLO(>55% Fe)	13085	100	1308500	3.5	4579750	6986	698600	1117760	1:0.8
	OTHER THAN HLO(>55% Fe)	11698	100	1169800	2.7	3158460				
	LOW GRADE(45-55% Fe)	2987.72	100	298772	2.5	746930				
Sub-total				2777072		8485140	6986	698600	1117760	1:0.8
W4/ OSKN-01, 30,47,38 SKN-1,5,14,18	HLO(>55% Fe)	7786	100	778600	3.5	2725100	7949	794900	1271840	1:0.06
	OTHER THAN HLO(>55% Fe)	32468	100	3246800	2.7	8766360				
	LOW GRADE(45-55% Fe)	6797.6	100	679760	2.5	1699400				
Sub-total				4705160		13190860	7949	794900	1271840	1:0.06
W5/ OSKN-02, 08,11,19, 25,31,43,48 ,39	HLO(>55% Fe)	7405	100	740500	3.5	2591750	18277	1827700	2924320	1:0.1
	OTHER THAN HLO(>55% Fe)	44510	100	4451000	2.7	12017700				
	LOW GRADE(45-55% Fe)	6522.4	100	652240	2.5	1630600				
Sub-total				5843740		16240050	18277	1827700	2924320	1:0.1

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W6/ OSKN-03,12,20,32, 37 SKN-2,5,10,20,19	HLO(>55% Fe)	9379	100	937900	3.5	3282650	17508	1750800	2801280	1:0.1
	OTHER THAN HLO(>55% Fe)	42675	100	4267500	2.7	11522250				
	LOW GRADE(45-55% Fe)	8010.04	100	801004	2.5	2002510				
Sub-total				6006404		16807410	17508	1750800	2801280	1:0.1
W7/ OSKN-04,9,13,17, 21,26,33, 49,40	HLO(>55% Fe)	9123	100	912300	3.5	3193050	12944	1294400	2071040	1:0.1
	OTHER THAN HLO(>55% Fe)	41768	100	4176800	2.7	11277360				
	LOW GRADE(45-55% Fe)	2456	100	245600	2.5	614000				
Sub-total				5334700		15084410	12944	1294400	2071040	1:0.1
W8/ OSKN-05,14,22,34, 50,53,33, 49,40 SKN-3,7,9,12	HLO(>55% Fe)	1907	100	190700	3.5	667450	8497	849700	1359520	1:0.07
	OTHER THAN HLO(>55% Fe)	37798	100	3779800	2.7	10205460				
	LOW GRADE(45-55% Fe)	2529	100	252900	2.5	632250				
Sub-total				4222400		11505160	8497	849700	1359520	1:0.07
W9/ OSKN-06,10,15,18, ,23,27,35	HLO(>55% Fe)	1641	100	164100	3.5	574350	8851	885100	1416160	1:0.9
	OTHER THAN HLO(>55% Fe)	30067	100	3006700	2.7	8118090				
	LOW GRADE(45-55% Fe)	2441	100	244100	2.5	610250				
Sub-total				3414900		9302690	8851	885100	1416160	1:0.9
W10/ OSKN-07,16,24,36 , SKN-4,8,11,13	HLO(>55% Fe)	2879	150	431850	3.5	1511475	18886	2832900	4532640	01:00.2
	OTHER THAN HLO(>55% Fe)	27239	150	4085850	2.7	11031795				
	LOW GRADE(45-55% Fe)	3357	150	503550	2.5	1258875				
Sub-total				5021250		13802145	18886	2832900	4532640	01:00.2
GRAND TOTAL				**41313110**		**116217187**	**139221**	**15425420**	**24680672**	**1:0.1**
Less (-) 20% towards accuracy in sampling and other variables						23243438				
Net resource						**92973749**				

SUMMARY OF GRADE WISE GEOLOGICAL RESOURCE (in MT)	
HIGH GRADE (HLO) (>55% Fe)	193,99,996
HIGH GRADE - OTHER THAN HLO (SLO + Powdery ore + Shale) (>55% Fe)	648,63,089
LOW GRADE(Fragmented ore, Powdery ore) (45-55% Fe)	87,10,664
TOTAL	**929,73,749**

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Mineable Reserve

Mineable reserve has been calculated deducting the reserve that would be blocked under the pit slope and within the safety village roads etc.

The details of mineable reserve of the area are given below:

SECTION-WISE ESTIMATION OF MINEABLE RESERVE (UNFC- 122)

SECTION/ BHs CONSIDE-RED	TYPE OF IRON ORE	X – SECTIO-NAL AREA OF ORE (m^2)	LOI (m)	VOL. OF ORE (m^3)	BULK DENSI-TY (MT/ m^3)	TOTAL TONNA-GE (MT)	X – SECTIO-NAL AREA OF WASTE (m^2)	VOL. OF WASTE (m^3)	SWELL VOL.OF WASTE (m^3)	STRIPP-ING RATIO (MT/m^3)
a	b	c	d	e = c x d	f	g = e x f	h	i= h x d	j= i x 1.6	k = i /g
W1/ OSKN-57, 41	HLO(>55% Fe)	0	142	0	3.5	0	11562	1641804	2626886	1:4.51
	OTHER THAN HLO(>55% Fe)	836	142	118712	2.7	320522.4				
	LOW GRADE(45-55% Fe)	122	142	17324	2.5	43310				
Sub-total				136036		363832.4	11562	1641804	2626886	1:4.51
W2/ OSKN-56, 59,28 SKN-15	HLO(>55% Fe)	3609	100	360900	3.5	1263150	25864	2586400	4138240	1:0.7
	OTHER THAN HLO(>55% Fe)	5408	100	540800	2.7	1460160				
	LOW GRADE(45-55% Fe)	3866	100	386600	2.5	966500				
Sub-total				1288300		3689810	25864	2586400	4138240	1:0.7
W3/ OSKN-55,58,29,42,46	HLO(>55% Fe)	10863	100	1086300	3.5	3802050	6892	689200	1102720	1:0.1
	OTHER THAN HLO(>55% Fe)	7934	100	793400	2.7	2142180				
	LOW GRADE(45-55% Fe)	1908	100	190800	2.5	477000				
Sub-total				2070500		6421230	6892	689200	1102720	1:0.1
W4/ OSKN-01, 30,47,38 SKN-1,5,14,18	HLO(>55% Fe)	9916	100	991600	3.5	3470600	7843	784300	1254880	1:0.08
	OTHER THAN HLO(>55%	17994	100	1799400	2.7	4858380				

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	Fe)									
	LOW GRADE(45-55% Fe)	4386	100	438600	2.5	1096500				
Sub-total				3229600		9425480	7843	784300	1254880	1:0.08
W5/ OSKN-02, 08,11,19, 25,31,43,48,39	HLO(>55% Fe)	4352	100	435200	3.5	1523200	17534	1753400	2805440	1:0.12
	OTHER THAN HLO(>55% Fe)	42542	100	4254200	2.7	11486340				
	LOW GRADE(45-55% Fe)	2930	100	293000	2.5	732500				
Sub-total		49824		4982400		13742040	17534	1753400	2805440	1:0.12
W6/ OSKN-03,12,20,32, 37 SKN-2,5,10,20	HLO(>55% Fe)	6254	100	625400	3.5	2188900	16329	1632900	2612640	1:0.1
	OTHER THAN HLO(>55% Fe)	43037	100	4303700	2.7	11619990				
	LOW GRADE(45-55% Fe)	4744	100	474400	2.5	1186000				
Sub-total		54035	100	5403500		14994890	16329	1632900	2612640	1:0.1
W7/ OSKN-04,9,13,17, 21,26,33, 49,40	HLO(>55% Fe)	3202	100	320200	3.5	1120700	12842	1284200	2054720	1:0.11
	OTHER THAN HLO(>55% Fe)	37355	100	3735500	2.7	10085850				
	LOW GRADE(45-55% Fe)	535	100	53500	2.5	133750				
Sub-total		41092	100	4109200		11340300	12842	1284200	2054720	1:0.11
W8/ OSKN-05,14,22,34, 50,53,33, 49,40 SKN-3,7,9,12	HLO(>55% Fe)	1907	100	190700	3.5	667450	8416	841600	1346560	1:0.08
	OTHER THAN HLO(>55% Fe)	33589	100	3358900	2.7	9069030				
	LOW GRADE(45-55% Fe)	531	100	53100	2.5	132750				
Sub-total		36027	100	3602700		9869230	8416	841600	1346560	1:0.08
W9/ OSKN-06,10,15,18, 23,27,35	HLO(>55% Fe)	1641	100	164100	3.5	574350	7359	735900	1177440	1:0.08
	OTHER THAN HLO(>55% Fe)	26686	100	2668600	2.7	7205220				

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	LOW GRADE(45-55% Fe)	2268	100	226800	2.5	567000				
Sub-total		30595	100	3059500		8346570	7359	735900	1177440	1:0.08
W10/ OSKN-07,16,24,36, SKN-4,8,11	HLO(>55% Fe)	189	150	28350	3.5	99225	10319	1547850	2476560	1:0.13
	OTHER THAN HLO(>55% Fe)	25584	150	3837600	2.7	10361520				
	LOW GRADE(45-55% Fe)	3209	150	481350	2.5	1203375				
Sub-total		28982	150	4347300		11664120	10319	1547850	2476560	1:0.13
GRAND TOTAL				32229036		89857502	124960	13497554	21596086	1:0.15
Less (-) 20% towards accuracy in sampling and other variables						17971500				
Net resource						71886002				

SUMMARY OF GRADE WISE MINEABLE RESERVE(in MT)	
HLO(>55% Fe)	117,67,700
OTHER THAN HLO(>55% Fe)	548,87,354
LOW GRADE(45-55% Fe)	52,30,948
TOTAL	**718,86,002**

Grade:

In the lease area iron ore varies 45% to +65 % Fe. Iron ore of > 55% Fe is considered as marketable grade. The reserve in between 45-55% Fe has been taken as sub-grade ore (mineral rejects).The mining lease has been decided to be granted in favour of the applicant as a captive source of the Successful Bidder's steel plant located at Anugul. As per the specification of the steel plant, iron ore of +60%Fe and iron ore fines of +55% Fe will be consumed for production of steel.

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2.0 MINING

A. Opencast Mining:

a) The existing as well as proposed method for excavation with all design parameters indicated on plans /sections.

The area has remained completely virgin so far and no mining operation was carried out in the past to win iron ore. The disposition of the iron ore bodies available in the area has been reflected in the geological plan (Plate No.III). In consideration of the targeted production level, fully opencast mining has been proposed with shovel dumper combination. It is proposed to commence mining operation within the grid values of 2428464N to 2429142N and 322951E to 3238810E covering the ore body coming under the borehole influences of SKN1-7, OSKN-1-17, 55, 56,58 and 59. This has been proposed with an objective of exploiting the HLO and fragmentary ore taking into consideration the ease in approachability of the ore body and disposal of ore and waste. The face will be laid out in NE - SW initially and during the subsequent years the faces will be completely aligned along the strike direction with an objective of advance of the face dip ward.

The above site for development of the mine during first five years has been selected primarily on the basis of following reasons.

i) The site is easily approachable from the existing RD road cutting across the leasehold area.

ii) The requirement of iron ore for captive use can be met by developing the in situ ore body preferentially, a major part of which comes within the proposed development area.

iii) The development proposed will make the remaining part of the mineralised area easily amenable for future development.

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iv) The gradient of the mine haul roads will be in favour of the load.

v) Minimum expenditure will be required to bring the developed faces to production level and it will also involve minimum gestation period.

vi) Disposal of waste in the proposed dumping area and transportation of ore to the processing unit will be easily facilitated.

vii) Least amount of land degradation will be involved in the process of development.

viii) The site selected is suitable for advancement of pits from North to South i.e. from top RL to Bottom RL, to meet the proposed target quantity of iron ore of 2.95 MTPA and to maintain the average grade of iron ore for its captive use at around 60% Fe in view of scientific mining.

In the ensuing plan period a quantity of about maximum 29,50,000 MT/Yr on an average, has been proposed for production. The reasons for reduction are as below,

- Previously when it was Bhushan Steel Ltd, planning was made in the approved mining plan for maximum production from the mines at 5MTPA (Annexure V). Now Tata Steel BSL Ltd, being a subsidiary of Bamnipal Steel limited is already fed by other captive mines of Tata Steel. The production planning in Kalamang mine needs to be done in such a manner that best product mix can be optimized for ultimate use in the plant in a sustainable manner.
- Kalamang ore contains high silica with an average of 5% SiO2 which is deleterious to the steel plants. This can be mitigated by blending these high siliceous ores with low silica ore from other mines of Tata Steel at the plant site and accordingly the production plan has been

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prepared keeping in view of mineral conservation and scientific mining.

- Mineable Reserve of iron ore at cut-off grade of 55% Fe is only 66.66 million tons which is very low for a 50 years mining lease period with production plan of 5 MTPA. For the purpose Director of Mines, Odisha has issued a NOC to reduce the production of iron ore which is attached as Annexure XI.
- Excavation planning has been modified with respect to mining& dump locations and excavation quantities. The peak production in the approve mine plan is 5MTPA which is reduced to 2.95 MTPA of RoM in this modification.
- Evacuation of 5-million-tonnes ore per annum with existing road-rail network is difficult. Also planning for setting up conveyor belt or slurry pipeline with huge CAPEX is not feasible for this small deposit. Hence, the Suggested Ore Transport Mode would be SOTM3 as per recommendation by NEERI, since maximum production of RoM is capped at 2.95 MTPA (<3MTPA).

As the mining activities in the lease area is to be commenced, activities connected with development of the mine such as scrapping of weathered zone, cutting of trees/bushes, making of access roads, infrastructure development etc will be given prime preference. After the development of access road to the targeted area a box cut will be opened and thereafter, it will be expanded both laterally and depth-ward to fulfill the required production target. In course of mining a single quarry having total 13 nos. of benches will be developed. The top RL of the bench will be at 690 m and bottom RL of the bench will be at 570m. ROM Ore will trucked to crusher while waste will be trucked to the earmarked waste dump area. As there is no overburden present in the proposed excavation area, all benches will be developed in the ore body. The waste generation due to removal of the innerburden will give

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rise to the average stripping ratio of 1:0.11 m^3/MT during the modified plan period. The individual bench faces will be kept nearly vertical (75° - 80°) whereas the overall quarry slope angle (the angle between the line joining the toe of bottom bench and the crest of the top bench with the horizontal) is/will be maintained at less than 45° with the horizontal.

The design parameters of the mine are given below:

Bench height	Around10 m
Working bench width	10-15 m
Ultimate bench width	10 m
Ultimate pit slope	45°
Bench slope	75-80°
Berm width	1 to 2 m

Iron ore will be loosened through deep hole drilling & blasting. Rock breaker may be used to avoid secondary blasting of the bigger blocks of iron ore. Controlled blasting technique will be practiced by using NONEL/delay detonators if required. The ROM will be fed to a crushing/screening plant. The lump ore (10 - 40mm) and fines (-10mm) will be segregated in the Crushing / Screening plant. The haul road used for movement of machineries and for transportation will be maintained at suitable gradient of preferably less than 1 in 16. Inter-bench ramps have been planned to facilitate movement of equipment. Minimum width of proposed inter-bench ramp will be 6.0 m laid at a gradient of 1 in 10. Approach road of 10 m width at a gradient of 1 in 16 or less have also been envisaged to the proposed waste and mineral rejects dumping sites. These approach roads and ramps along with main access road will be regularly graded and compacted using motor graders and vibratory compactors to avoid formation of pot holes. Road surface cross-slopes should be approximately 4% to facilitate easy drainage. Fully mechanized method of mining on double shift basis working will be adopted. If required, the maintenance will be undertaken in the third shift. Mining machineries like hydraulic excavators, dumpers, dozer, wagon drill, front-end loader, motor-grader,

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rock breaker etc will be deployed. For processing of the mineral produced within the leasehold area, a mobile crusher with screening facility of adequate capacity will be installed.

Excavator of capacity 2.5 to4.5 m^3 and dumpers of 35/50 ton capacity will be engaged for excavation and transportation of RoM to the crushing site and shifting of waste to the earmarked dumping site. Marketable ore will be despatched by road through trucks of different capacities and rail. Dumpers of 15/25T capacity would be utilized for shifting of crushed ore to the stack-yard. Waste generated from the quarry will be stacked on the proposed dumping sites. The area identified on the north eastern and southern part (Ref. Geological Plan) has been chosen for waste disposal and allied activities such as stacking of minerals and mineral rejects material, processing of mineral etc. In total there will be here dumps detail of which is submitted in Chapter 4.0. Also, backfilling will be commenced second year onwards and the existing dump will be elongated over the backfilled area.

All the mining activities like deep hole drilling, excavation, loading and transportation will be carried out by using heavy earth-moving machineries. Keeping in view the above aspect, the proposed method of mining justifies categorization of the mine as A-FM (Fully mechanised). Machineries proposed to be used are as follows:

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PROPOSED MACHINERIES AND EQUIPMENTS

Sl no.	Equipment	Specification	Proposed
1	Excavator	3.5 m^3 capacity (may vary from 2.5 to 4.0 cum)	5Nos.
2	Front-end-loarder	3.5 m^3 capacity(may vary from 2.5 to 3.5 cum)	2 Nos
3	Wagon drill	110mm	3 Nos.
4	Compressor	1000 CFM	2 Nos.
5	Dumpers	50/35MT	11 Nos.
6	Dumpers	25/15MT	3 Nos.
7	Dozer	Length:- 3490mm, Height:-1690 mm	3Nos.
8	Rock breaker	45 MT	1 No.
9	Motor Grader	Length:- 3490mm, Height:-1690 mm	1 No.
10	Mobile Crushing and Screen plant	1000 TPH	1 No.
11	Water Sprinkler	28KL	2 Nos.
12	Water Tanker	10KL	2 Nos.

However, the capacity and hence the numbers of the machines may vary during operation time depending on the requirement. The area is well connected by one black-top road on its southern part (Ref. Surface Plan). It has been proposed to connect the network of mine roads to this road for all activities concerning the mining operation.

b) Year-wise tentative excavation in cubic meter indicating development, ROM pit wise as in table below:

The tentative excavation programme for the next 5 years for achieving a production level of 2.95 MTPA of ROM (for which Environmental Clearance shall be obtained) for the lease, from different sections of the quarry/ pit is given below. As it is prerequisite to obtain the environment Clearance before start of Mining operations, year wise tentative excavation prgramme has been prepared considering the delay that may happen. It is envisaged that environment clearance shall be obtained during Fy' 2020-21 (Year-1 as per the table). In case the mining

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operation starts in between the year pro-rata quantity both for ROM and waste would be targeted.

i) In-situ tentative excavation

Year	Total Excavation in m³	Top Soil in m³	OB/SB/IB in m³	RoM		Mineral Reject	ROM To Waste Ratio (MT/m³)
				Ore in m³	Mineral Reject in m³		
Year-1	8,00,197	0	4,42,653	3,54,013	3,531	0	1:0.44
Year-2	14,90,041	0	3,87,513	9,11,032	1,91,496	0	1:0.13
Year-3	13,34,849	0	2,37,781	10,25,981	71,087	0	1:0.08
Year-4	12,66,094	0	1,70,254	10,52,001	43,839	0	1:0.06
Year-5	13,28,861	0	2,20,779	8,87,616	2,20,469	0	1:0.08
Total	62,20,045	**0**	**14,58,980**	**42,30,643**	**5,30,422**	**0**	**1:0.11**

अनुमोदित
APPROVED
8/2020
क्षेत्रीय खान नियंत्रक
REGIONAL CONTROLLER OF MINES
भारतीय खान ब्यूरो
INDIAN BUREAU OF MINES
भुवनेश्वर/BHUBANESWAR

NOTE:

Mineral rejects include all the excavated materials those do not constitute usetul material. Such material may be either grade or size reject. The mineral reject may be (i) chemically mineral reject material which is below the acceptable limits of specifications that is below the cut-off grade and above the threshold value within or outside ore zone, (ii) materials of physical characteristics not acceptable to the market, (iii) material having deleterious constituents,

Note : Tentative tonnage of the saleable material has been arrived by computing approximate bulk density and recovery factor as these data are variable and are to be established on time series.

At present, in this document approximate Bulk density of iron ore has been taken as per GSI and as below:

Hard Laminated Ore (HLO)- 3.5 gm/cc

High grade ore other than HLO (comprising of high grade powdery ore, soft laminated ore, minor HLO etc) - 2.7 gm/cc

Low grade ore (comprising of powdery ore, soft laminated ore, lateritised HLO mixed with Fe-shale and BHQ/BHJ in between 45-55% Fe) - 2.5 gm/cc.

The recovery factor has been considered as 100% as the proposed development has been calculated from the ore zones only through cross-sectional method.

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Average grade of saleable ore- 60% Fe

Average grade of mineral rejects– 52%

Cut-off grade of mine- In the lease area iron ore varies 45% to +65 % Fe.The reserve in between 45-55% Fe has been taken as mineral rejects.The mining lease has been decided to be granted in favour of the applicant as a captive source of the applicant's steel plant. As per the specification of the steel plant, iron ore of +60%Fe Fe will be consumed for production of steel.

Thus, the tonnage arrived is as below:

Break-up of saleable ore and mineral rejects:

Year	Total RoM (m^3)	Saleable (MT)	Min Rejects (MT)	Total ROM (MT)	Total waste (MT)	Total Excavation (MT)	Waste: Ore ratio
Year-1	3,57,544	10,03,652	8827	10,12,479	11,06,633	2119112	1.09
Year-2	11,02,528	24,71,260	4,78,740	29,50,000	9,68,783	3918783	0.33
Year-3	10,97,060	27,72,283	1,77,717	29,50,000	5,94,453	3544453	0.20
Year-4	10,95,840	28,40,402	1,09,598	29,50,000	4,25,635	3375635	0.14
Year-5	11,08,085	23,88,915	5,51,173	29,40,088	5,51,948	3492036	0.19
Total	**47,61,065**	**114,76,512**	**13,26,055**	**128,02567**	36,47,450	**16450019**	0.28

* Tentative tonnage of the ore arrived by computing average bulk density and recovery factor as these data are variable and may vary as the quarry is deepened and extended.

ii) Dump rehandling (For the purpose of recovery of mineral)

There is no old dump containing recoverable iron ore available in the area. Therefore, question of dump rehandling does not arise.

As fresh mining is to be started in the lease area, developmental work such as scrapping of soil, bush cutting, road development, infrastructure facilities are to be taken up on priority before development of benches.

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Thereafter, a box cut will be made to access the mineralised zone for proposed production target. The details of year wise excavation, generation of ore, mineral rejects& ROM have been summarised below:

i) Development during the 1st year

As the mining activities are going to be started in the lease area, developmental work will be initiated during this year. After cutting of bushes and scrapping of weathered zone, a box cut will be made to access the mineral. Then the benches will be formed to fulfill the required production target. In the process, seven nos. of benches will be developed. 7nos. of cross-sections have been considered to depict the sectional view and the ore zone of the benches. The benches will be moved from north to south and orientation of the benches will be along NE-SW direction. In the ensuing plan period, development has been proposed in grid locations between 2428731N to 2429142N and 323147E to 323810E

The RL of the top most bench will be at 692.6 mRL and RL of the bottommost bench will be at 630 mRL. The benches will be formed in a spiral lay out manner. In the process, the proposed excavation area will be extended laterally as well as down-wards. The orientations of the benches have been shown in Plate No.V(A). The total volume of excavation, tonnage of saleable and mineral rejects and waste to be generated are as follows:

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Particular for the 1st year		
Bench Geometry	Bench Height (m)	10
	Bench Width (m)	>10
	Individual bench slope angle	75⁰-80⁰
Quarry development	Location (Quarry Name)	Only one quarry
	Extent of Development (Co-ordinates)	2428731N to 2429142N and 323147E to 323810E
	Sections considered	W-1to W-7
	No of Benches	7
	Benches considered for Development with RL	7 from 630 m to 692.6m
	Top RL.(m)	692.6
	Bottom RL (m)	630
	Direction of advancement	SE
	Dimension of the quarry at the yearend including existing benches	680m x 192m x 62.6m
	Area occupied (sq m)	1,11,725
	Over all quarry slope angle	<45⁰
	Total production of Iron ore (MT)	10,03,652
	Total production of Mineral reiects (MT)	8827
	Production of ROM (Ore + MR) in MT	10,12,479
	Total generation of waste (cum)	4,42,653

ii) Development during the 2nd year

During the year the production will be achieved by developing two new benches as well as extending the benches of previous year toward SW with simultaneous advancement of the benches in SE direction. For this purpose, seven nos. of cross-sections have been considered. The RL of the top bench will be at 662.7 m and the bottom RL of the bench will continue to be at 610mRL. In the ensuing plan period development has been proposed in grid locations between 2428670N to 2429090N and 323050E to 323760 E. The layout of the benches have been shown in Plate No.V(B). Benches have been planned to advance along SE direction.

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The total volume of RoM excavation, ore, and waste to be generated are as follows.

Particular for the 2nd year		
Bench Geometry	Bench Height (m)	10
	Bench Width (m)	>10
	Individual bench slope angle	75⁰-80⁰
Quarry development	Location (Quarry Name)	Only one quarry
	Extent of Development (Co-ordinates)	2428670N to 2429090N and 323050E to 323760 E
	Sections considered	W-3 to W-9
	No of Benches	6
	Benches considered for Development with RL	6 from 610 m to 662.7m
	Top RL.(m)	662.7
	Bottom RL (m)	610
	Direction of advancement	SE
	Dimension of the quarry at the yearend including existing benches	850m x 192m x 82.6m
	Area occupied (sq m)	1,29,213
	Over all quarry slope angle	<45⁰
	Total production of Iron ore (MT)	24,71,260
	Total production of Mineral rejects (MT)	4,78,740
	Production of ROM (Ore + MR) in MT	29,50,000
	Total generation of waste (cum)	3,87,513

iii) Development during the 3rd year

During the 3rd year, the benches will be advanced further towards SE and one new bench will be developed below the RL 610. In the process of mining the bottom of the quarry will reach 600mRL. The orientation of the benches has been shown in Plate No.V(C). In the said period, development has been proposed in grid locations between 2428595N to 2429080N and 322960E to 323740E

The total volume of excavation, saleable ore, mineral rejects and waste to be generated are as follows.

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Particular for the 3rd year		
Bench Geometry	Bench Height (m)	10
	Bench Width (m)	>10
	Individual bench slope angle	75⁰-80⁰
Quarry development	Location (Quarry Name)	Only one quarry
	Extent of Development (Co-ordinates)	2428595N to 2429080N and 322960E to 323740E
	Sections considered	W-3 to W-10
	No of Benches	4
	Benches considered for Development with RL	4 from 600 m to 640m
	Top RL.(m)	640
	Bottom RL (m)	600
	Direction of advancement	SE
	Dimension of the quarry at the yearend including existing benches	900m x 240m x 92.6m
	Area occupied (sq m)	1,74,510
	Over all quarry slope angle	<45⁰
	Total production of Iron ore (MT)	27,72,283
	Total production of Mineral rejects (MT)	1,77,717
	Production of ROM (Ore + MR) in MT	29,50,000
	Total generation of waste (cum)	2,37,781

iv) Development during the 4th year

During the year, the existing benches of the previous year will be extended depth-ward with developing two new benches to reach at a level 580 meter. A total of 5 Nos. of the benches will be developed to fulfill the required production target. Laterally the benches will proceed from NE to SW.

The orientations of the benches have been shown in Plate No.V(D). In the ensuing plan period development has been proposed to be in grid location between 2428590N to 242900N and 323110E to 323700E

The total volume of excavation, saleable ore, mineral rejects and waste to be generated are as follows.

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Particular for the 4th year		
Bench Geometry	Bench Height (m)	10
	Bench Width (m)	>10
	Individual bench slope angle	75⁰-80⁰
Quarry development	Location (Quarry Name)	Only one quarry
	Extent of Development (Co-ordinates)	2428590N to 242900N and 323110E to 323700E
	Sections considered	W-4 to W-8
	No of Benches	5
	Benches considered for Development with RL	5 from 630 m to 580m
	Top RL.(m)	630
	Bottom RL (m)	580
	Direction of advancement	SE
	Dimension of the quarry at the yearend including existing benches	900m x 336m x 112.6m
	Area occupied (sq m)	1,56,015
	Over all quarry slope angle	<45⁰
	Total production of Iron ore (MT)	28,40,402
	Total production of Mineral rejects (MT)	1,09,598
	Production of ROM (Ore + MR) in MT	29,50,000
	Total generation of waste (cum)	1,70,254

v) Development during the 5th year

During the year, excavation the quarry floor will be further depressed up to 570mRL. A total 6 Nos. of benches will be formed in the ensuing plan period. The excavation has been envisaged in between the grid 2428480N to 2428870N and 322950E to 323660E. The orientation of the benches have been shown in Plate No.V(E). Benches have been planned to advance towards SE direction.

The total volume of excavation, saleable ore, mineral rejects and waste to be generated are as follows.

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Particular for the 5th year		
Bench Geometry	Bench Height (m)	10
	Bench Width (m)	>10
	Individual bench slope angle	75^0-80^0
Quarry development	Location (Quarry Name)	Only one quarry
	Extent of Development (Co-ordinates)	2428480N to 2428870N and 322950E to 323660E
	Sections considered	W-5 to W-10
	No of Benches	6
	Benches considered for Development with RL	6 from 630 m to 570m
	Top RL.(m)	630
	Bottom RL (m)	580
	Direction of advancement	SE
	Dimension of the quarry at the yearend including existing benches	680m x 360m x 122.6m
	Area occupied (sq m)	2,62,542
	Over all quarry slope angle	<45^0
	Total production of Iron ore (MT)	23,88,915
	Total production of Mineral rejects (MT)	5,51,173
	Production of ROM (Ore + MR) in MT	29,40,088
	Total generation of waste (cum)	2,20,779

c) Plans & sections

All the activities proposed in this mining plan will be under category A - Fully Mechanised (FM) mine. The year-wise development plan and sections have been furnished in Plate No-V (A to E).

d) Describe briefly giving the Salient features of proposed method of working indicating category of the mine.

Mining Method: The Kalamang West (Northern part) Iron Ore Mines comes under Category - A (Fully Mechanized category) as per the IBM guidelines. Opencast mining method with shovel–dumper combination has been proposed for Kalamang West (Northern part) Iron Ore Mines. Production level has been proposed to vary from 1 million ton during first year to 2.95 million ton in the third year and continue with the same capacity i.e 2.95 MTPA of Iron ore ROM for rest part of the of the

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DEVELOPMENT TABLE OF KALAMANG WEST IRON ORE BLOCK

Year	SECTION CONSIDERED	GRADE	CROSS SECTIONAL AREA (m^2)	LOI (m)	VOL. OF ORE EXCAVATION (m^3)	BULK DENSITY (MT/M^3)	TONNAGE (MT)	CROSS SECTIONAL AREA WASTE (m^2)	VOL. OF WASTE (m^3)	STRIPPING RATIO (M^3/MT)
a	b	c	d	e	f=dxe	g	h=fxg	i	j=ixe	K=j/h
1St year	W2,W3,W4,W5, W6 &W7	>55(HLO)	597.7	100	59770	3.5	209195	4426.53	442653	
		>55(OTHER THAN HLO)	2942.44	100	294244	2.7	794457			
		45-55(LG)	35.31	100	3531	2.5	8827			
Sub-total			3575.45		357545		1012479	4426.53	442653	1:0.44
2 nd Year	W3,W4,W5,W6, W7, W8,&W9	>55(HLO)	143.41	100	14341	3.5	50194	3875.13	387513	
		>55(OTHER THAN HLO)	8966.91	100	896691	2.7	2421065.7			
		45-55(LG)	1914.96	100	191496	2.5	478740			
Sub-total			11025.28		1102528		2950000	3875.13	387513	1:0.13
3rd year	W3,W4,W5,W6, W7, W8,W9 & W10	>55(HLO)	26.67	100	2667	3.5	9336	2377.81	237781	
		>55(OTHER THAN HLO)	10233.14	100	1023314	2.7	2762947			
		45-55(LG)	710.87	100	71087	2.5	177717			
Sub-total			10970.68		1097068		2950000	2377.81	237781	1:0.08
4 th year	W4,W5,W6, W7,& W8	>55(OTHER THAN HLO)	10520.01	100	1052001	2.7	2840402.7	1702.54	170254	
		45-55(LG)	438.39	100	43839	2.5	109597			
Sub-total			10958.4		1095840		2950000	1702.54	170254	1:0.06
5 th year	W5,W6, W7, W8,W9 & W10	>55(OTHER THAN HLO)	8847.83	100	884783	2.7	2388915	2207.79	220779	
		45-55(LG)	2204.69	100	220469	2.5	551173			
Sub-total			11052.52		1105252		2940088	2207.79	220779	1:0.08
GRAND TOTAL			**47582.33**		**4758233**		**12802567**	**14589.8**	**1458980**	**1:0.11**

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modified plan period. Company will obtain Environment Clearance for the same.

Working Regime: Mine & maintenance of HEMMs has been proposed to be operated in all shifts.Each shift will be of 8 hours duration. Number of working days per year will be 300 days.However, working days in a year may increase or decrease depending upon requirements.

Mine Design Parameters: The bench height of 10 m with 10 m of minimum working width has been proposed. Haul road has been planned at a gradient of 1 in 16. Inter-bench ramp width has been considered as 6 m.

Drilling & Blasting: : Drilling will be carried out using 110-150 mm dia. Drill with 3.0-4.0m burden & 3.5-4.5 m spacing based on the geological rock characteristics. Taking into account the disposition of the ore body, it has been estimated that about 80 % (approx.) of planned quantity will require drilling & blasting. Holes will be charged with slurry explosives and initiated using electric delay detonators/detonating fuse/NONEL.

Loading & transportation: Blasted material will be loaded with hydraulic excavators of bucket capacity of 2.5 to 4.0 cum into 35/50 ton capacity dumpers and will be transported to proposed crushing & screening plant for production of lump& fines. Dumpers of 15/25T capacity would be utilized for shifting of crushed ore to the stack-yard. Marketable ore will be despatched by road through trucks of different capacities and rail. Waste generated will be transported to proposed waste dump.

Front-end-loaders & hydraulic excavators of 2.5 to 3.5cum bucket capacity will be deployed for required re-handling works.

Mines access / haul road: Keeping in view the expected weather conditions (rain fall), largest vehicle on site, speed of the vehicles and construction practices in the mine, haul road will be maintained (a) in the M.L area to suit the load capacity of the tippers and (b) with good condition. Width of the haul road will be kept more than 3 times of the width of largest vehicles plying on the road. Gradient will be maintained

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up to a maximum of 1 : 16 for haul road and 1 : 10 for ramp up to 10m length at one stretch. Haul road above the level of surrounding area will be provided with parapet wall / embankment. Warning notices and road signs will be posted along the haul roads at appropriate places like crossings, curves etc. for guidance of truck or tipper drivers. Haul road will be properly maintained by way of adequate compaction and leveling. Water sprinkling will be done on the haul road for dust suppression for road safety as well as clean environment.

Salient parameters of proposed mine working at the end of plan period is given below:

Sl. No.	Parameters	Proposed Quarry
1.	Quarry Size (L x W x D)	945m x 390 m x 75 m
2.	Total no. of Benches	13
3	Top Bench RL	690 mRL
4	Bottom Bench RL	570mRL
5	Average Bench Height	10 m
6	Average Bench Width	>10 m
8	Average Pit Slope	< 45^0

e) Describe briefly the Layout of mine workings, pit road lay out, the layout of faces and siles for disposal of overburden/waste along with ground preparation prior to disposal of waste.

Mining operation has been proposed to be confined within the grid values of 2428464N to 2429142N and 322951E to 3238810Eduring the modified plan period. The year-wise pit development plan & section for the plan period is shown in Plate No. V (A) to V(E) respectively. The face will be laid out in NE - SW initially and during the subsequent years the faces will be completely aligned along the strike direction with an objective of advance of the face dip ward. Inter-bench ramp has been planned to facilitate movement of equipment. Width of proposed inter

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bench ramp is 6.0 m laid at a gradient of 1 in 10. Approach road of 7.0 m width at a gradient of 1 in 16 have also been envisaged to the proposed waste &mineral rejects dumping sites. These approach roads and ramps along with main access road will be regularly graded and compacted using motor graders and vibratory compactors to avoid formation of pot holes regularly. Road surface cross-slopes will be maintained at approximately 4% to facilitate easy drainage. Three sites, one in the NE corner and the rest two in the SE corner are selected outside the UPL (Ref. Plate No.VIII). Although, these sites are mineralized, it is not possible to win out the ore of these areas due to paucity in the non-mineralised area within the leasehold, the narrow shape of the selected sites, more depth of occurrence of ore and being located marginal to the lease boundary. Retaining wall & garland drains along with settling pits will be constructed to protect the surrounding environment from wash-offs etc. The summary is as below:

Name of Pit	Description	1st year	2nd year	3rd year	4th year	5th year
Only one quarry	Face RL (m)	630	610	600	580	570
	Length of Face	680	724	810	568	673
	Direction of advancement	SE	SE	SE	SE	SE
	Length of advancement	192	188	240	336	360

Backfilling of the exhausted quarries:

Backfilling will start from the 2nd year onwards using the generated waste. Mineralisation in these areas has been proved through boreholes and will be backfilled only after exhaustion of the mineable reserve in terms of their depth & extension. Part of Waste to be generated during 2nd and 3rd years will be utilized to backfill the exhausted areas which will start from the NE corner of the quarry adjoining the proposed Dump A. Wastes of 4th and 5th years will be fully utilized for the backfilling. It will be tried to ensure the original sequence of lithologies during the backfilling. The backfilled areas will be brought under grass plantation. Backfilling will advance from NE to SW as below:

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Year/Quarry	Mined out area at the beginning in m²	Additional area proposed during the modified plan period in m²	Total area in m²	Area to be reclaimed during the modified plan period in m²	Area rehabilitated by plantation (sqm)	Balance area to be reclaimed at the end of year (sq m)
1st year/One pit	0	111725	111725	0		
2 nd year/One pit	111725	25750	137475	11352	0	126123
3 rd year/One pit	126123	56831	182954	23529	11352	159425
4 th year/One pit	159425	18286	177711	22195	23529	155516
5 th year/One pit	155516	53368	208884	44664	22195	164220

f) Conceptual mine planning up to the end of lease period taking in to consideration the present available reserve and resources describing the excavation, Recovery of ROM, Disposal of waste, backfilling of voids reclamation and rehabilitation sowing on a plan with few sections.

Life of the mine:

The mineable reserve of iron ore in the lease area is 71,886,002MT or 71.89 million tons. In the ensuing plan period about 12,802,567 MT or 12.80 million ton will be exploited. After this plan period balance mineable reserves of 59,083,435 MT or 59.09 million ton of iron ore will be available. Keeping in view the production of iron ore @2,950,000 per annum, life of the mine will be 20.03 years or say 20 years after the current plan period. So, total life of the mine will be 25 years including this plan period.

However, there is every likelihood of addition of more resource through exploration to be undertaken in future and this may increase the life of the mine.

Ultimate extent and size of the quarry:

In the lease area, mineralized area has been proved through boreholes. Basing upon the present exploration status ultimate pit limit has been earmarked in concerned plates. At the end of the conceptual period all the mineralized zones will be exploited.

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The ultimate extent of Kalamang West (Northern part) Iron Ore Mine is as follows.

QUARRY	EXTENT	SIZE	TOP RL/BOTTOM RL
Kalamang West (Northern part) Iron Ore Mine	795370 m^2	986m x 755m x 150 m	692.6/530

Ultimate slope angle:

During proposed plan period, the individual benches will kept nearly vertical. Keeping the height and minimum width of the benches at 10 m and 10 m respectively, the final slope angle will be kept at around 45° at the close of the mine.

The mine safety zone of 3.972 Ha around the lease area will not be disturbed at any point of time till the end of life of the mine. Plantation exists within the safety zone, which shall not be degraded. If required, barbed wire fencing will be undertaken conceptually around the ML area.

Ultimate pit limit boundaries:

The ultimate pit limit boundaries have been earmarked in conceptual plan **(Ref: Plate – VIII)**.

Ultimate capacity of dump:

A cumulative quantity of 141,10,154 m^3 waste will be generated during the conceptual plan period.

14,58,980 m^3 waste will be generated in the ensuing modified plan period out of which 8,55,122 m^3 of waste is proposed to be stored on the earmarked 3 dumps and the rest 1,12,241 m^3 will be utilized for making of roads and other related construction activities. Rest quantity of generated waste of vol. 4,91,557 m^3 will be utilized in the proposed backfilling.

In the modified plan period, it has been proposed to dump the wastes over the proposed three earmarked dump sites, one of which is located

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at the north eastern side and other two are at the southern side of the lease area which would continue to be in the conceptual period also. Conceptually, these dumps have been located outside the UPL. The conceptual height of the dumps will be around 60m. The ultimate dump slope will be maintained at 26^0 with individual terraces slopes not exceeding 37^0. Although, these sites are mineralized, it is not possible to win out the ore of these areas due to the narrow shape of the sites selected, more depth of occurrence of ore and being located marginal to the lease boundary. Retaining wall & garland drains along with settling pits will be constructed to protect the surrounding environment from wash-offs etc. The three proposed dumps will be rehabilitated through slope plantation and will not be re-handled. A total area of 7.071 Ha will be under dumping.

Backfilling will start from the 2nd year onwards using the generated waste. Mineralisation in these areas has been proved through boreholes and will be backfilled only after exhaustion of the mineable reserve in terms of their depth & extension. Part of Waste to be generated during 2nd and 3rd years will be utilized to backfill the exhausted areas which will start from the NE corner of the quarry adjoining the proposed Dump A. Wastes of 4th and 5th years will be fully utilized for the backfilling. It will be tried to ensure the original sequence of lithologies during the backfilling. Conceptually, the total excavated area would be backfilled using the wastes of the mine to appropriate height as possible practically. The backfilled areas will be brought under grass plantation.

The following measures are proposed for protection:

During the rainy season to arrest the wash-off of the dumps following protective measures and precautions are to be undertaken for the proposed waste dump and its management as follows:

i) The ultimate dump slope will be maintained at 26^0 with individual terraces slopes not exceeding 37^0.

ii) The individual terrace heights will be maintained at 10 m.

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iii) Each terrace will have inward slope with catch drains at the inward side of the terrace.

iv) The catch drains of the individual terrace will be connected to the garland drain outside the periphery of the dump.

v) These catch drains will have half concrete open pipes followed by settling tanks to avoid wash offs.

vi) Each terrace will have a provision of berms at the outer end to reduce gully formation due to rain water wash offs.

vii) The retaining wall will be made to arrest the waste dump materials for consolidation. The retaining wall constructed during first year will cater to the requirement of the entire plan period.

viii) The details of the protective measures to prevent wash-off are given below:

Year of construction	Location	Garland drain	Retaining wall
		Size, L x W x H in m	Size, L x W x H in m
1 st year	Around proposed dump-B at the southern side of the lease area	215x 3 x 2	200x2x3

Year of construction	Location	Garland drain	Retaining wall
		Size, L x W x H in m	Size, L x W x H in m
2nd year	Around proposed dump-C at the southern side of the lease area	380x 3 x 2	370x2x3

ix) Lemon grass/plant species will be paved in the dump slope, which will hold the materials in its fibrous and spread over roots to protect wash off in the rainy seasons.

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Conceptual generation of Top-soil:

During the first five years of planning there will be no generation of top-soil. The valley portion of the block has a meagre thickness of around 0.2 m of top-soil which is covered under agriculture by the local villagers. Total area having top soil is 17.2 Ha. Hence, a total of 17.2 Ha x 0.2m= 34,400 $m^3$of top-soil will be generated during the conceptual period. This will be temporarily stacked over an area of 0.843 ha in the southern part of the lease area, height of which would be around 30m in the conceptual period. This stored top-soil shall be used for different plantation programmes. Retaining wall and garland drain are also to be constructed around the top-soil stack.

Ultimate mineral rejects stack:

Iron ore having Fe content of 45% to 55% has been considered as mineral rejects. Conceptually, 52,30,948 MT of mineral rejects will be generated. This mineral rejectswill be will be stored in the earmarked site covering an area of 14.0 Ha with a height of 35m in five terraces of 7.0m height each and top RL of 630m. Due to paucity in non-mineralised area within the lease, this has been planned mostly on the mineralized area. Therefore, it is planned conceptually to store the mineral rejects on the exhausted and backfilled areas in the SW part of the area. It is proposed to re-handle the stored mineral rejects located within the UPL to the exhausted benches before excavation of the particular area and again will be stored in the exhausted area after due backfilling. The actual conceptual area of the Mineral Reject Stackyard would be 14.00 Ha out of which an area of 12.558 ha would be located on the backfilled areas of the exhausted quarry. Hence, only 1.442 Ha has been depicted as conceptual Mineral Reject stackyard area which will be rehabilitated through plantation.

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Land degradation and/reclamation/afforestation:

At the end of the conceptual period a total area of 88.903 hectare will be degraded due to mining and allied operations. However, based on status of exhaustion of reserve over any part of the quarry area, simultaneous mining and backfilling of the exhausted patch will be undertaken in the first review period which is proposed to start from the second year of the modified plan period. Conceptually, the exhausted quarries will be backfilled using the wastes of the dumps and the backfilled areas will be rehabilitated through plantation.

The land use pattern at the conceptual period is as follows:

Type of land use	Area at present in ha.	Area during modified Plan period in ha.	Total area in ha.	Total area in ha. at conceptual period
Area under excavation including the backfilled areas	0	26.599	26.599	75.377
Overburden dump	0	7.971	7.971	7.071
Mineral storage	0	17.246	17.246	0
Top soil Stack	0	0	0	0.843
Mineral rejects stack	0	3.556	3.556	*1.442
Road	0.726	4.436	5.162	0
Infrastructure(Rest shelter, Magazine, School , inhabitant sites, and abandoned crusher)	2.286	8.887	11.173	0
Retaining wall & Garland drain	0	0.34	0.34	0
Green belt in the south beyond the UPL	0	0	0	4.17
a) Sub-Total	***3.012***	***69.035***	***72.047***	***88.903***
Safety zone				
i)7.5 meter along the inner side of MI boundary	3.972	0	3.972	3.972
ii)10 meter width on either side of the village road	1.709	0	1.709	0
b) Sub-total	***5.681***	***0***	***5.681***	***3.972***
Total	**8.693**	**69.035**	**77.728**	**92.875**
Un touched area	84.182		15.147	0
Grand total	**92.875**	-	**92.875**	**92.875**

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*The actual conceptual area of the Mineral Reject Stackyard would be 14.00 Ha in all of which an area of 12.558 ha would be located on the backfilled areas of the exhausted quarry. Hence, only 1.442 Ha has been depicted as conceptual Mineral Reject stackyard area.

CONCEPTUAL USAGE OF FOREST LAND OF THE LEASE

TYPE OF LAND USE	FOREST AREA IN HA.			
	Kalamang	Ghodabudhani	Gandhalpada	**Total**
Area under excavation	0.476	21.716	14.266	36.458
Overburden dump	0.951	0	1.158	2. 109
Safety zone of mine boundary	0.477	0.671	1.234	2.382
Mineral reject stack	0	0 032	0	0.032
Top soil stack	0.028	0.2	0	0.228
Green belt in the south beyond the UPL	1.399	0	0	1.399
Total	**3.331**	**22.619**	**16.658**	**42.608**

Management of environment:

Air: Control of air pollution will be carried out by sprinkling of water on haul roads and dumps and also through plantation. Dust collectors will be deployed at the drilling sites to arrest the generated dust.

Noise: Noise level form the deployed machines will be controlled by selecting proper equipment with control system, adopting appropriate maintenance of the equipments, by controlled blasting to reduce ground vibration and adopting adequate plantation programmes within the lease area..

Ground vibrations: Ground vibrations will be controlled by controlled blasting using delay detonators.

B. UNDERGROUND MINES

i) to viii) is not applicable

The Kalamang west iron ore mine will be worked for iron ore ROM @ 2.95 million tons / annum with the deployment of earthmoving machines on two shift basis. Loosening of the hard rock mass will be effected by blasting of 110 to 150 mm dia DTH drilled holes. Excavators of 3.5 CuM capacity will be

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utilized for excavation & loading of blasted rocks. Rear dump trucks of 50T capacity will be used for transportation of ore and waste.

ix) Extent of mechanisation

Drilling

Diameter of the blast hole	110 to 150mm
Height of the bench	10 m
Sub-grade drilling	1m
Length of the hole	11m
Burden	3m
Spacing	3.5m
Volume of Ore to be broken/loosened per hole.	3.0m x 3.5m x 11 m = 115.5m^3

Meterage of drilling per year

Vol. of max. excavation per year = 14,89,541 m^3

Assuming 80% of excavation to be drilled = 11,91,633 m^3

Number of holes to be drilled = 11,91,633 /115.5 m^3 = 10,317 nos. nos.

Meterage of drilling to be required=10317 x 11 = 1,13,487 m.

Meterage of drilling per drill:

Speed of the drill = 15m/Hr
No. of working days in a year = 300
Efficiency = 80%
No. of shift per day = 2

Meterage of drilling to be effected/ year = 300 x 6 x 15x 2 x 80%= 43200m

Requirement of Drills:

No. of drills required = Total meterage to be drilled/year

Total meterage can drill/year/ drill

= 1,13,487m./43200 m

= 2.62 or say 3 nos.

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Compressor requirement:

3 nos. of compressors of 12 Cu.m /min (1000 CFM) capacity will be sufficient at the mine site to operate the said drills effectively.

Blasting

Drilling and blasting will be required for loosening of the rock mass for ease in excavation. Controlled blasting technique will be adopted to minimize the ground vibration and to avoid flying of rocks. During the blasting, in case of formation of large boulder, rock breaker will be used for breaking the same to avoid secondary blasting.

Broad blasting parameters

Drill holes will be drilled in single rows as well as in multi row on staggered pattern by wagon drills. However, drilling and blasting paramotors will be as follows:

Sl. No.	Parameters		Magnitude
1	Dia. of the hole		110 to 150mm
2	Drilling pattern	Burden	3.0 m
		Spacing	3.5 m
3	Depth	Blast hole	10 m
		Sub-grade drilling	1m
		total	11 m
4	Nature of the hole		Vertical
5	Type of main explosive	Name	SMS
6	Powder factor		8 t/kg
7	Requirement of explosive	Quantity/hole	40 kg
		Quantity/single blast	360 kg
8	Initiative explosive	Detonator	OD
		Fuse	NONEL
9	Type of blasting	Frequency of blasting	Primary
10	Yield/hole		115.5 m3

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Type of explosive to be used

Shock tube initiation system/NONEL system of blasting will be adopted for getting optimum blast result and minimization of flying rocks.

Other details regarding blasting are as given below:

When blasting is carried out at a minimum distance of 50 m. from any site service building, the permissible safe charge per round per delay is 77 kg. only. However, this safety distance increases to 500 m, when the permissible charge per round / delay is as high as 7752 kg. In practice, the total number of holes does not exceed more than 15, in case of single row blasting and the most commonly blasted rounds consists of 8-10 holes. Depending on the type of rock to be blasted and the type of explosives used, the total explosive charge per round varies from 400 kg. to a maximum of 600 kg.

Secondary Blasting

When oversize boulders are produced in the material of primary blast, these are required to be broken by using rock breaker or through secondary blasting.

Storage of Explosives and Accessories

For conducting day to day blasting operations, an Explosive Magazine has been proposed in the southern part of the lease area. License will be acquired from the Controller of Explosives before adopting blasting practice in the lease area. The explosive magazine will have separate storage arrangement for detonators. The Licensed Capacity of this magazine will be as under:

Category of Explosives		Storage Capacity for Explosives
Class – II	:	15,000 kg.
Class – III	:	5,000 kg.
Class – VI :		
(Div-I)	:	25,000 mtrs.
(Div-II)	:	5000 mtrs.
(Div-III)	:	10000 Nos.

For transporting explosives required for blasting, from explosive magazine to the site of blasting, one number of explosive van, will be provided at the mine. The safety radius has been considered as 500 meter from the explosive magazine

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Loading equipment

Loading of waste to tippers will be accomplished by using hydraulic excavators of 2.5 to 4.0 m3 bucket capacity.

Excavation

Specification		
Bucket capacity	=	3.5 m3
Production efficiency [machine operating efficiency + job management efficiency]	=	90%
Time cycle/pass at 900 swing	=	35sec
Excavating Parameters		
Nominal bucket capacity	=	3.5m3
Average nominal bucket capacity [C]	=	3.3m3
Bucket fill factor [f]	=	0.9
Time cycle/pass at 900 swing [T]	=	35sec
Swell factor [s]	=	0.7
Production efficiency factor [e]	=	0.9
Seconds per hour [t]	=	3600
Depth of cut factor [d]	=	0.95
Rate of production.		
Output/shovel/hour	–	C x f x s x d x e x t : T=3.3 x 0.9 x 0.7 x 0.95 x 0.9 x (3600 ÷35) = 182.84 m3
Output/shovel/shift with 6hours effective working time	=	182.84x 6x2 – 2191.08m³ or say 2195m³
Max total excavation handling per day (Considering 300 working days in a year)	–	14,89,541 m³: 300 –4965m³
Number of excavator(s) required	=	Total vol. of excavation handling in a day ÷Handling capacity of one excavator per day
Excavator required to be engaged	=	4965: 2195= 2.26 or say 3 nos

Transportation

Blasted RoM will be transported to the crushing site by 35/50 ton dumpers. The dumpers will be loaded by hydraulic excavators of of 2.5 to 4.0 m³ bucket capacity. Estimation of number of excavator and tipper/ dumper for achievement of targeted production is furnished below:

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Dumper / Tipper parameters

Parameters	
Dumper capacity	50 MT
Swelling volume	90%
Fill factor	0.8
Average bucket capacity of the excavator	3.5m^3
Tonnage factor	2.8 t/m^3
Tons per pass	0.9x0.8x2.8x3.5=7.05 or say 7ton
No. of passes	Tonnage rating per tipper/ tons per pass=50/7=7.14 Pass or 8 pass

Tipper cycle time:

Loading time	No. of passes x time cycle per pass 8x 35sec = 280sec
Hauling time	Lead K.M. / avg. haul speed (15 Kmph) 1 /15 = 240 sec
Unloading time	60 sec
Returning time	1km / 20(Kmph) = 180 sec
Spotting time	60 sec
Tipper cycle time	280+240 + 60 + 180 + 60 = 820 seconds

Tipper requirement:

Overall Utilisation factor	0.6
No. of tippers	Tipper Cycle Time / Excavator cycle time = 820/280 = 2.9 nos. or say 3 per excavator. Total tippers required are 3x3 =9 Nos.+ 2 Nos. (Standby)=11Nos.

Transportation of marketable ore

The sized marketable iron ore will be dispatched to it's own captive unit through road through trucks of different capacitiesand rail transport.

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Machineries and equipments required

Sl no.	Equipment	Specification	Proposed
1	Excavator	3.5 m^3 capacity (may vary from 2.5 to 4.0 cum)	5Nos.
2	Front-end-loarder	3.5 m^3 capacity(may vary from 2.5 to 3.5 cum)	2 Nos
3	Wagon drill	110mm	3 Nos.
4	Compressor	1000 CFM	2 Nos.
5	Dumpers	50/35 MT	11 Nos.
6	Dumpers	25/15MT	3 Nos.
7	Dozer	Length:- 3490mm, Height:-1690 mm	3Nos.
8	Rock breaker	45 MT	1 No.
9	Motor Grader	Length:- 3490mm, Height:-1690 mm	1 No.
10	Mobile Crushing and Screen plant	1000 TPH	1 No.
11	Water Sprinkler	28KL	2 Nos.
12	Water Tanker	10KL	2 Nos.

However, the capacity and hence the numbers of the machines may vary during operation time, depending on the requirement.

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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 minimum and maximum depth of water table is 7m and 25m below the general surface level as observed in the dug-wells of the locality. Minimum level of water table of the area is at 568 mRL and maximum is 550mRL as is observed from nearby wells and water bodies.

b) Indicate maximum and minimum depth of working

Since mining is carried out in hilly area, water table is not intersected as it is planned to be worked up to a depth of average 70 meter i.e.570 mRL at the end of the modified plan period which is above the ground water table. Therefore such depth of working is not likely to affect the ground water table. However, during conceptual period the water table will be intersected for which required permission will be obtained from statutory authority.

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.

Since mining is carried out only up to 570mRL in this plan period, water table is not intersected as the general ground water table observed in the dug-wells of the locality has RL of 568 m to 550m. The trend of natural drainage pattern in the area is towards south and SW (Please refer Rain water management plan, Plate No XI). The surface run-off water will find clear access into the existing nala during rains. Part of the surface run-off water will enter into the mine workings and may cause water-logging temporarily. As a precaution, number of check dams in staggered pattern across the existing seasonal nalas have been proposed. Peripheral drain has been proposed around the quarry to arrest the surface run off and to obstruct entering mine working. Retaining wall and garland drains around proposed dump, boulder wall around mineral

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rejects stackhave been proposed to arrest solid wash offs. In order to make the working faces dry, pumping of water out of the pits may be necessary during rainy season. It is proposed to deploy two diesel operated centrifugal pumps (at least 10 HP capacity each) to pump out accumulated water of the mine to the nala as and when necessary. During dry seasons, the problem of surface run-off water is not likely to arise.

d) Regional and local drainage pattern, Also indicate Annual rain fall, catchment area and likely quantity of rain water to flow through the lease area, arrangement for arresting solid wash offs.

The average rain fall recorded at IMD observatory at Keonjhar is 1269.1mm. The south west monsoon lasts from mid June to mid September and the area gets more than 80% of the annual rainfall during this period.

A dendritic type of drainage pattern is generally displayed by the area. Because of the hilly topography, there is one seasonal drainage channel found in the western part of the area. Suna nadi is a perennial river flowing from South to North outside the area at a distance of 2km in the South-East part and it changes its course to West-East from Malda and debouch into river Baitarani. The drainage channel originating in the western part of the area traverses through the area towards South.

Morcover, plantation on safety zone will also check the possible soil erosion and arrest the solid waste.

e) Average water requirement at mine for domestic and mine use are to the tune of 65 m3/day and 170 m3/day respectively. Water for drinking and domestic purpose will be made from bore wells and that for mining use will be from sources like Water harvesting pond (WHP) / perennial stream / river. Peak water requirement at mine for domestic and industrial use are to the tune of 65m3/day and 200 m3/day respectively.

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Class of Use	Purpose	Peak demand (liters / day)	Source of water
Domestic	Drinking (for 170 persons @ 10 liters / man / day)	1700, say 2000	Bore well / dug well
	Bathing, washing, cooking etc. (for 250 persons @250 liters / man / day)	63000	-do-
	Sub_total	**65,000**	
Non-Domestic	Dust suppression at the dust prone areas like haul road, loading & unloading site etc. and Drilling	100000	Water harvesting pond (WHP) / perennial stream / river
	Equipment and vehicle washing	12000	
	Watering the plantation site	50000	-do-
	Misc	8000	
	Sub-total	**1,70,000**	
	Total	**2,35,000**	---

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4.0 STACKING OF MINERAL REJECTS &DISPOSAL OF WASTE

a) Indicate briefly the nature and quantity of top soil, overburden/ waste and mineral rejects to be disposed off

As discussed before, the iron ore deposits of the area is associated with BHJ, Laterite, lateratic soil and shale. These will be generated from the lease area as waste with iron ore. No top-soil will be generated in the ensuing plan period. The volume of waste likely to be generated during the plan period is given below:

Waste to be generated

Year	Top soil (m^3)		Waste(m^3)		Mineral rejects (m^3)	
	Reuse/ Spreading	Storage	Backfilling	Storage	Storing	Beneficiation
1st year	-	-	1,12,241 (making of roads)	3,30,412	3531	-
2 nd year	-	-	1,84,267	2,03,246	1,90,996	-
3 rd year	-	-	1,00,524	1,37,257	70,719	-
4 th year	-	-	1,70,254	-	43,834	-
5 th year	-	-	2,20,779	-	2,20,469	-
Total			**7,88,065**	**6,70,915**	**5,29,549**	-

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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 and justification.

Selection of dumping site

In the ensuing plan period it has been proposed to change the proposed dump site of the approved mining plan to the north eastern and south eastern side of the lease area. Three dumps namely Dump A, B & C are proposed. Dump A is located in the extreme NE corner of the ML area, which is located outside UPL. Dump B & Dump C are located in the south eastern part of the ML and a small part of Dump C comes within the UPL. This is purely temporary and will be rehandled for backfilling within the conceptual period locating all these three dumps outside the UPL. Although, these sites are mineralized, it is not possible to win out the ore of these areas due to paucity in the non-mineralised area within the leasehold, the narrow shape of the selected sites, more depth of occurrence of ore and being located marginal to the lease boundary.

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

In the ensuing modified plan period a total volume of 14,58,980 m^3insitu waste is to be generated from the lease area. As the lease area is a virgin area, developmental work is to be done initially. So development of road will be done for smooth movement of vehicles and heavy earth moving machineries. For the purpose a volume 1,12,241 m^3 waste generated in the first year from the lease area will be used and rest waste of volume 3,30,412 m^3 will be accommodated on the proposed dumps. For the purpose, Dump-A and B have been proposed in the north eastern side and south eastern side of the lease area over an area of 0.967 Ha. and 1.826 Ha. respectively. Similarly the in situ waste to be

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generated in the 2nd year is 3,87,513 m³,out of which of 1,84,267 m³ will be used for backfilling of the exhausted portion and rest quantity of waste of volume 2,03,246 m3 shall be accommodated over the proposed dump-A and C. Dump C will be located at the northern part of the Dump-B. In the third year a vol of 100524 m³ waste will be utilized for backfilling and the rest of 1,37,257m³ waste will be dumped on Dump C. The total waste to be generated in the fourth year and fifth year of volume 1,70,254m³ and 2,20,779m³ respectively will be used for backfilling of the exhausted areas. Dumping will be undertaken in retreating method of dumping. The details of the proposed dumps are as below:

Dump Name	Height (m)	Top RL	Bottom RL	Northing	Easting
Dump A	30m	720	690	2428982 to 2429248	323687 to 323910
Dump B	30m	620	590	2428229 to 2428488	324006 to 324303
Dump C	40m	630	590	2428054 to 2428197	324158 to 324343

The year-wise buildup of dump is as follows:

Year	1st
Waste to be accommodated in dump A+B	3,30,412 m³
Waste to be used for road making and other activities (35%)	112241 m³
Area of dump-A & B	A-9674+B-18260 =27934 m²
Nos. of terrace	2 &3
Top R.L. of the terrace at the end of the year	A- 710m & B-620m
Top RL of Individual terraces	A 1st- 700m, A 2nd-710m B 1st- 600m, B 2nd-610m B 3rd - 620m
Bottom R.L. of the terrace at the end of the year	A-690 m. & B-590 m
Bottom RL of Individual terraces	A 1st- 690m, A 2nd-700m B 1st- 590m, B 2nd-600m B 3rd - 610m
Individual terrace height	10 m.
Individual terrace slope	37⁰
Overall slope	26⁰

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Year	2nd
Waste to be accommodated in dump-A & C	2,03,246 m^3
Waste to be used for road making and other activities (35%)	112241 m^3
Area of dump--A & C	A-11077m2+C-50377 m^2=61454 m^2
Nos. of terrace in A & C	3 & 3
Top R.L. of the terrace at the end of the year	A-720m & C-620m
Top RL of Individual terraces	A 1st- 700m, A 2nd-710m A 3rd - 720m C 1st- 600m, C 2nd-610m C 3rd - 620m
Bottom R.L. of the terrace at the end of the year	A-690m & C-590 m.
Bottom RL of Individual terraces	A 1st- 690m, A 2nd-700m A 3rd - 710m C 1st- 590m, C 2nd-600m C 3rd - 610m
Individual terrace height	10 m.
Individual terrace slope	37^0
Overall slope	26^0

Year	3rd
Waste to be accommodated in dump-C	1,37,257 m^3
Area of dump-C	Nil
Nos. of terrace	1
Top R.L. of the terrace at the end of the year	C-630m
Top RL of Individual terrace	C 4th - 630m
Bottom R.L. of the terrace at the end of the year	C 620 m.
Bottom RL of Individual terrace	C 4th - 620m
Individual terrace height	10 m.
Individual terrace slope	37^0
Overall slope	26^0

Proposals for protective measures,

During the rainy season to arrest the wash-off of the dumps following protective measures and precautions are to be undertaken for the proposed waste dump and its management as follows:

x) The ultimate dump slope will be maintained at 26^0 with individual terraces slopes not exceeding 37^0.

xi) The individual terrace heights will be maintained at 10 m.

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xii) Each terrace will have inward slope with catch drains at the inward side of the terrace.

xiii) The catch drains of the individual terrace will be connected to the garland drain outside the periphery of the dump.

xiv) These catch drains will have half concrete open pipes followed by settling tanks to avoid wash offs.

xv) Each terrace will have a provision of berms at the outer end to reduce gully formation due to rain water wash offs.

xvi) The retaining wall will be made to arrest the waste dump materials for consolidation. The retaining wall constructed during first year will cater to the requirement of the entire plan period.

xvii) The details of the protective measures to prevent wash-off are given below:

Year of construction	Location	Garland drain	Retaining wall
		Size, L x W x H in m	Size, L x W x H in m
1 st year	Around proposed dump-B at the southern side of the lease area	215 x 3 x 2	200x2x 3

Year of construction	Location	Garland drain	Retaining wall
		Size, L x W x H in m	Size, L x W x H in m
2nd year	Around proposed dump-C at the southern side of the lease area	380x 3 x 2	370x2x3

xvii)Lemon grass/plant species will be paved in the dump slope, which will hold the materials in its fibrous and spread over roots to protect wash off in the rainy seasons.

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d. Selection of site for stacking of Mineral rejects materials

Iron ore containing 45% to 55 % Fe has been considered as mineral rejects. The year wise generation of mineral rejects from the lease area is as follows:

Year	Vol. of mineral rejects (m^3)	Quantity of mineral rejects (MT)
1st year	3531	8827
2 nd year	1,90,996	4,78,740
3 rd year	70,719	1,77,717
4 th year	43,834	1,09,598
5 th year	2,20,469	5,51,173
Total	**5,29,549**	**13,26,055**

The mineral rejects stack yard for iron ore has been planned separately to stack the generated mineral rejects near the mineral stack yard with northing from 2428000 to 2428258 and easting from 323237 to 323520. The earmarked site has been shown in reclamation plan (Ref plate No – VII).The details of the protective measures to prevent wash-off are given below:

Lemon grass/plant species will be paved in the slope, which will hold the materials in its fibrous and spread over roots to protect wash off in the rainy seasons.

Year of construction	Location	Garland drain	Retaining wall
		Size, L x W x H in m	Size, L x W x H in m
1 st year	Around proposed mineral rejects stack	1500 x 3 x 2	1200x2x 3

Height & Spread of stacks

The mineral rejects stack yard for iron ore has been planned separately to stack the generated mineral rejects near the mineral stack yard beyond the located partly within and partly outside UPL over an area of 3.556 Ha. This is due to paucity in non-mineralised area within the leasehold. This will be of purely temporary nature as it

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is proposed to re-handle the stored mineral rejects located within the UPL to the exhausted benches before excavation of the particular area and again will be stored in the exhausted area after due backfilling. The location for mineral rejects stack will be between grids from northing 2428000 to 2428258 and easting from 323237 to 323520. The height of the mineral rejects stack will be 25 meter in four terraces of 7m height each with Top RL 620 m at the end of the plan period. (Ref plate no – VII).

The year wise build up if the stackyard is as below:

Year	Area to occupy (Ha)	Top RL (m)	Terrace (7m Height)
1st year	3.556	601	One
2 nd year	No additional area	606	One and two
3 rd year	No additional area	610	Two and Three
4 th year	No additional area	615	Three
5 th year	No additional area	620	Three & Four
Total	**3.556**		

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5.0 USE OF MINERAL AND MINERAL REJECT

a) Specification of end-use industry specifically in terms of physical and chemical composition.

As per Clause 3.5 of the Tender Document (Annexure X), the entire ore production including lumps and fines produced from the mine will be consumed in lessee's own iron plants situated at Meramandali. The chemical & physical specifications of the existing steel plant of the applicant for lump & fine ores are given below:

SL No.	Parameters	Lump Ore	Fines Ore
i	Fe	60.0 % (min)	55.0 % (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. 5% Each)	Size: - 10mm {with oversize 5% maximum and undersize 20% maximum.

b) Requirement of intermediate industries involved in upgradation of mineral before its end use

No

c) Detail requirement for other industries, captive consumption, export, associated industrial use etc.

The entire production of iron ore will be utilized for captive consumption of the lessee in its own plant located at Meramandali. As the rated capacity of the steel plant is 5.6 MTPA, iron ore to the tune of 5.6 x 1.6= 8.96 MTPA is required for the plant out of which a quantity of 2.95 MTPA will be supplied from this mine after opening of the mine and the rest iron ore would be obtained from different other mines of the Group.

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d) Physical and chemical specification stipulated by buyers

No sale is allowed. Hence, not applicable.

e) Processes adopted to up-grade the ROM to suit the user requirement

Mineral rejects ore containing 45-55% Fe will be stored in the earmarked site for future use through possible change/upgradation of technology. RoM of the mine only will be sized to the desired range suitable for its use in the steel plants by crushing & screening in the proposed mobile crushing & screening plant. No other processing excpting crushing and screening will be done within the lease area.

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6.0 PROCESSING OF RoM AND MINERAL REJECTS

a) Nature of processing-

No mineral beneficiation will be carried out in the mine. Total RoM of iron ore produced from the mine will be subjected to screening and crushing. The lumpy ore segregated in the screening process will be crushed and further screened to produce +10mm to +40mm lump and -10 mm fines. The sized ore along with the generated fines will be stored in the earmarked stackyards.

b) Material balance Chart & Flow chart of Screening & Crushing Plants

At present, no crushing & screening facility is available at the mines. It is proposed that about 2.95 MTPA of ROM (Run of Mine) from this will be processed in two nos. of Mobile Crushing & Screening Plants located within the ML area. The ore from mines will be fed to two no of hoppers. The material from the hopper flows through the grizzly and oversize from the grizzly is feed to the jaw crusher and the undersize is passed through a screen placed under grizzly. The oversize of the screen also flows in to the jaw crusher while the undersize is fed to the screen (tertiary) having three decks. There from under size of 0-10 mm comes out as product fines and the oversize i.e. +10 to -90mm is fed to cone crusher (tertiary). The output of jaw crusher and cone crusher (tertiary) is fed to another screen (secondary).The under size of this screen is termed as product (i.e. 0-10mm). The over size of the same is circulated to the circuit till the specified sized ore is obtained. The plant is capable of producing products of different size specifications (as mentioned in Table No. 5.a) The flow sheet of Mobile Crushing & Screening plant is as below:

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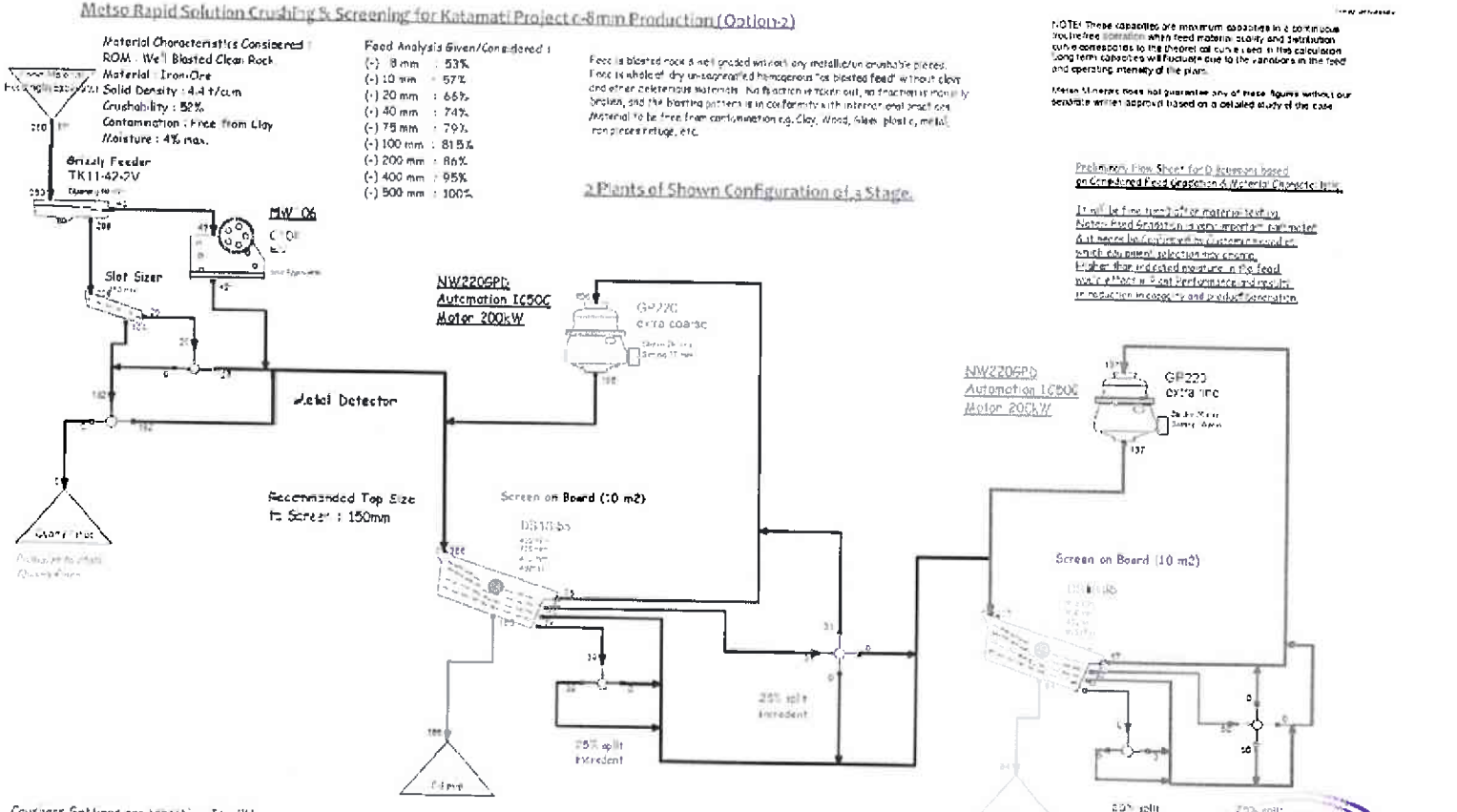
Metso Rapid Solution Crushing & Screening for Katamati Project c-8mm Production (Option-2)



Feed Analysis Given/Considered :

(-) 8 mm	: 53%
(-) 10 mm	: 57%
(-) 20 mm	: 66%
(-) 40 mm	: 74%
(-) 75 mm	: 79%
(-) 100 mm	: 81.5%
(-) 200 mm	: 86%
(-) 400 mm	: 95%
(-) 500 mm	: 100%

Feed is blasted rock & well graded without any metallic/un crushable pieces. Feed is wholly of dry un-segregated homogeneous "as blasted feed" without clays and other detrimental materials. Rejection is taken out, as required mainly by Section, and the blasting pattern is in conformity with interior and exterior. Material to be free from contamination e.g. Clay, Wood, Glass, plastic, metal, non pieces refuse, etc.

2 Plants of Shown Configuration of a Stage.

NOTE: These capacities are maximum capacities in a continuous (no/less interruption) when feed material quality and distribution curve corresponds to the theoretical curve used in the calculation. Long term capacities will fluctuate due to the variations in the feed and operating intensity of the plant.

Metso Minerals does not guarantee any of these figures without our specific written approval based on a detailed study of the case.

Preliminary Flow Sheet for D Recovery based on Considered Feed Gradation & Material Characteristics.

It will be fine tuned after material testing.
Moisture Feed Gradation is very important parameter & it needs to be monitored & corrected as much as present selection may change.
Higher than indicated moisture in the feed would affect plant performance and results in reduction in capacity and product generation.

Crushers Settings are tentative. It will be finally selected after material testing & adjusted at site as per product requirement

Screen Aperture Selection is Tentative. Based on requirement. Customer to Confirm. Media selection may undergo change based on screen performance at site.

Final Plant Capacity and Product Percentages/Capacity shall depend on Feed Material Crushability/Solid density and Feed Gradation Fed to the Plant at Site. Feed should not be slabby/laminated. Otherwise no. Guarantee on Product, Slope, PB Test will be conducted based on Belt Cut Method

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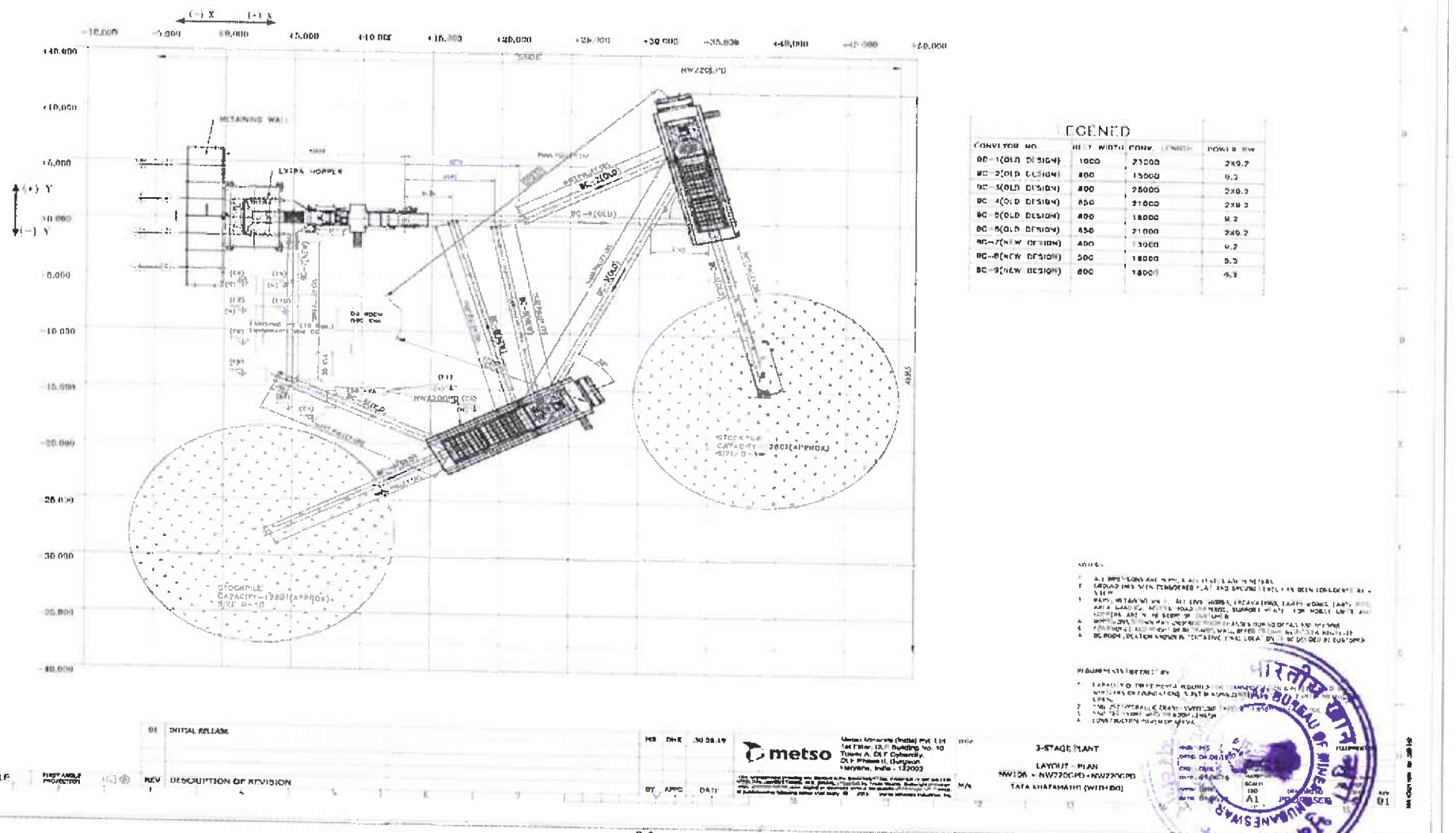
M/S TATA STEEL BSL LTD.
(PREFERED BIDDER)

MODIFICATION OF MINING PLAN
IN RESPECT OF
" KALAMANGA WEST (NORTHERN PART) IRON ORE BLOCK"
OVER 62.875 HA UNDER KOIRA AND BARBIL TAHASILS
OF SUNDARGARH & KEONJHAR DISTRICT,ODISHA



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c) **Explain the disposal method for tailing or rejects from the processing plant**

The screening and crushing will be entirely dry process and as such no tailings are expected t be generated.

d) **Quantity and quality of tailing / rejects 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 tailing dam.**

Does not arise.

f) **Specify quantity and type of chemicals if any to be used in the processing plant.**

Not applicable

g) **Specify quantity and type of chemicals to be stored on site/plant**

Not applicable

h) **Indicate quantity of water required for mining and processing and sources of supply of water disposal of water of recycling. Water balance chart may be given.**

i) Average water requirement at mine for domestic and mine use are to the tune of 65 m3/day and 170 m3/day respectively. Water for drinking and domestic purpose will be made from bore wells and that for mining use will be from sources like Water harvesting pond (WHP) / perennial stream / river. Peak water requirement at mine for domestic and industrial use are to the tune of 65m3/day and 200 m3/day respectively.

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Class of Use	Purpose	Peak demand (liters / day)	Source of water
Domestic	Drinking (for 170 persons @ 10 liters / man / day)	1700, say 2000	Bore well / dug well
	Bathing, washing, cooking etc. (for 250 persons @250 liters / man / day)	63000	-do-
	Sub_total	**65,000**	
Non-Domestic	Dust suppression at the dust prone areas like haul road, loading & unloading site etc. and Drilling	100000	Water harvesting pond (WHP) / perennial stream / river
	Equipment and vehicle washing	12000	
	Watering the plantation site	50000	-do-
	Misc	8000	
	Sub-total	**1,70,000**	
	Total	**2,35,000**	---

Water balance chart indicating source, consumption & extent of recycling with average value [peak value] is given in below figure.

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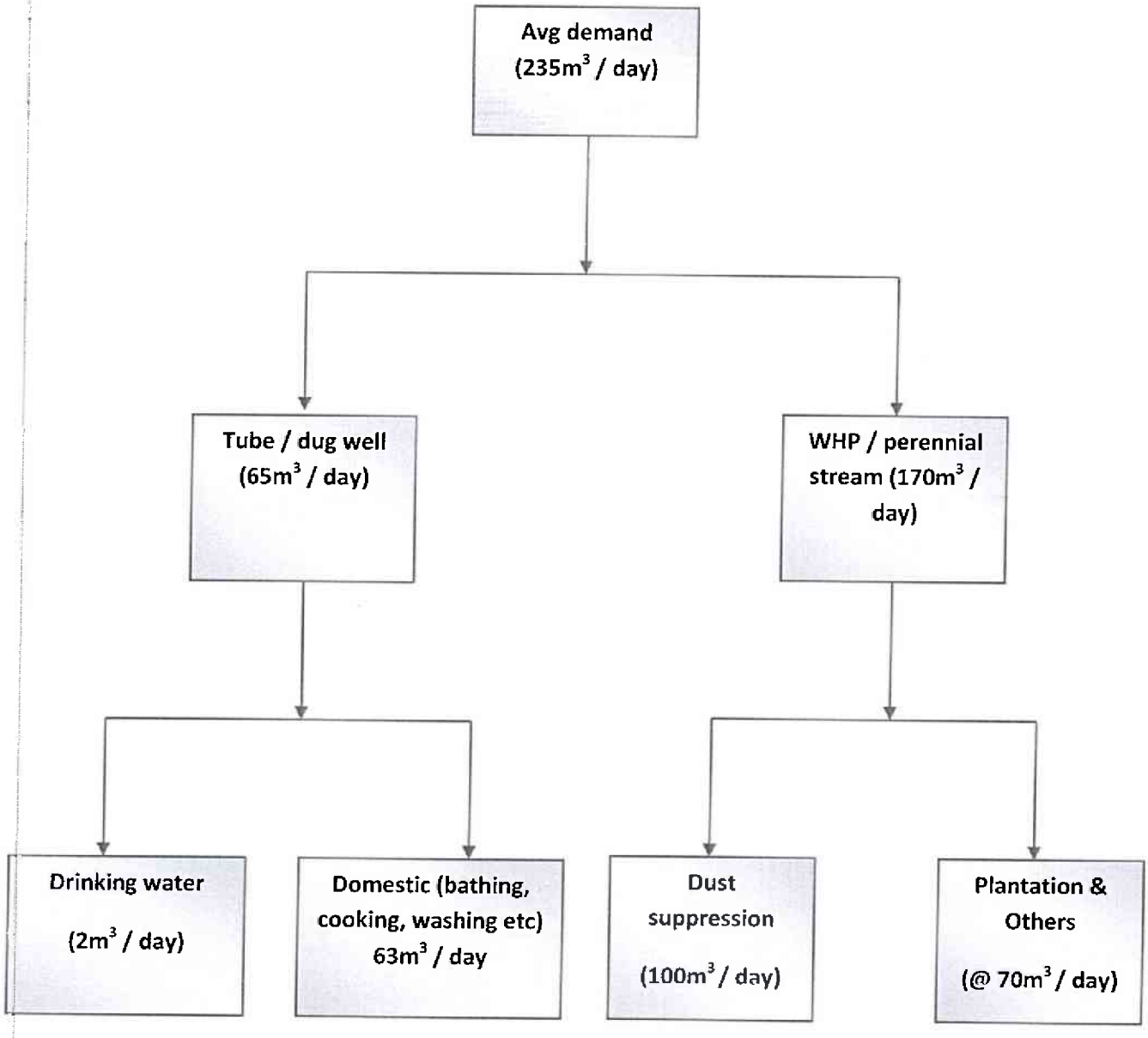

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7.0 OTHERS

a)Site services

The site services play a vital role in management of mines. The following site services will be provided within Kalamang west (North part) iron ore mines to facilitate mining operation.

i) All statutory services like first aid center, drinking water station, Rest shelters, sheds will be provided in close proximity of mines being developed.

ii) Electricity/ DG will be provided in camp, office, and mines.

iii) There will be an ambulance in the mines which in case of emergency can take the patient to the nearest hospital.

i) There will be water supply system for drinking water from the dug well/ tube well and distributed to camp, colony mines etc.
ii) An office of mines manager will be provided.

b) **Employment potential**

Proposed-

The mine is yet to be started. At present, there is no existing man power in the mine. Keeping in view the excavation, sorting & sizing etc. in the above manner and higher ratio of ore to waste. the OMS has been expected to be 3 t ROM iron ore. However, the total work force in the mine is required to be 428 numbers to achieve the planned production as calculated below:

Sl. No.	Particulars	Quantity
1	Production of RoM proposed / year	29,50,000T
2	Number of working days in the year excluding rainy days, holiday's etc.	300
3	Production of iron ore / day	90,043 / 300 = 9833.3 t, say 9833T
4	Method of mining	Fully Mechanized
4	OMS expected	23 t
5	Number of persons required / day	9833 / 65 = 427.5 or 428 Nos.

The employment distribution pattern has been proposed to be as follows:

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Category	Post	Qualification	Nos.
Management	1st class Mines Manager	1st class mines Manager Certificate of Competency as per DGMS	1
	Mining Engineer-in-charge	Degree in Mining Engineering/2nd class mines manager certificate of competency	3
	Geologist	M. Sc. in Geology / Applied Geology	2
Supervisory	Mining Foreman	Foreman's Certificate of Competency	6
	Mining Mate	Mate's Certificate of Competency	8
	Surveyor	Surveyor's Certificate of Competency	2
	Blaster	Blaster's Certificate of Competency	4
Highly Skilled	Excavator/ operator	Experienced with valid license	17
	Dumper operator	Experienced with valid license	45
	Clerical staff	Graduate and experienced	10
Skilled	Four Wheeler Driver	Experienced with valid license	15
	Water Tanker Driver	Experienced with valid license	15
	Pay loader operator	Experienced with valid license	8
	Crushing and Screen Operator	Experienced	15
	Drill, compressor& Dozer operator	Valid driving license	30
	Clerical staff	Graduate and experienced	15
Semi-Skilled	Security Guards	Experienced with valid gun license	60
	Spotter	Experienced	20
	Khalasi (Dumper)	Experienced	45
	Khalasi (Screen)	Experienced	20
Un-Skilled	Peon	Experienced	25
	Water carrier	Experienced	15
	Workers/Helpers	-	47
Total	---	---	428

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Category-wise employment pattern has been summarized as follows:

Category of Employment	Numbers	Percentage
Management & Supervisory	26	6%
Highly Skilled	72	17%
Skilled	98	23%
Semi-Skilled	145	34%
Un-skilled	87	20%
Total	**428**	**100%**

All statutory personnel will be employed by the applicant company directly. The labourers will be employed through contractor.

Organizational chart for risk assessment study

The below mentioned officials of the applicant company are to be contacted during the course of any accident. Hierarchy of the officials would be as below:

Vice president

General Manager

Asst. General manager (2 Nos)

Manager (4 Nos)

Foreman (6 Nos)Surveyor (2 Nos)Geologist (2Nos) Mining Mate (8 Nos)

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8.0 PROGRESSIVE MINE CLOSURE PLAN

8.1 Environment Base line information

In the Kalamang west (North part) iron ore mine, 42.608 Ha. comes under forest category and the rest 50.267 Ha. is non forest land. As this is a new mine and is yet to be executed no baseline information has been collected by any certified consultant and is not available with the applicant. The below mentioned baseline information has been collected and provided by the applicant itself.

The Present land–use pattern is given below:

Type of land use	Area At present in ha.
Area under excavation	0
Overburden dump	0
Mineral storage	0
Mineral rejects stack	0
Roads	0.726
Infrastructure (School , inhabitant sites, and abandoned crusher)	2.286
Safety zone	5.681
Total	**8.693**
Un touched area	84.182
Grand total	**92.875**

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Drainage pattern-

A dendritic type of drainage pattern is generally displayed by the area. Because of the hilly topography, there is only one seasonal drainage channel found in the western part of the area. Suna nadi is a perennial river flowing from South to North outside the area at a distance of 2km towards South-East and it becomes West-East from Malda and debouch into river Baitarani. The drainage channel originating in the western part of the area traverses through the area towards South.

Vegetation - The forest growth available in the area resembles Northern Tropical Dry Deciduous Forest. Sal is the most dominant tree with Mahul, Asun, Char, Kendu, Barkoli, Kusum, Dimiri etc. as common associates. The leasehold area comprises of 42.608 Ha of forest land.

Climate - The leasehold area lies in tropical region where climate is characterized by very hot summer and cool winters. Summer is typically from April to July when monthly temperature ranges from a maximum of 42^{0}C during day time to a minimum of 15^0 C at night. Winter is from November to February when the maximum temperature during day goes up to 37^0 C and minimum temperature at night becomes as low as 8^{0}C.

Rainfall data - The average rainfall recorded at IMD observatory at Keonjhar is 1269.1mm. The south-west monsoon lasts from mid-June to mid-September and the area gets more than 80% of the annual rainfall during this period.

Water Regime

There is only one seasonal drainage channel found in the western part of the area. Suna nadi is a perennial river flowing from South to North outside the area at a distance of 2km towards South-East and it becomes West-East from Malda and debouch into river Baitarani. The

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drainage channel originating in the western part of the area traverses through the area towards South.

Air Quality

The mining & industrial activities are gradually increasing within 5 km radius of the ML area. Therefore, air pollution may occur in near future. Ambient Air Quality will be monitored by lessee after commencement of mining operation. However, presently pollutant in air is negligible as no mining operation has been carried out in the lease area.

Flora and Fauna

The forest in the leasehold is classified as Northern Tropical Dry Deciduous Forests. The average tree density in core zone is about 0.2. The forest is under moderately degraded stage.

Fauna

Mangoose, Kuji Neola, Fox, Jackal, rats, krait, lizard etc. are major faunal species found in the core zone.

Human settlements

Kalamang, Ghodabudhani, Gandhalpada, Sagasahi, are the villages found within the 500m buffer zone of the area. The details of the population of the villages in the buffer zone are given in the table below:-

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Name of villages in the buffer zone	Population Nos.	Male Female Ratio	Rate of literacy	Occupation and Employment
Kalamang	1290	49:51	49.37%	Cultivation and mining
Ghodabudhani	167	49:51	28.74%	Cultivation and mining
Gandhalpada	602	49:51	29.90%	Cultivation and mining
Sagasahi	271	45:54	28.41%	Cultivation and mining

Public building, palaces, and monuments

There are no public buildings, palaces or monuments of interest inside the M.L area or within a radius of 500m.

Any sanctuary is located in the vicinity of leasehold

No sanctuary is located in the vicinity of the lease hold.

8.2 Environmental Impact Assessment (EIA)

i) Area likely to be degraded

A total of 72.047 Ha of land is likely to be degraded due to proposed mining, dumping, and other allied services at the end of the modified plan period. This would naturally create a change in topography. These topographical changes would be of the following order.

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Type of land use	Area at present in ha.	Area during modified Plan period in ha.	Total ared in ha.	Total area in ha at conceptual period
Area under excavation including the backfilled areas	0	26.599	26.599	75.377
Overburden dump	0	7.971	7.971	7.071
Mineral storage	0	17.246	17.246	0
Top soil Stack	0	0	0	0.843
Mineral rejects stack	0	3.556	3.556	*1.442
Road	0.726	4.436	5.162	0
Infrastructure(Rest shelter, Magazine, School , inhabitant sites, and abandoned crusher)	2.286	8.887	11.173	0
Retaining wall & Garland drain	0	0.34	0.34	0
Green belt in the south beyond the UPL	0	0	0	4.17
a) Sub-Total	***3.012***	***69.035***	***72.047***	***88.903***
Safety zone				
i)7.5 meter along the inner side of MI boundary	3.972	0	3.972	3.972
ii)10 meter width on either side of the village road	1.709	0	1.709	0
b) Sub-total	***5.681***	***0***	***5.681***	***3.972***
Total	**8.693**	**69.035**	**77.728**	**92.875**
Un touched area	84.182		15.147	0
Grand total	**92.875**	-	**92.875**	**92.875**

*The actual conceptual area of the Mineral Reject Stackyard would be 14.00 Ha out of which an area of 12.558 ha would be located on the backfilled areas of the exhausted quarry. Hence, only 1.442 Ha has been depicted as conceptual Mineral Reject stackyard area.

ii) Air quality

Mining activities will have the impact on the air environment because various operations like quarrying, screening, crushing, deploying of dumpers and diesel operated machineries and blasting.

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Corrective Measures

Monitoring

Regular monitoring of air and noise level will be carried out at potential points. To quantify the impact of the proposed mining and allied activities on the ambient air quality it is necessary at first to evaluate the existing ambient air quality of the core and buffer zone. The existing ambient air quality, in terms of suspended particulate matter (SPM), Respirable particulate (RPM), SO_2, oxides of Nitrogen (NOX), CO, Pb and Dust fall are to be measured through a planned field monitoring. To assess the ambient air quality level, monitoring stations (3) have been proposed within the core zone. Air samples will be taken once in a year to know the quality of air at different monitoring stations.

Measures to Control Air Pollution

Mitigating measures proposed against the possible impacts are as follows:

- Water sprinkling at regular intervals on the dust prone areas such as haul roads and other possible dust generation areas to suppress emission and distribution of dust particles.
- Use of wet-drilling techniques/ dust-collectors to prevent generation of dust during drilling operations.
- Use of suitable blast design & delay detonators to avoid excess generation of noise & dust during blasting operations.
- Water sprinkling on haul road for dust suppression.
- Use of equipment designed to latest environment standards so as to decrease the exhaust emissions.
- Proper maintenance of diesel equipment to decrease the emission level of NO_x and SO_x.
- Plantation along existing road to arrest the air borne dust from further spreading.

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- Dust masks will be provided to protect the workmen who are exposed to prolonged dust.

Periodical monitoring of air & noise level will be carried out throughout the life of the mine. The parameters like RPM, SPM, SO_2, NO_x and CO are proposed to be quantified in the air samples taken from core zone as well as buffer zone.

Programme of Afforestation

The details of plantation programme along the 10 meter safety zone of road wherever feasible, are as follows.

Year	Area in m^2 under plantation	Species	Distance between saplings	Nos. of saplings
1st year	2850	Ziziphus jujuba	2.5mx2.5m	456
2 nd year	3580	Anacardium occidentale	2.5mx2.5m	573
3 rd year	4270	Ziziphus jujuba	2.5mx2.5m	683
4 th year	3550	Anacardium occidentale	2.5mx2.5m	568
5 th year	2840	Ziziphus jujuba	2.5mx2.5m	454
Total	**17090**			**2734**

Apart from this, the dump slope and the matured backfilled areas will be brought under grass plantation.

iii) Water quality

Existing surface water bodies

There is no perennial nala present in the lease area.There is only one seasonal drainage channel found in the western part of the area.

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Existing ground water bodies

Ground water in the area occurs in unconfined condition in weathered mantle. The ground water is present 7 to 25 meters below the general surface level. Existing ground water body will not be affected by the mining as the level of operation is much above the water table.

Water quality management.

There will be least chance of pollution of the surface and groundwater due to surface mining. In rainy season there may be a chance of surface water pollution due to contamination of suspended and dissolved solids those are mostly expected from the out slopes of the mine excavation and slopes of waste dumps. The mitigation measures proposed are:

- Run-off water will be diverted from entering into active mining area through the proposed peripheral drain. No water from the active mining area will be allowed to flow down the valley.

- The direct precipitation into active mining area will be tackled by channelising the surface runoff to the lower level.

- Water will be chanallized to accumulate at the lowermost level, percolate down through the strata and enrich the ground water table.

- Peripheral barrier (7.5 m wide) will be left around the mine to stop the flow of water towards the streams.

- Samples collected from the nearby surface water sources and tube wells are/will be analyzed for their pollutant levels. For the purpose two water sampling stations have been proposed for monitoring of water on annual basis.

- Retaining walland Garland drain have been proposed to be constructed around the dump to control soil erosion.

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- Check dams in a staggered manner are proposed to be constructed along the seasonal nala to arrest the flow of run off and hence to reduce the erosion as below:

Dimension of Chekdam along nala

CD-1= 16mx5mx2m
CD-2= 20mx6mx3m
CD-3= 12mx4mx2m
CD-4= 6mx2mx1m

- Working benches will be kept free from loose overburden/ waste materials.

The details of the protective measures to prevent wash-off from the dumps and mineral rejects stack are given below:-

Year of construction	Location	Garland drain	Retaining wall
		Size, L x W x H in m	Size, L x W x H in m
1 st year	Around proposed dump-B at the southern side of the lease area	215x 3 x 2	200x2x 3

Year of construction	Location	Garland drain	Retaining wall
		Size, L x W x H in m	Size, L x W x H in m
2nd year	Around proposed dump-C at the southern side of the lease area	380x 3 x 2	370x2x3

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Year of constr uction	Location	Garland drain	Retaining wall
		Size, L x W x H in m	Size L x W x H in m
1 st year	Around proposed mineral rejects stack	1500 x 3 x 2	1200x2x 3

(v) Noise level

Due to operation of the HEMM & plant, ambient noise levels is likely to increase but the same will be managed through proper maintenance of the plant & machineries & use of personal protective equipment. This will help keep noise level within 90 dBA and also help in reducing vibration level. Plantation as proposed will help minimize noise level. Annual monitoring of noise level study will be carried out for which 3 stations have been proposed.

Exposures to high level of noise continuously over a long period may cause deafness, physiological stresses and feeling of tiredness.

Measures to minimize noise level

In work zone, operators sit in the enclosed of the HEMM to have the dust free environment and workers exposed to the dust are provided with dust mask.

The maximum noise level prescribed by Director General of Mine Safety (DGMS) for an 8 hours exposure is 90dB (A). Therefore, following control measures are suggested to keep the noise level within permissible limit :

- HEMM's will be maintained and lubricated properly.
- Operators cabins of the various installations equipment and vehicles will be built sound proof.

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- Instantaneous noise of blasting will be minimized by the implementation suitable blast design and use of proper delay interval.
- Man & animals will be evacuated to a safe distance (beyond the blasting danger zone) for safety from noise and fly rocks.

v) Vibration levels

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 5-6 times per week.

vi) Water regime

There is no perennial nala present in the lease area. There is only one seasonal drainage channel found in the western part of the area.Suna nadi is a perennial river flowing from South to North outside the area at a distance of 2km in the South-East and it becomes West-East from Malda and debouch into river Baitarani. The drainage channel originating in the western part of the area traverses through the area towards South.

It is to be noted that the existing groundwater levels on the hill top are well below the ore-body floor, expectedly more than 25 m underneath the surface levels. These would therefore remain unaffected by mining operations.

Details of the monitoring stations is as below:

Parameter	No	Northing	Easting
Air	A1	2428630	323578
	A2	2428148	323642
	A3	2428082	323816
Water	N1	2429050	323772
	N2	2428314	323402
	N3	2428462	323884
Noise	W1	2428432	323160
	W2	2428130	323476
	W3	2428128	323926

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vii) Acid mine drainage

Does not arise.

viii) Surface subsidence

Does not arise.

ix) Socio economics

This mining employment would greatly increase the income levels of the neighbouring natives. In addition, creation of comparatively well paid jobs in the area will generate not only sizeable trade in household supplies (including vegetables, milk, food, textile, etc) but also some household employment. It will also generate demand for tertiary services like transport and repair shops. The impact of mining operations in the nearby areas on socio-economic has been a positive one. The infrastructure of the area roads, public transport and electricity supply will also be improved after the advent of mining operation in the area. The socio-economic parameters of the nearby villages are as below:

Name of villages in the buffer zone	Population Nos.	Male Female Ratio	Rate of literacy	Occupation and Employment
Kalamang	1290	49:51	49.37%	Cultivation and mining
Ghodabudhani	167	49:51	28.74%	Cultivation and mining
Gandhalpada	602	49:51	29.90%	Cultivation and mining
Sagasahi	271	45:54	28.41%	Cultivation and mining

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x) Historical monuments etc

No historical monument is present within the area.

8.3 Progressive reclamation plan

Backfilling will start from the 2nd year onwards using the generated waste. Mineralisation in these areas has been proved through boreholes and will be backfilled only after exhaustion of the mineable reserve in terms of their depth & extension. Part of Waste to be generated during 2nd and 3rd years will be utilized to backfill the exhausted areas which will start from the NE corner of the quarry adjoining the proposed Dump A. Wastes of 4th and 5th years will be fully utilized for the backfilling. It will be tried to ensure the original sequence of lithologies during the backfilling. The backfilled areas will be brought under grass plantation. Backfilling will advance from NE to SW as below:

Year/Quary	Mined out area at the beginning in m²	Additional area proposed during the modified plan period in m²	Total area in m²	Area to be reclaimed during the modified plan period in m²	Area rehabilitated by plantation (sqm)	Balance area to be reclaimed at the end of year (sq m)
1st year/One pit	0	111725	111725	0		
2 nd year/One pit	111725	25750	137475	11352	0	126123
3 rd year/One pit	126123	56831	182954	23529	11352	159425
4 th year/One pit	159425	18286	177711	22195	23529	155516
5 th year/One pit	155516	53368	208884	44664	22195	164220

8.3.1 Mined out land

At the end of the modified plan period a total area of 72.047 Ha will be degraded under various mining activities.

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Type of land use	Area at present in ha.	Area during modified Plan period in ha.	Total area in ha.	Total area in ha. at conceptual period
Area under excavation including the backfilled areas	0	26.599	26.599	75.377
Overburden dump	0	7.971	7.971	7.071
Mineral storage	0	17.246	17.246	0
Top soil Stack	0	0	0	0.843
Mineral rejects stack	0	3.556	3.556	*1.442
Road	0.726	4.436	5.162	0
Infrastructure(Rest shelter, Magazine, School , inhabitant sites, and abandoned crusher)	2.286	8.887	11.173	0
Retaining wall & Garland drain	0	0.34	0.34	0
Green belt in the south beyond the UPL	0	0	0	4.17
a) Sub-Total	***3.012***	***69.035***	***72.047***	***88.903***
Safety zone				
i)7.5 meter along the inner side of MI boundary	3.972	0	3.972	3.972
ii)10 meter width on either side of the village road	1.709	0	1.709	0
b) Sub-total	***5.681***	***0***	***5.681***	***3.972***
Total	**8.693**	**69.035**	**77.728**	**92.875**
Un touched area	84.182		15.147	0
Grand total	**92.875**	**-**	**92.875**	**92.875**

*The actual conceptual area of the Mineral Reject Stackyard would be 14.00 Ha out of which an area of 12.558 ha would be located on the backfilled areas of the exhausted quarry. Hence, only 1.442 Ha has been depicted as conceptual Mineral Reject stackyard area.

Similarly, a total of 88.903 Ha of land will be utilized during conceptual period of the mine with present status of exploration.

The lessee has a plan to drill some boreholes in the area to prove the ore as per UNFC. After delineation of the ore body the limit of excavation will certainly be changed which will be reflected in the next review.

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8.3.2 Top- soil Management

During the first five years of planning there will be no generation of top-soil. The valley portion of the block has a meager thickness of around 0.2 m of top-soil which are covered under agriculture by the local villagers. Total area having top soil is 17.2 Ha. Hence, a total of 17.2 Ha x 0.2m= 34,400 $m^3$of top-soil will be generated during the conceptual period. This will be temporarily stacked in the Southern part of the ML area and shall be used for different plantation programmes. Retaining wall and garland drain are also to be constructed around the top-soil stack.

8.3.3 Tailing dam Management

Does not arise.

8.3.4 Acid mine drainage

Does not arise.

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

Since no patch of the proposed quarry is getting exhausted in the present plan period and there is further scope of mining in the area, reclamation proposal has not been proposed for the ensuing plan period. Conceptually, the area will be reclaimed through backfilling of the exhausted area and plantation over the backfilled areas. This can be planned out in the next review period after completion of the proposed exploration.

Year-wise proposal for progressive mine closure:

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PROPOSAL FOR THE YEAR 1st year

ITEMS	DETAILS	PROPOSED AREA (HECT.)	ACTUAL AREA (HECT.)	REMARKS
DUMP MANAGEMENT	Area afforested(ha)	Dump slope	Nil	
	No of sapling planted	Grass plantation	Nil	
	Cumulative nos. of plants	-	Nil	
	Cost including watch and care during the year	Nil	Nil	
MANAGEMENT OF WORKED OUT BENCHES	Area available for the rehabilitation(ha.)	Nil	Nil	
	Afforastation done	Nil	Nil	
	No of saplings planted in the year	Nil	Nil	
	M3 ulative nos. of plants	Nil	Nil	
	Any other method of rehabilitation	Nil	Nil	
	Cost including watch and care during the year	Nil	Nil	
RECLAMATION AND REHABI-LATION BY BACKFILLING	Void available for backfilling(LXBXD) pit wise/stope wise	11.17 Ha	Nil	
	Void filled by waste /tailing	Nil	Nil	
	Afforastation on the backfilled area	Nil	Nil	
	Rehabilitation by making water reservoir	Nil	Nil	
	Any other means	Nil	Nil	
REHABILITATION OF WASTE LAND WITHIN THE LEASE	Area available (ha.)	Nil	Nil	
	Area rehabilitated	Nil	Nil	
	Method of rehabilitation	Nil	Nil	
OTHERS (Specify)	Plantation along safety zone	0.285	Nil	
	Garland drain around proposed dump and SG stack	0.14	Nil	
	Retaining wall around proposed dump and SG stack	0.12	Nil	
	Check dams over Garland drain	02	Nil	

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PROPOSAL FOR THE 2nd YEAR

ITEMS	DETAILS	PROPOSED AREA (HECT.)	ACTUAL AREA (HECT.)	REMARKS
DUMP MANAGEMENT	Area afforested(ha)	Dump slope	Nil	
	No of sapling planted	Grass plantation	Nil	
	Cumulative nos. of plants	Nil	Nil	
	Cost including watch and care during the year	Nil	Nil	
MANAGEMENT OF WORKED OUT BENCHES	Area available for the rehabilitation(ha.)	Nil	Nil	
	Afforastation done	Nil	Nil	
	No of saplings planted in the year	Nil	Nil	
	M3 ulative nos. of plants	Nil	Nil	
	Any other method of rehabilitation	Nil	Nil	
	Cost including watch and care during the year	Nil	Nil	
RECLAMATION AND REHABI-LATION BY BACKFILLING	Void available for backfilling(LXBXD) pit wise/stope wise	13.75 Ha	Nil	
	Void filled by waste /tailing	1.135 Ha	Nil	
	Afforastation on the backfilled area	Nil	Nil	
	Rehabilitation by making water reservoir	Nil	Nil	
	Any other means	Nil	Nil	
REHABILITATION OF WASTE LAND WITHIN THE LEASE	Area available (ha.)	Nil	Nil	
	Area rehabilitated	Nil	Nil	
	Method of rehabilitation	Nil	Nil	
OTHERS (Specify)	Plantation along safety zone	0.358	Nil	
	Garland drain around proposed dump	0.04	Nil	
	Retaining wall around proposed dump	0.04	Nil	
	Check dams over Garland drain	Nil	Nil	

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PROPOSAL FOR THE 3rd YEAR

ITEMS	DETAILS	PROPOSED AREA (HECT.)	ACTUAL AREA (HECT.)	REMARKS
DUMP MANAGEMENT	Area afforested(ha)	Dump slope	Nil	
	No of sapling planted	Grass plantation	Nil	
	Cumulative nos. of plants	Nil	Nil	
	Cost including watch and care during the year	Nil	Nil	
MANAGEMENT OF WORKED OUT BENCHES	Area available for the rehabilitation(ha.)	Nil	Nil	
	Afforastation done	Nil	Nil	
	No of saplings planted in the year	Nil	Nil	
	M3 ulative nos. of plants	Nil	Nil	
	Any other method of rehabilitation	Nil	Nil	
	Cost including watch and care during the year	Nil	Nil	
RECLAMATION AND REHABI-LATION BY BACKFILLING	Void available for backfilling(LXBXD) pit wise/slope wise	18.29Ha	Nil	
	Void filled by waste /tailing	2.35 Ha	Nil	
	Afforestation on the backfilled area	1.165 Ha	Nil	
	Rehabilitation by making water reservoir	Nil	Nil	
	Any other means	Nil	Nil	
REHABILITATION OF WASTE LAND WITHIN THE LEASE	Area available (ha.)	Nil	Nil	
	Area rehabilitated	Nil	Nil	
	Method of rehabilitation	Nil	Nil	
OTHERS (Specify)	Plantation along safety zone	0.427	Nil	
	Garland drain around proposed dump	Nil	Nil	
	Retaining wall around proposed dump	Nil	Nil	
	Check dams over Garland drain	Nil	Nil	

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PROPOSAL FOR THE 4th YEAR

ITEMS	DETAILS	PROPOSED AREA (HECT.)	ACTUAL AREA (HECT.)	REMARKS
DUMP MANAGEMENT	Area afforested(ha)	3.0	Nil	
	No of sapling planted	5000	Nil	
	Cumulative nos. of plants	Nil	Nil	
	Cost including watch and care during the year	Nil	Nil	
MANAGEMENT OF WORKED OUT BENCHES	Area available for the rehabilitation(ha.)	Nil	Nil	
	Afforastation done	Nil	Nil	
	No of saplings planted in the year	Nil	Nil	
	M3 ulative nos. of plants	Nil	Nil	
	Any other method of rehabilitation	Nil	Nil	
	Cost including watch and care during the year	Nil	Nil	
RECLAMATION AND REHABI-LATION BY BACKFILLING	Void available for backfilling(LXBXD) pit wise/stope wise	17.77 Ha	Nil	
	Void filled by waste /tailing	2.22 Ha	Nil	
	Afforastation on the backfilled area	2.35 Ha	Nil	
	Rehabilitation by making water reservoir	Nil	Nil	
	Any other means	Nil	Nil	
REHABILITATION OF WASTE LAND WITHIN THE LEASE	Area available (ha.)	Nil	Nil	
	Area rehabilitated	Nil	Nil	
	Method of rehabilitation	Nil	Nil	
OTHERS (Specify)	Plantation along safety zone	0.355	Nil	
	Garland drain around proposed dump	Nil	Nil	
	Retaining wall around proposed dump	Nil	Nil	
	Check dams over Garland drain	Nil	Nil	

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PROPOSAL FOR THE 5th YEAR

ITEMS	DETAILS	PROPOSED AREA (HECT.)	ACTUAL AREA (HECT.)	REMARKS
DUMP MANAGEMENT	Area afforested(ha)	4.0	Nil	
	No of sapling planted	7000	Nil	
	Cumulative nos. of plants	12000	Nil	
	Cost including watch and care during the year	Nil	Nil	
MANAGEMENT OF WORKED OUT BENCHES	Area available for the rehabilitation(ha.)	Nil	Nil	
	Afforastation done	Nil	Nil	
	No of saplings planted in the year	Nil	Nil	
	M3 ulative nos. of plants	Nil	Nil	
	Any other method of rehabilitation	Nil	Nil	
	Cost including watch and care during the year	Nil	Nil	
RECLAMATION AND REHABI-LATION BY BACKFILLING	Void available for backfilling(LXBXD) pit wise/stope wise	20.88Ha.	Nil	
	Void filled by waste /tailing	4.47 Ha	Nil	
	Afforastation on the backfilled area	Nil	Nil	
	Rehabilitation by making water reservoir	2.22 Ha	Nil	
	Any other means	Nil	Nil	
REHABILITATION OF WASTE LAND WITHIN THE LEASE	Area available (ha.)	Nil	Nil	
	Area rehabilitated	Nil	Nil	
	Method of rehabilitation	Nil	Nil	
OTHERS (Specify)	Plantation along safety zone	0.284	Nil	
	Garland drain around proposed dump	Nil	Nil	
	Retaining wall around proposed dump	Nil	Nil	
	Check dams over Garland drain	Nil	Nil	

CHANDRABHANU DAS
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8.4 Disaster management & risk assessment

- Geological and climatic hazards such as landslide, subsidence and inudation are not expected as because the working is by opencast mining.
- Although earthquake was felt several times in Odisha, the scale is very small.
- Flood due to river action is not expected due to higher surface relief of the area.
- Small scale fire is possible, which can be tackled by fire extinguishers.
- In case of any disaster the below mentioned name is to be contacted:

Name and address of the Person responsible in respect of disaster & risk management:

The below mentioned officials of the applicant company are to be contacted during the course of any disaster and risk management. Hierarchy of the officials would be as below:

Vice president

General Manager

Asst. General manager (2 Nos)

Manager (4 Nos)

As no statutory personnel are there and are yet to be posted, and the mine is yet to start operation, no such disaster is presumed within the ML area. However, the Power of Attorney Holder as mentioned below would be monitoring the disaster & risk managementof the ML till such appointments are complete.

CHANDRABHANU DAS
QUALIFIED PERSON

POA Holder- Mr Manikanta Naik

Office of Chief Corporate Service,
Narendrapur, PO-Kusupanga, Via- Meramandali,
Dist- Dhenkanal. 759 121, Odisha, India.
Tel +91 6762 300000, +91 6762 660002
Email: tatasteelbsl.co.in, ccs.office@tatasteelbsal.co.in
Website : www.tatasteelbsl.co.in

8.5 Care & maintenance during temporary discontinuance

Temporary discontinuance of mining may happen due to below causes:

- Court order
- Natural calamities
- Mine related accident
- Slope failure
- Failure in fulfillment of statutory requirement
- Local issues, or
- Any other unforeseen circumstances

During temporary discontinuance, the following measures can be undertaken partly/fully depending upon the causes:

- Intimation to local mine & legal administrative authorities regarding the discontinuance
- Listing of machines and materials
- Care and maintenance of machineries
- Tightening of security to keep the machine and materials safe and secured
- Preparation of plans and sections at the time of discontinuance
- Repair and maintenance of haul roads
- Regular monitoring of air, water, noise etc in the permitted zones

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8.6 Financial assurance (As per CCOM's Circular No.4/2006)

SL No.	Type of land used	Area put on use at start of plan period (Hectares)	Additional requirement during plan period. (Hectares)	Total (Hectares)	Area considered as fully reclaimed & rehabilitated (Hectares)	Net area considered for calculation of financial assurance
a	b	c	d	e=c+d	f	g
1	Area of excavation	0	26.599	**26.599**	0	**26.599**
2	Storage for top-soil	0	0	**0**	0	**0**
3	Overburden dump	0	7.971	**7.971**	0	**7.971**
4	Mineral storage	0	17.246	**17.246**	0	**17.246**
5	Infrastructure Rest shelter, Magazine, School , inhabitant sites, and abandoned crusher)	2.286	8.887	**11.173**	0	**11.173**
6	Roads	0.726	4.436	**5.162**	0	**5.162**
7	Railway	0	0	**0**	0	**0**
8	Tailing pond	0	0	**0**	0	**0**
9	Effluent treatment plant	0	0	**0**	0	**0**
10	Mineral separation plant	0	0	**0**	0	**0**
11	Township area	0	0	**0**	0	**0**
12	(Others) i)MR storage ii)Retaining wall iii)Garland drain	0 0 0	3.556 0.16 0.18	**3.556** **0.16** **0.18**		**3.556** **0.16** **0.18**
	Total	**3.012**	**69.035**	**72.047**	**0**	**72.047**

अनुमोदित
APPROVED
क्षेत्रीय खान नियंत्रक
REGIONAL CONTROLLER OF MINES
भारतीय खान ब्यूरो
INDIN BUREAU OF MINES
भुवनेश्वर / BHUBANESWAR

As the mine is an auctioned one, no financial assurance is required to be submitted by the applicant along with this document as per Rule 27 (1) of MCDR 2017.

CHANDRABHANU DAS
QUALIFIED PERSON

Certificate & Undertaking:

The certificate duly signed by the lessee is enclosed, declaring that the said closure plan complies all statutory rules, regulations, orders made by the Central or State Government, statutory organizations, court etc. and have been taken into consideration in the document and wherever any specific permission is required, the lessee will approach the concerned authorities.

An undertaking to the effect that all the measures proposed in this closure plan will be implemented in a time bound manner as proposed is also submitted by the lessee.

CHANDRABHANU DAS
QUALIFIED PERSON

PART B

9.0 Consents /Undertakings/ Certificates (As detailed below)

10.0

11.0

Chandrabhanu Das
Qualified Person

9.0 Certificates/Undertakings/Consents

A. CONSENT LETTER /UNDERTAKING/CERTIFICATE FROM THE APPLICANT

01. The Modification of Mining Plan in respect of Kalamang West (Northern Part) Block Iron Ore Mine over an area of 92.875 Ha. or 229.494 acres in villages Kalamang & Ghodabudhani of Koida Tahasil of Sundargarh district and village Gandalpada of Badbil Tahasil of Keonjhar district, Odisha, under *Rule 17(3) of the* Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2016, has been prepared by Sri Chandrabhanu Das, Qualified Person.

This is to request the Regional Controller of Mines, Indian Bureau of Mines, Bhubaneswar to make any further correspondence regarding any correction of the Modification of Mining Plan with the said Qualified Person at his address below:-

Chandrabhanu Das

Geo Consultants Pvt. Ltd.

853, Gobind Prasad (Medical Lane)

Mahavir Nagar

(in front of Radhika Complex/Reliance Fresh)

Laxmisagar, Bhubaneswar-751006

Phone: 0674-2575702, 09437019019

We hereby undertake that all modifications/updating as made in the said Modification of 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.

02. It is certified that the CCOM's circular no. 2/2010 has already been complied with related to DGPS survey by ORSAC. Also, Boundary Pillars will be maintained as per CCOM's circular no. 2/2010.

03. It is certified that the Progressive Mine Closure Plan of Kalamang West (Northern Part) Block Iron Ore Mine Of M/s TATA Steel BSL Limited over an area of 92.875 Ha. or 229.494 acres complies with all statutory Rules, Regulations, Orders made by the Central or State Government, Statutory Organizations, Court etc. and wherever any specific permission is required, the preferred bidder 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.

04. "The Provisions of Mines Act, Rules and Regulations made there under have been observed in the Modification of Mining Plan in respect of Kalamang West (Northern Part) Block Iron Ore Mine of M/s TATA Steel BSL Limited over an area of 92.875 Ha. or 229.494 acres in village Kalamang & Ghodabudhani of Koida Tahasil of Sundargarh district and village Gandalpada of Badbil Tahasil of Keonjhar district, Odisha, and where specific permissions are required, the lessee will approach the DGMS Further, standards prescribed by DGMS in respect of miners' health will be strictly implemented".

Place: KOLKATA

Date: 19.08.20

Signature of the Applicant
For Tata Steel BSL Ltd

Rajeev Singhal
Managing Director
(Nominated Owner)

TATA STEEL BSL LIMITED
(Formerly known as Bhushan Steel Limited)
Plant: Narendrapur Kusupanga Meramandali Dhenkanal 759 121 Odisha India Tel (O) 06762 300000/ 660002/ 660000
Regd. Office: Ground Floor Mira Corporate Suites Plot No. 1&2 Mathura Road Ishwar Nagar New Delhi 110065
Email: tsbsl@tatasteelbsl.co.in Website: www.tatasteelbsl.co.in CIN No.: L74899DL1983PLC014942

CERTIFICATE

This is to certify that I, Chandrabhanu Das has successfully completed the master degree in applied Geology from Indian School of Mines, Dhanbad in 1989 which is the required qualification for preparation of mining plan and scheme of mining as per Rule 15 (a) of the Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2015 . This is also certified that I have served the state Directorate of Geology in the position of Geologist from November 1990 to October 2011 and have the requisite experience. Also, I am working as Director, M/s Geo Consultants Pvt. Ltd, Bhubaneswar since December 2011 where I have prepared mining plans and scheme of mining for different clients like ML 130 of SAIL, Gorumahisani Iron mine of Ms Ghanashyam Mishra, Alanda Limestone and Dolomite mine of B D Pattanayak, Inganijharan Iron Mine of B C Dev etc as a RQP holder and these documents have duly been approved by IBM. Therefore, I have also the experience as required under Rule 15 (b) of the Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession Rules, 2015.

Place : Bhubaneswar

Date : 14.08.2020

Chandrabhanu Das

Qualified Person

CERTIFICATE - I

The provisions of the Mineral Conservation and Development Rules, 2017 have been observed in the preparation of the modification of mining plan for Kalamang West (Northern Part) Block Iron Ore Mine of M/s TATA Steel BSL Limited over an area of 92.875 Ha. or 229.494 acres in villages Kalamang, Ghodabudani & Gandalpada, Tahasils Koida & Barbil of Sundargarh & Keonjhar districts, Odisha, and wherever specific permission is required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

The information furnished in the modification of mining plan is true and correct to the best of our knowledge.

Date : 14.08.2020
Place : Bhubaneswar

Chandrabhanu Das
Qualified Person

10.0 LIST OF PLATES

Plate No	Description	Scale (R F)
I	Key Plan	1 : 50,000
II	Lease Plan countersigned by Mining Authority	16" = 1 mile
IIA	DGPS Lease plan	16" = 1 mile
III	Surface Plan	1 : 2,000
IV	Geological plan	1 : 2,000
IV-A	Geological sections	1 : 2,000
V	Year wise development plan (1 St Year)	1: 2,000
V'	Year wise development Sections(1 St Year)	1: 2,000
V-A	Year wise development plan (2 nd Year)	1: 2,000
V-A'	Year wise development Sections (2 nd Year)	1: 2,000
V – B	Year wise development plan (3 rd Year)	1: 2,000
V-B'	Year wise development Sections (3 rd Year)	1: 2,000
V-C	Year wise development plan (4 th Year)	1: 2,000
V-C'	Year wise development Sections (4 th Year)	1: 2,000
V-D	Year wise development plan (5 th Year)	1: 2,000
V-D'	Year wise development Sections (5 th Year)	1: 2,000
VI	Environment plan	1: 5,000
VII	Reclamation Plan	1 : 2,000
VIII	Conceptual Plan	1 : 2,000
VIII-A	Conceptual Sections	1: 2,000
IX	Progressive Mine Closure Plan	1: 2,000
X	Financial Assurance plan	1: 2,000

Chandrabhanu Das
Qualified Person