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TEXT

MINING PLAN

(Submitted Under Rule 16(1) of MCR, 2016)

WITH

PROGRESSIVE MINE CLOSURE PLAN

(Submitted Under Rule 23 of MCDR, 2017)

In respect of

MAHULSUKHA IRON & MANGANESE BLOCK
OVER AN EXTENT OF 390.317 HA IN RANDA, RANTHA AND BHUTUDA
IN LAHUNIPADA TAHASIL, OF SUNDARGARH DISTRICT, ODISHA

PERIOD OF MINING PLAN PROPOSAL 2020-21 TO 2024-25

LAND DETAILS		CATEGORY OF MINE	DATE OF EXECUTION	VALIDITY
FOREST	NON-FOREST			
370.751	19.566	'A' - FM	29.06.2020	28.06.2070 (50YEARS)

LESSEE

M/S PATNAIK MINERALS PVT LTD

ADDRESS OF MINES OFFICE	REGISTERED OFFICE ADDRESS
MAHULSUKHA IRON AND MANGANESE BLOCK AT/PO : BHUTUDA, VIA : BARSUAN DIST : SUNDARGARH, ODISHA, E-MAIL : PIN : 770041 E-MAIL:MOHAPATRAB123@GMAIL.COM	M/S PATNAIK MINERALS PVT LTD BANEIKELA, JODA DIST- KEONJHAR, ODISHA TEL NO-06767-272101 TELE FAX-06767-273807 PMPL1123@REDIFFMAIL.COM

PREPARED BY

Sri Bhabagrahi Mohapatra, Qualified Person

Qualification: M.Sc- Geology

Address

M/S PATNAIK MINERALS PVT LTD
BANEIKELA, JODA
DIST- KEONJHAR, ODISHA
TEL NO-06767-272101

Email : mohapatrab123@gmail.com

MOB: 9437139637

B. MOHAPATRA
GENERAL MANAGER (P & C)
M/S. PATNAIK MINERALS PVT. LTD.

B. MOHAPATRA
GENERAL MANAGER (P & C)
M/S. PATNAIK MINERALS PVT. LTD.

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

BY REGD PANCEL
Office 0674-2552493
Tele Fax 0674-2352400
Email ro.bhubaneshwar@imm.gov.in
Plot No.149, Pokhariput
BHUBANESWAR-751020

No. MP/A/17-ORI/BHU/2020-21/7496 Date: 01.10.2020

To

Shri S K Patnaik, Director,
M/s Patnaik Minerals Pvt Ltd,
P.O- Bonaikela, Joda,
Dist- Keonjhar, Odisha-758035

Sub: Approval of Mining Plan of Mahulsukha Iron & Mn. Mine along with Progressive Mine Closure Plan (PMCP), over an area of 390.317 ha (As per DGPS)/ 399.838 ha (As per ROR) in Sundargarh district of Odisha State, submitted by M/s Patnaik Minerals Pvt Ltd under Rule 16 of Mineral Concession Rules, 2016.

Ref: - i) Your letter No. PMPL/RCM dated 08.09.2020.
ii) This office letter of even no. dated 08.09.2020.
iii) This office letter of even no. dated 08.09.2020 addressed to the Director of Mines, Govt. of Odisha, copy endorsed to you.
iv) This office letter of even no. dated 15.09.2020.
v) Your letter No. PMPL/332, dated 21.09.2020

Sir,

In exercise of the power delegated to me vide Gazette Notification No. S.O. 1857(E) dated 18.05.2016, I hereby **Approve** the Mining Plan including Progressive Mine Closure Plan of Mahulsukha Iron & Mn. Mine over an area of 390.317 ha (As per DGPS)/ 399.838 ha (As per ROR) of M/s Patnaik Minerals Pvt Ltd in Sundargarh district of Odisha State submitted under Rule 16 of Mineral Concession Rules, 2016. This approval is subject to the following conditions:

I. The Mining Plan is approved without prejudice to any other law applicable to the mine area from time to time whether made by the Central Government, State Government or any other authority and without prejudice to any order or direction from any court of competent jurisdiction.

II. The proposals shown on the plates and/or given in the document is based on the lease map /sketch submitted by the applicant/ lessee and is applicable from the date of approval.

III. It is clarified that the approval of aforesaid Mining Plan does not in any way imply the approval of the Government in terms of any other provision of Mines & Minerals (Development & Regulation) Act, 1957, or the Mineral Concession Rules, 2016 and any other laws including Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 or the rules made there under, Mines Act, 1952 and Rule & Regulations made there under.

IV. Indian Bureau of Mines has not undertaken verification of the mining lease boundary on the ground and does not undertake any responsibility regarding

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

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

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

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

VIII. The feasibility report considered for reserve/resource estimation as per UNFC is submitted by the preferred bidder / lessee which is prepared based on the current data as reported and it may not establishes the future economic viability of mining project, which may be affected by the market dynamics and other related factors..

भवदीय / yours faithfully,

Encl: - One copy of
of Mining Plan

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

Copy for kind information to:-

1. The Director of Mines, Directorate of Mines, Government of Odisha, Heads of the Department Building, Bhubaneswar– 751001, Odisha along with one copy of Mining Plan by **REGISTERED PARCEL.**
2. Shri Bhabagrahi Mohapatra, M/s Patnaik Minerals Pvt Ltd, P.O- Bonaikela, Joda, Dist- Keonjhar, Odisha-758035.

(HARKESH MEENA)
/ Regional Controller of Mines

Approved vide letter no:-
MP/B/117 - ORI/ BHU/ 2020-21
Dated 01.10.2020.

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(Submitted Under Rule 16(1) of MCR, 2016)

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PREPARED BY

Sri Bhabagrahi Mohapatra, Qualified Person

Qualification: M.Sc- Geology

Address

M/S PATNAIK MINERALS PVT LTD
BANEIKELA, JODA
DIST- KEONJHAR, ODISHA
TEL NO-06767-272101
Email : mohapatrab123@gmail.com
MOB: 9437139637

CONTENTS

B-HABAGRAHI MOHAPATRA
QUALIFIED PERSON

LIST OF ANNEXURES

BHABAGRAHI MOHAPATRA
QUALIFIED PERSON

LIST OF PLATES

PLATE NO	PARTICULARS	SCALE
I	Key Plan	1:50,000
II	Authenticated Lease Plan / DGPS	16"= 1 MILE
III	Surface Plan	1:2000
IV	Geological Plan	1:2000
V (A), (B) & (C)	Geological Sections	1:2000
VI	UNFC Plan	1:2000
VII (A) & (B)	Development Plan & Section Manganese Block (2020-2021)	1:2000
VIII (A) & (B)	Development Plan & Section Manganese Block (2021-2022)	1:2000
IX (A)	Development Plan & Section Manganese Block (2022-2023)	1:2000
IX (B)	Development Plan & Section Iron Block (2022-2023)	1:2000
X (A)	Development Plan & Section Manganese Block (2023-2024)	1:2000
X (B)	Development Plan & Section Iron Block (2023-2024)	1:2000
XI (A)	Development Plan & Section Manganese Block (2024-2025)	1:2000
XI (B)	Development Plan & Section Iron Block (2024-2025)	1:2000
XII	Dump Plan & Section	1:1000
XIII	Environment Plan	1:2000
XIV	Reclamation Plan	1:2000
XV	Conceptual Plan	1:2000
XVI (A) & (B)	Conceptual Sections	1:2000
XVII	Financial Assurance Area Plan	1:2000

DIBAKARA MOHAPATRA
QUALIFIED PERSON

INTRODUCTORY NOTE

HISTORY OF THE MINING LEASE:

The Mahulsukha Mining Lease area was initially executed for mining of Manganese Ore on 03.02.1945 for a period of twenty (20) years in favor of M/s Aryan Mining & Trading Corporation Ltd. The 2nd renewal over an area of 399.838 hectares was granted w.e.f 03.02.1985 for twenty (20) years which expired on 03.02.2005. The mining operation was under deemed extension provision under rule 24A (6) of Mineral Concession Rule 1960. In the meantime, the MMDR (Amendment) Act 2015 came into force on 12.01.2015. Subsequently, the Govt. of Odisha, Department of Steel & Mines vide Letter No.IIIB)SM-13/2012-3326/S&M. Bhubaneswar, dt.18.04.2015, extended the validity period of above mining lease area under Section 8(A) (6) of the M&M (D&R) Act, 1957 as amended by the MMDR Amendment Act, 2015 from the date of expiry of the last valid period of lease i.e. 03.02.2005 to 31.03.2020 in favor of M/s Aryan Mining & Trading Corporation Ltd. Consequently, a supplementary lease deed has been executed in favor of M/s Aryan Mining & Trading Corporation Ltd. on 17.12.2015 for a period of lease w.e.f. 03.02.2005 to 31.03.2020 which has been registered on 18.12.2015 vides registered No.1721500607.

APPROVED

10/12/2020

क्षेत्रीय खनन नियंत्रक
REGIONAL CONTROLLER OF MINES
भारतीय खान ब्यूरो
INDIAN BUREAU OF MINES
भुवनेश्वर/BHUBANESWAR

PRESENT STATUS OF MINING LEASE

As per the section 8A (4) of MMDR (Amendment) Act 2015, on the expiry of the lease period, the lease shall be put up for auction. Accordingly, the Govt of Odisha put the Mining Lease for auction. Pursuant to the Mines and Minerals (Development and Regulation) ACT, 1957 and The Mineral (Auction) Rules, 2015, Govt of Odisha issued the Notice Inviting Tender dated 06.12.2019 for commencement of the auction process to grant the mining Lease undernon-captive category in respect of **Mahulsukha Iron and Mn ore block** over an area of 390.317Ha in Lahunipada Tahasil of Sundargarh district of Odisha. **(Copy of the NIT is attached as Annexure-1)**

The e-auction process was conducted in accordance with the tender document and the mineral auction rule, 2015 for said block and M/s Patnaik Minerals Pvt Limited was declared as the Preferred Bidder under Rule 9(4) (b) (iii) of the Rules having quoted a final price offer of 92.70%. (Copy of the preferred bidder is attached as **Annexure-2**)

Subsequently, M/s Patnaik Minerals Pvt Ltd has made payment of Rs2, 01,80,194.00 (Rupees two crore one lakh eighty thousand and one hundred ninety four only) in shape of treasury challan vide e challan no 10125 on dated 25..02.2020 at cyber treasury, District Sundargarh which was received by the Govt on same date i.e. 25.02.2020 against the first installment being ten percent of the upfront money. Accordingly, the Government of Odisha has issued **Letter of Intent(copy enclosed as Annexure- 3)** under Rule 10(2) of Mineral Auction Rules 2015 to M/s Patnaik Minerals pvt Ltd for grant of Mining Lease for Mahulsukhaironand Manganese block for Iron and Manganese ore over an area of 390.317Ha in Randa, Rantha, and Bhutuda villages, LahunipadaTahasil of Sundargarh district of Odisha for a period of 50 years.

BHABAGRAHI MOHAPATRA
QUALIFIED PERSON

This letter of intent and subsequent grant of aforementioned mining lease is valid subject to the provision of the Act and the Rules made there under as amended from time to time and M/S Patnaik Minerals pvt Ltd shall be designated **as the Successful Bidder** and the **subsequently granted the mining lease** only upon satisfactory completion of all the requirements under the Act and Rules made there under.

(A) M/s Patnaik Minerals Pvt Limited has been considered as Successful Bidder:

On payment of Second Instalment of the Upfront Payment, Submission of the Performance Security and complying with all other requirements as prescribed under Rule 10, Sub-Rule (3) of the said Rules, we M/S Patnaik Minerals Pvt. Ltd have been declared as the **Successful Bidder** vide Order No. 5252/SM dated 24.06. 2020.(Copy enclosed vide**Annexure – 4.**)

(B) Issue of Vesting Order: Pursuant to the provisions contained in rule 9 A(2) of the Rules, 2016 order that all the valid rights, approvals, clearances, licenses and the like vested in the previous lessee in respect of the aforementioned mining block are deemed to have vested in favour of the holder of the letter of intent on the same terms and conditions every rights, approvals, clearances, licenses and the like which vested with the previous lessee.

Without prejudice to the generality of the provisions of section 8B(2) of the MMDR Act, 1957, the details of the valid rights, approvals, clearances, licenses and the like held by the previous lessee are vested in favor of M/S Patnaik Minerals Pvt Ltd by the Govt. of Odisha for a period of 2 years from the date of execution of lease deed or till the date of getting fresh approvals, clearances, licenses, permits, and the like, whichever is earlier vide order No-4246/SM, dated 30.05.2020. The copy of the vesting order is enclosed as **Annexure-4(a)**

(C) Signing of Mine Development and Production Agreement (MDPA)

M/s Patnaik Minerals Pvt Limited has executed and registered the **Mine Development and Production Agreement** (MDPA) with the Government of Odisha on 26.06.2020 videLr. No – 159, dated 26.06.2020 upon obtaining all consents, approvals, permits, NOC and the like as may be required under applicable laws for commencement of Mining operationand have paid the Third Instalment of Upfront Payment as confirmed by Director of Mines vide letter No. 4443/DM dated 29.06. 2020. (copy of the MDPA is enclosed as **Annexure-5.**

(D) Execution of the lease deed

State Government, after careful consideration, in exercise of powers conferred under Rule 10, Sub-Rule (5) of the Mineral (Auction) Rules, 2015 have been pleased to grant the Mining Lease for Iron and Manganese Ore in favour of M/S Patnaik Minerals Pvt. Ltd, the Successful Bidder in respect of Mahulsukha Iron and Manganese Ore Block over an area of 390.317 hac (as per DGPS)/ 399.838 hac (as per RoR) in Village Randa, Rantha and Bhutuda under Tahasil- Lahunipada of Sundargarh district

BHABAGRAHI MOHAPATRA
QUALIFIED PERSON

for the period of 50 (fifty) years as provided under section 8A, Sub- Section 2 of the Mines and Minerals Development and Regulation Act, 1957 (67 of 1957) vide Order No. 5518/SM Dated 29.6.2020 The Collector & District Magistrate, Sundargarh , has executed the Mining Lease Deed over the said area in favour of us M/S Patnaik Minerals Pvt. Ltd on 29.06.2020 (Copy of the lease deed is attached as **Annexure-6)**

Status of statutory Clearances

All the statutory clearances were obtained by previous lessee and have been vested with M/s Patnaik Minerals pvt ltd for a period of 2 years. As per the MMDR (Amendment) Act 2020, M/s Patnaik Minerals pvt Ltd has to obtain all the statutory clearances in its favor within a period of 2 years. The details of the Rule in which it has been mentioned that seamless mining operation can be continued are furnished below:

Rule 9A (5) of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession (Amendment) Rules, 2020: It shall be lawful for the new lessee to commence and continue mining operations on the land in which mining operations were being carried out by the previous lessee, after the execution of the lease deed for a period of two years as provided in section 8B of the Act

Rule 9A (7) of Minerals (Other than Atomic and Hydro Carbons Energy Minerals) Concession (Amendment) Rules, 2020: On submission of new mining plan, the new lessee shall switch over to the new mining plan and while undertaking mining operations as per the new mining plan, the new lessee shall confirm to the approved quantity and the conceptual limit of mining plan held by previous lessee till the new lessee obtains afresh the requisite clearances, approvals, rights and the like.

Name of the statutory clearances	Authority	Status of statutory clearancesobtained by previous lessee
Approval of Mining Plan	Indian Bureau of Mines, GOI	Approved by previous Lessee on dated 02.06.2016.
Forest Clearance	Ministry of Environment and Forest, GOI	As per the memo no-2809/6F, dated 29.03.2016 of the DFO, Bonai, the forest area within the mining lease comes to 377.563 as against 340.332 Ha of forest land as per the approval DP. The NPV of the additional forest area was paid on 30.03.2016 through RTGS. The lessee has obtained forest clearance over an area of 227.00Ha on 18.06.2008 vide MoEF letter No – F.No.8 – 93/2004-FC.The copy of the forest clearance is enclosed as **Annexure-7.**
Environment Clearance	Ministry of Environment, Forest & Climate Change GOI	The Ministry of Environment and Forest has granted the Environmental Clearance for the production capacity of 0.040MTPA Manganese ore vides the letter No-J-11016/412/2005-A.II (M) dated 5.04.2007. The copy of the Environmental Clearance is enclosed as **Annexure-8.**

BHABAGRAHI MAHAPATRA
QUALIFIED PERSON

Consent to Operate	State Pollution Control Board, Odisha	Consent to operate order has been granted by the State Pollution Control Board, Odisha vide letter No. 4646/IND-I-CON-2254 dated [illegible].2017 which is valid up to 31.03.2020. (The copy of the consent letter is enclosed as **Annexure-9).** After getting approved mining plan, based on existing EC, FC and CTE order from SPCB, Fresh Consent to Operate will be obtained.

As part of the statutory clearance, this **Mining Plan** and **Progressive Mine Closure Plan** is prepared under **Rule 16 of MCR, 2016 and Rule 23 of MCDR, 2017** respectively for a period of 5 years from the date of opening of the mine for grant of Mining Lease in favour of **M/s Patnaik Minerals pvt ltd.**

Utilization of iron ore and Manganese ore

The Mahulsukha Iron and Manganese block has been awarded to M/s Patnaik Minerals Pvt ltd by the Auction process. M/s Patnaik Minerals has been declared as the successful bidder and Letter of Intent has been issued in favor of them. The Iron and Manganese ore to be produced from the lease area will be sold to the market as the block has been put for Auction.

The RoMof Iron and Manganese ore will process at mines side to produce -200mm lumps and it will be transported outside the lease area for further beneficiation to sole the open market. The low grade iron and manganese ore will be process at mines through screening and crushing plant and after processing of the material the product will be sold to the outside market as per the demand.

BHABAGRAHI ROHAPATRA
QUALIFIED PERSON

1.0 GENERAL

a) **Name and Address of the Lessee**
M/s Patnaik MineralsPvt Ltd.

Mines office	**Registered office**	Residential/ correspondence address of
Mahulsukha Manganese Ore Mine At/PO : Bhuluda Via : Barsuan Dist : Sundargarh, Odisha, E-mail : PIN : 770041 E-mail:mohapatrab123@gmail.com	M/s Patnaik Minerals Pvt ltd Baneikela, Joda Dist- Keonjhar, Odisha Tel No-06767-272101 Tele Fax-06767-273807 pmpl1123@rediffmail.com	Mr. S.K.Patnaik S/o- Late R.N.Patnaik M/s Patnaik Minerals pvt ltd Baneikela, Joda Dist- Keonjhar, Odisha Tel No-06767-272101 Tele Fax-06767-273807 pmpl1123@rediffmail.com

Rule 45 registration No. : Not provided

b) Status of the Lessee

M/s Patnaik Mineral is a private limited company. The latest lists of directors are furnished below:

Sl. No	**Name**	**Position**	**Address**
1.	Mr.Saroj Ku. Patnaik	Director and Nominated Owner	Patnaik Minerals Pvt. Ltd At/po: Baneikela PS : JODA, Dist: Keonjhar Odisha- 758038
2.	MrJitendraNath Patnaik	Director	At/PO : Baneikela PS : Joda, Dist: Keonjhar Odisha- 758038
3	Mr Ajay Ku. Patnaik	Director	H - 12, Civil Township, Rourkela -769004, Sundargarh, Odisha, India
4	Smt. Sheela Patnaik	Director	At/PO : Baneikela PS : Joda, Dist: Keonjhar Odisha- 758038
5	MrDwipayan Patnaik	Director	At/PO : Baneikela PS : Joda, Dist: Keonjhar Odisha- 758038

MrS.K.Patnaik, Director and nominated ownerhas been appointed as Authorized Signatory. A Copy of resolution nominating the Authorized Signatoryis enclosed vides Resolution of Board of Directors (**Ref: Annexure– 10A**). The copy of the ID and address proof of nominated owner is enclosed as **Annexure – 10B)**. List of Board of Directors is enclosed as **Annexure No – 10C**.

c) Mineral(s) which is / are included in the prospecting license (For Fresh grant)

Not applicable since it is a mining lease area.

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

Iron Manganese ore is included in the lease deed.

e) Mineral(s) which is the applicant /lessee intends to mine

The Lessee intends to miningthe Iron and manganese ore; occurring in the lease area.

BHABAGRAHI MOHAPATRA
QUALIFIED PERSON

f) Name and Address, Registration No. of the Recognized Person Together With Category of Qualified Person Employed Under Rule 42(1)(b) Who Has Prepared Mining Plan

As per Rule 15 of MCR 2016, the Qualified Person who has prepared the Mining Plan is furnished below:

Name	**BhabagrahiMohapatra**
Address	At : Baneikela, Po - Joda, Keonjhar, Odisha Pin-758038 Email : mohapatrab123@gmail.com Mob: 9437139637
Registration Number	Not Applicable
Date of Registration	Not Applicable
Valid up to	Not Applicable

Self-certified copy of working experience along with certificates in support of educational qualifications required as per the Rule 15 of MCR 2016 is attached as **Annexure 11**

2.0 LOCATION AND ACCESSIBILITY

(a) **Lease Details**

Name of the Mine	Mahulsukha Iron and Manganese Ore Block
Latitude	21°46'52.12" to 21°49'04.55" N
Longitude	85°07'55.43" to 85°09'10.42" E

The above co-ordinate is as per the geo-referenced map prepared by ORSAC through DGPS survey (ref Plate IB) and forms a part of Survey of India toposheet No.73G/1 (Ref Plate-I). The co-ordinates of all the boundary pillars are furnished below:

Pillar No	Latitude	Longitude	Northing	Easting
BP_1	21° 46' 57.6" N	85° 8' 50.8" E	308463.3408	2409920.809
BP_3	21° 47' 16.5" N	85° 9' 0.6" E	308602.1764	2410217.824
BP_5	21° 47' 25.2" N	85° 9' 1.6" E	308753.5271	2410501.089
BP_6	21° 47' 36.1" N	85° 9' 4.3" E	308785.8071	2410768.002
BP_7	21° 47' 37.9" N	85° 9' 5.7" E	308818.3457	2411032.315
BP_8	21° 47' 40.0" N	85° 9' 7.4" E	308865.7748	2411102.604
BP_9	21° 47' 41.5" N	85° 9' 8.4" E	308905.9002	2411157.292
BP_10	21° 47' 42.5" N	85° 9' 8.8" E	308955.1822	2411219.782
BP_11	21° 47' 44.6" N	85° 9' 8.0" E	308986.1329	2411265.417
BP_12	21° 47' 47.2" N	85° 9' 6.3" E	308997.2144	2411296.54
BP_13	21° 47' 50.6" N	85° 9' 5.9" E	308975.3586	2411361.127
BP_14	21° 47' 54.8" N	85° 9' 9.2" E	308929.0559	2411443.409
BP_15	21° 47' 56.8" N	85° 9' 9.6" E	308917.2028	2411546.29
BP_16	21° 47' 52.3" N	85° 9' 3.4" E	309013.9941	2411674.673
BP_17	21° 47' 53.7" N	85° 9' 1.3" E	309025.2393	2411736.316
BP_18	21° 47' 54.2" N	85° 9' 0.5" E	308846.2481	2411599.485
BP_19	21° 47' 55.2" N	85° 8' 59.3" E	308785.6852	2411643.891
BP_20	21° 47' 58.2" N	85° 8' 57.4" E	308784.2751	2411659.588
BP_21	21° 48' 0.8" N	85° 8' 56.3" E	308730.4844	2411690.869
BP_22	21° 48' 4.0" N	85° 8' 56.1" E	308674.853	2411782.442
BP_23	21° 48' 6.8" N	85° 8' 54.1" E	308646.0066	2411863.662
BP_25	21° 48' 16.1" N	85° 8' 37.1" E	308640.2683	2411963.394
BP_26	21° 48' 16.8" N	85° 8' 39.0" E	308583.1118	2412048.273
BP_27	21° 48' 27.8" N	85° 8' 31.7" E	308337.4492	2412204.245
BP_28	21° 48' 29.3" N	85° 8' 27.3" E	308100.0042	2412339.801
BP_29	21° 48' 36.8" N	85° 8' 21.9" E	308153.7886	2412361.721

Dr BHAGIRATHI MOHAPATRA
QUALIFIED PERSON

BP_30	21° 48' 45.7" N	85° 8' 19.0" E	307948.0381	[illegible]
BP_31	21° 48' 51.7" N	85° 8' 19.9" E	307824.1698	[illegible]
BP_32	21° 49' 01.4" N	85° 8' 17.2" E	307669.8306	[illegible]
BP_33	21° 49' 3.0" N	85° 8' 18.8" E	307589.5123	[illegible]
BP_34	21° 49' 3.9" N	85° 8' 16.6" E	307612.6773	[illegible]
BP_36	21° 49' 1.7" N	85° 7' 55.4" E	307518.5881	[illegible]
BP_37	21° 48' 57.6" N	85° 8' 0.0" E	307580.6456	[illegible]
BP_41	21° 48' 16.6" N	85° 8' 7.0" E	307530.0156	[illegible]
BP_44	21° 47' 48.2" N	85° 7' 58.1" E	307232.3223	2413790.04
BP_47	21° 47' 37.6" N	85° 8' 26.2" E	306919.5726	2413759.369
BP_49	21° 47' 22.1" N	85° 8' 24.8" E	307049.7028	2413631.837
BP_50	21° 47' 16.1" N	85° 8' 30.0" E	307096.2727	2413315.932
BP_52	21° 47' 6.5" N	85° 8' 16.8" E	307142.8238	2413000.026
BP_54	21° 46' 52.3" N	85° 8' 18.3" E	307189.3862	2412684.118
BP_55	21° 46' 54.6" N	85° 8' 31.9" E	307235.9242	2412368.218
BP_57	21° 47' 12.1" N	85° 8' 38.0" E	307147.2788	2412077.624

	Date of Grant of Lease	The LOI has been issued in favor of M/s Patnaik Minerals Pvt Ltd vide no 30/3/S&M Bhubaneswar dated 18.03.2020
	Date of execution of Lease	29.06.2020
	Period/Expiry date	As per MMDR (Amendment) Act, 2015, the period of the lease is valid for 50 years i.e. up to 28.06. 2070
	Name of the Lease holder Postal Address Telephone Fax Email id Mobile No	Ref Para- (b) of Chapter-1.
(b)	Details of Applied Lease area with location map(fresh area/ mine)	M.L area over 390.317 hectares located in villages Randa, Rantha and Bhutuda, TahasilLahunipada, sub division Bonai, District Sundargarh, OdishaKhesra/Khata No./Plot No. has been given in the land schedule vide Annexure-12.

As per the land schedule, the pre-operational land use pattern is given as follows:

Village	Govt. Non Forest Land (in Hects.)	Forest Land in Hects	Private SC land in Hects	Private ST Land in Hects	Sub Total Area in Hects
Bhutula	1.016	8.884	0	0.919	10.817
Randa	13.691	128.858	0.429	0	142.978
Rantha	3.513	233.009	0	0	236.522
Total	**18.219**	**370.751**	**0.429**	**0.919**	390.317
Grand Total					**390.317 Hects.**

Pre-operational land use pattern with respect to forest land and non-forest land is authenticated by the concerned authorities of the State Govt. [Ref:**Annexure – 12**]

Total lease area / applied area :	390.317hectares
District & State :	Sundargarh, Odisha
Taluka :	Lahunipada
Village	Randa, Rantha and Bhutuda
Whether the area falls under Coastal Regulation Zone (CRZ) :	No
If yes, details thereof :	Not Applicable

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Existence of public road/railway line, if any nearby and approximate distance	The lease area is approachable from Barbil [illegible] well maintained metalled road (NH - 2[illegible] metalled road (National Highway 215 connecting Rourkela and Kolra) and a fair weather road of 10 km which is the kutcha between NH and lease area.
Toposheet No. with latitude & longitude of all corner boundary point/pillar	Ref: Para-(a) of this chapter as indicated above.
Attach a general location map showing area and access routes	The area has been earmarked on a survey of India topographical map as well as cadastral map. **Ref Plate No-I and II**

3.0 DETAILS OF APPROVED MINING PLAN/SCHEME OF MINING.

3.1 Date and reference of earlier approved Mining Plan/Scheme of Mining

Vide approval No : MPM/OTFM/24-ORI/BHU/2018-19/1367 dated 06.09.2018

3.2 Details of Last Modifications if any

Not Applicable

3.3 Review of earlier approved proposal in respect of exploration, excavation, reclamation etc.

This is the 1st Mining Plan being submitted for approval in favor of M/s Patnaik Minerals Pvt Ltd. Hence, review in respect of exploration, excavation, reclamation etc. is not applicable.

3.4 Give Status of Compliance of violations pointed out by IBM

Not Applicable

3.5Details of any suspension/closure/prohibitory order issued by any Government agency under any Rule or court of Law.

Not Applicable

3.6 In case the MP/SOM is submitted under Rule 9 and 10 of the MCDR 1988 or under Rule 22(6) of the MCR' 1960 for approval of Modification, specify reason and justification for modification under these Rule.

Not Applicable

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PART-A
CHAPTER-1

1.0 GEOLOGY AND EXPLORATION

a) Briefly describe the Topography, Drainage pattern, Vegetation, Climate, Rainfall data of the mining Lease area.

1. Topography

The core zone (lease area) is made up four hilly blocks dissected by the natural streams at many places (Plates-III) with the slope varying from 1 in 3 in the higher parts to 1 in 28 in the lower part giving an overall gradient of 1 in 10. The altitude in the highest part is 800m (Nandagira Hill) and in the lowest part about 460m. The overall slopes are due north. Manganese ore quarries are located along the nala sides. As per the hal settlement, 85% of the lease area is recorded as forest land. About one third of lease area has already been cleared for mining purposes which are distributed in all four blocks. At many places, no tree (forest free) land is available in the recorded forest area. Particularly, both the sides of nala course in the lease area do not have any canopy cover.

2. Drainage

The core zone (lease area) is made up four hilly blocks dissected by the natural streams at many places with varying slope. Two perennial nalas flow from the eastern part and one perennial nala locally known as Rajabasanala flow from the SW part of the lease area. These perennial nalas merge to form the Bhutudanala which flows towards north and finally drains into Kurarhinala in the north part outside ML area.

Western part in buffer zone is drained by KhandadharNala and GagarNala which flow due east. Their confluence point exists a distance of 6km from the lease area. From the confluence point, Hansaradihinala starts flowing towards further east.

South-North trending dissected hill range that dominates the northern part of the buffer zone seasonal nala& starting from the hill range joins with a perennial nala flowing north parallel to the eastern lease boundary of Lohadangar block (ref : Plate-III). Finally, water flows into SarakandaNala in the North, an important tributary of the buffer zone.

Through there is another perennial nala known as KhandadharNala exists at a distance of 8 km from southern lease boundary and flows due west there is no scope of drainage of southern most Nandagira hill block. The entire drainage which has a broad dendrite pattern is controlled by this tributary in the northern part.

3. Vegetation

Forest land is of the order of 377.563 hectares .The vegetation comprises mainly trees, shrubs, herbs etc having species like Asan, Amla, Bahada, Chara, Dhaura, Harida, Dhaman, Jamun, Kendu, Kusum, Mango, Patul, Sal, Semul, Chhana, Alundi, Muturi&Siali etc. The forest is of open type with density 0.1.

4. Climate and rainfall data

The climate in the area is generally cold in winter between November and February and hot in summer between March and June. The monsoon sets in late June and continues up to the end of August.

The mean minimum & maximum temperature shows the variation between 4.4°C to 47.6°C. January, May & August are the coldest, hottest & rainiest month respectively. Predominant wind direction is South-West.

There is a wide variation of raintall in the catchment area and around 10kms radius of buffer zone of this mine. The average annual rainfall of Sundargarh Dist. has been computed by taking the data of last 10 years which

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comes to 1300mm, out of which 92% occur in monsoon months. The average annual rainfall of the mine area is affected by steep hills, forest cover etc. The average rainfall is 1300.00 mm.

b) Brief description of regional Geology with reference to location of the lease area: The manganese ore deposit in the area forms a part of the South Eastern part of the Singhbhum-Keonjhar-Bonai belt known as the Jamda-Koira valley and is represented by narrow easterly plunging folded synclinorium of 60km length and 25km width. The Precambrian horse shoe shaped is well known for its large reserves of iron and manganese ore. The general strike is North East to North, dips are moderate to West. The Western limb of the synclinorium is slightly overturned, at some places.

The belt is first reported by Jones in 1934 and has been studied in detail by several eminent Geo scientists since then. The major litho types are metamorphosed sand stone, lithic wacke to arkose and or volcanic tuffs and or shale. The lithic wacke, mostly in the East, BIF and iron ore fragments are common. Shale, lavas, volcanic, pyroclastic tuffs, phyllite and Banded Iron Formation (BIF) including Banded Hematite Quartzite (BHQ) and the Kolhan Group of rocks are exposed.

The Precambrian rocks of this region comprising of basic lava, tuffs, Banded Iron Formation (BIF), Shales, Conglomerates and sandstones etc. were mapped for the first time by Jones (1934). The stratigraphic succession established by Jones has largely been modified later by Dunn (1940). Based on detailed mapping in the northern parts of the belt, Dunn recognized a new group lying unconformably over the Iron ore group which named as the "Kolhan Group". The rock types of the area belong to the Kolhan Group lies to the North of Noamundi, Jharkhand.

The most acceptable Litho- Stratigraphic succession for the belt was proposed by Murthy and Acharya (1975). They identified different depositional facies and proposed a more detailed Stratigraphic succession. They also proposed a new name the "Koira Group" to the rocks of Bonai-Keonjhar belt. The stratigraphy suggested by Murthy and Acharya (1975) is as follows..

Kolhan Group	Sand stone, Conglomerate, Breccia
	----------Unconformity----------
	Basic Lava, Tuffs and tuffites of volcanic facies
Mixed facies	Iron, Manganese, Lenses of iron formation, Chert, Small dolomitic 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
Volcanic Formation	Tuffaceous shale
	Basic lava
Basal Sandstone	Gritty sandstone
	Quartzite
	Conglomeratic at places with inter bedded lava at top
	----------Unconformity----------

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

c) Detail Description of the geology of the lease area such as shape, and size of the mineral/ore deposit, disposition of various litho units indicating structural features if any etc.

Rock of the manganiferous mixed facies formation occupies a major part of the Bonai-Keonjhar belt. This formation being younger to the Banded Iron Formation (BIF) occupies the inner slopes of the residual hill

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ranges constituted originally of this Jaspillites. The manganese deposits of Mahulsukha Manganese lease area are located in the inner slopes of the western limb of the synclinorium.

Manganiferous shale with manganese ore is an important litho unit of the mixed facies Formation exposed in the area. The surfacial exposures such as thin cover of soil occur extensively around Bhutuda. Laterite to cover is observed towards southern part of the lease area. Both sides of the nala course expose manganiferous shale which is enriched with manganese ore towards depth. Along the eastern and western sides of the lease area, no ore bearing shale and Banded Iron Formation (BIF) are observed.

Geological mapping over the area, exposures in the quarry excavation and nala section have helped to understand the geology to a considerable extent. The lithounits are, however, as follows:

Soil & Alluvium
Laterite with occasional Mn/Iron pebbles, boulders
Manganiferous Laterite/ Ferruginous shale
Banded Iron Formation
Manganiferous shale with Manganese Ore
Manganiferous shale
Shale
Chert

The general trend of the planer element is WNW-ESE with either northerly or southerly dips. There exist many variations of the attitudes of the planner and linear element which are obviously due to the results of superposed folding movements. The boundaries of these litho units are mainly covered with soil, laterite and BIF. The litho contacts delineated on the Geological plan is, therefore, inferred.

d) Name of the prospecting/exploration agency:

A. The Associated Cement Companies Limited

i)Address-	CRS Complex, LBS Marg, Thane 400604, India.
ii)Emails-	acominres@vsnl.com
iii)Phone/fax etc.	022-25835040

B. **GSI**

i)Address-	Bhubaneswar,Odisha

C. Earth probe

i)Address-	Shop No-25, Jaiswal Complex, Kasidihi Lease Area, Sakchi, Jamshedpur-831012
ii)Emails-	earthprobe@gmail.com
iii)Phone/fax etc.	Ph No - 0657-2442693

D. Orewin Engineering

i)Address	22/110, Greenways Road, Fair lands, Salem, Tamilnadu-636017
Phone/fax etc.	Ph No- +91-427-2447667

E. GemcoKati Exploration Pvt. Ltd

i)Address	Plot no-34, Postal colony,Bapatnagar, Chandrapur-442401
Phone/fax etc.	Ph: 07172 251191 Mob :09421725691 E Mail: jijo@gemcokati.com

Information has been collected from the Geological Report provided by state Govt.

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a) Details of prospecting / exploration already carried out.

Documentary evidence of exploratory work done such as name of agency, order for the work, cost involved, payment details by the Lessee etc. is enclosed. **(Ref attached Geological Report as Annexure-13)**

Topographic Survey

Topographic survey was carried out with the help of Total station survey instrument.

Geological Mapping

The lease area has been geologically mapped on a scale 1:2000 by Total Station Survey and hand held GPS.

DETAILED EXPLORATION

Topographical surveyhas been carried out and quarry, dump etc has been updated. Drill holes put in field has been shown in the geological plan and geological sections. As on 010.07.2020, total 416 nos. of drill holes have been sunk by the old lessee in the M.L area with 13279.71m drilling. Further, 40 nos pit have been dug during 2018-19 to know the occurrence of Manganese ore. The details of exploration undertaken till date are furnished below:

Sl. No	Year of exploration	Number of Bore Hole	Type of BH	Dia. (mm)	Inclination	Depth (m.)
1	2002-03	18	DTH	100	Vertical	141
2	2003-04	44	DTH	100	Vertical	475.5
3	2004-05	87	DTH/RC	100	Vertical	822
4	2006-07	14	DTH	100	Vertical	126
5	2016-17	31	Core	63	Vertical	1701.2
6	2017-18	165	Core	54.7	Vertical	7828.06
7	2018-19	57	Core	54.7	Vertical	2185.95
	Total	**416**				**13279.71**
	2018-19	40	Trial Pit	(3x3x5)m		

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

Mining was commenced in the lease area on 03.02.1945. The lease area has been geologically mapped on a scale 1:2000 by Total Station Survey and hand held GPS. There is no proper data regarding the surface sampling.

Total 40 nos of pits have been put within the lease area by the old lessee during 2018-19. The details of pitting are furnished below:

Sl no	Year of exploration	Number of pits/ trenches	Dimension (L X W)	Grid Location		Mineralized/Non-mineralized
1	2018-19	TP-1	5X5X3	2413739	307065	Non-Mineralised
2	2018-19	TP-2	5X5X3	2413626	307073	Non-Mineralised
3	2018-19	TP-3	5X5X3	2413520	307087	Non-Mineralised
4	2018-19	TP-4	5X5X3	2413766	307511	Non-Mineralised
5	2018-19	TP-5	5X5X3	2413206	307142	Non-Mineralised
6	2018-19	TP-6	5X5X3	2413098	307153	Non-Mineralised
7	2018-19	TP-7	5X5X3	2413343	307579	Non-Mineralised
8	2018-19	TP-8	5X5X3	2412994	307173	Non-Mineralised
9	2018-19	TP-9	5X5X3	2413127	307603	Non-Mineralised
10	2018-19	TP-10	5X5X3	2411939	307147	Laterite Iron ore
11	2018-19	TP-11	5X5X3	2412319	308005	Non-Mineralised
12	2018-19	TP-12	5X5X3	2412031	307705	Non-Mineralised
13	2018-19	TP-13	5X5X3	2412151	307878	Non-Mineralised
14	2018-19	TP-14	5X5X3	2411520	307021	Non-Mineralised
15	2018-19	TP-15	5X5X3	2411844	307582	Non-Mineralised
16	2018-19	TP-16	5X5X3	2412172	308150	Non-Mineralised
17	2018-19	TP-17	5X5X3	2411245	307632	Non-Mineralised
18	2018-19	TP-18	5X5X3	2411224	307709	Non-Mineralised

BHABAGRAHI MOHAPATRA
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19	2018-19	TP-19	5X5X3	2411170	307513	Non-Mineralised
20	2018-19	TP-20	5X5X3	2411079	307856	Non-Mineralised
21	2018-19	TP-21	5X5X3	2411201	308089	Non-Mineralised
22	2018-19	TP-22	5X5X3	2410930	308700	Non-Mineralised
23	2018-19	TP-23	5X5X3	2410788	307771	Non-Mineralised
24	2018-19	TP-24	5X5X3	2410691	307786	Non-Mineralised
25	2018-19	TP-25	5X5X3	2410493	307900	Non-Mineralised
26	2018-19	TP-26	5X5X3	2410199	307533	Non-Mineralised
27	2018-19	TP-27	5X5X3	2410082	307531	Non-Mineralised
28	2018-19	TP-28	5X5X3	2409872	307565	Non-Mineralised
29	2018-19	TP-29	5X5X3	2410093	307949	Non-Mineralised
30	2018-19	TP-30	5X5X3	2409857	307876	Non-Mineralised
31	2018-19	TP-31	5X5X3	2410185	308309	Non-Mineralised
32	2018-19	TP-32	5X5X3	2410385	308655	Non-Mineralised
33	2018-19	TP-33	5X5X3	2410225	308577	Non-Mineralised
34	2018-19	TP-34	5X5X3	2409975	308453	Non-Mineralised
35	2018-19	TP-35	5X5X3	2411700	308700	Non-Mineralised
36	2018-19	TP-36	5X5X3	2411620	308760	Non-Mineralised
37	2018-19	TP-37	5X5X3	2411655	308618	Non-Mineralised
38	2018-19	TP-38	5X5X3	2411388	308856	Non-Mineralised
39	2018-19	TP-39	5X5X3	2411267	308511	Non-Mineralised
40	2018-19	TP-40	5X5X3	2411190	308620	Non-Mineralised

Existing quarries

Mining operation in this lease area is going on long back. Continuation of mining operation in the area has opened up a quarry. Mining operation since 1945 has resulted 15 manganese quarries. Most of the quarries are scattered in nature and distributed throughout the lease area.The details of quarry are furnished below:

Sl. No.	Name of Quarry	Name of Block	Avg. Length (m)	Avg. width (m)	Area Utilized (m^2)	Grid Reference
1	Q-5	Nandegira	180	60	10800	2411264-2411452 & 308604-3305721
2	Q-5 top	-do-	116	40	4640	2410580-2410689 & 308246-308371
3	Q-1N	-do-	420	185	77700	2410742-2411062 & 308299-308656
4	Q-8	-do-	74	25	1850	2410189-2410253 & 307794-307844
Total	—	—	---	---	**94,990**	
1	Q-6	Rajabasa	100	75	7500	2411485-2411555 & 307301-307451
2	Q-6A	-do-	150	60	9000	2411876-2412006 & 307874-308024
3	Q-6B & 6C	-do-	160	55	8800	2411928-2412040 & 308369-308516
Total	—	—	---	---	**25,300**	
1	Q-1	Mahulsukha	450	160	72000	2411856-2412353 & 307316-307517
2	Q-3	-do-	420	130	54600	2411976-2412384 & 307535-307640
3	Q-7	-do-	100	30	3000	2412322-2412438 & 307796-307854
4	Q-7B	-do-	80	22	1760	2412300-2412386 & 307725-307772
5	Q-2	-do-	140	60	8400	2412581-2412728 & 307372-307465
6	Q-2A	-do-	140	40	5600	2412381-2412526 & 307350-307430
Total	—	—	---	—	**145,360**	
1	Q-4	Lohandanger	116	45	5220	2413322-2413424 & 307456-307523
2	Q-4A	-do-	40	30	1200	2413375-2413416 & 307386-307409
Total	—	—	---	—	**6,420**	
Grand Total	—	—	---	---	**272,070**	

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(II) Number of boreholes indicating type(core type/DTH), diameter, spacing, inclination, collar, depth etc. with standard borehole logs duly marking on geological plan/sections.

A total of 416 nos of bore holes (DTH/RC/CORE) have been drilled within the lease area at grid interval of 50 to 200m. However, earlier DTH/RC bore holes have not been considered as all these bore holes within Block 1 and Nandagira quarry have been excavated. Further, as there is no detail information on GSI bore hole data, these bore holes are not considered for resource estimation. Therefore, 253 bore hole drilled during the period 2016-17 to 2018-19 have been shown in the geological plan and sections. Further, existing quarries and 40 nos of trial pits are also giving valuable information about the mineralisation and ore body configuration. All these bore holes along with quarries and trial pits are taken into consideration for resource estimation under G1 and G2 categories. The details of G1 and G2 categories of resource estimated based on the exploration program are furnished below.

For G1 categories

Sl. No.	Name of Quarry	Name of Block	Avg. Length (m)	Avg width (m)	Area Utilized (m^2)	Grid Reference
1	Q-1N	Nandagira	420	185	77700	2410742-2411062 & 308298-308656
2	Q-1	Mahulsukha	450	160	72000	2411856-2412353 & 307316-307517
3	Iron ore	Northern part	1300	400	520000	2413750-2412750 & 307200-307600
4	Iron ore	Southern part	1700	300	510000	2409800-2411150 & 307600-308400

For G2 categories

Sl. No	Year of Exploration	Number of Bore Hole	Type of BH	Meterage of drilling (M)	Spacing Grid Interval	Scale Of Exploration
1	2016-17	31	Core	1701.2	100m x 100m 50m x 50m	G2
2	2017-18	165	Core	7828.06	100m x 100m	G2
3	2018-19	57	Core	2185.95	100m x 100m	G2
	Sub-Total	**253**		**11715.21**		
4	2018-19	40	Trial Pit			G2

These bore holes are sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource estimation procedure(s) and classifications applied. Total stations with GPS was used to take the location of 253 nos of bore hole points. Further, mine workings have been taken into consideration for resource calculation. The quarries are also surveyed by using the total station as well as DGPS whose accuracy level is above 95%. The bore holes with co-ordinate are furnished below:

Sl. No	Year	BH_ID	Easting	Northing	Collar RL	Inclination	BH Type	BH Depth(m)	No of samples
1	2016-17	NCDH-02	308446.36	2410990.63	549.5	linear	Core	50.50	20
2	2016-17	NCDH-03	308467.45	2411013.65	549.3	linear	Core	50.60	26
3	2016-17	NCDH-01	308371.16	2410930.56	547	linear	Core	50.50	17
4	2016-17	NCDH-04	308484.51	2410904.91	548.2	linear	Core	50.50	23
5	2016-17	NCDH-05	308382.97	2410960.31	556.5	linear	Core	65.60	43
6	2016-17	NCDH-06	308469.38	2410945.39	551	linear	Core	65.00	30
7	2016-17	NCDH-07	308356.23	2410940.63	552.5	angular	Core	65.10	28
8	2016-17	NCDH-08	308358.57	2410783.87	570.6	linear	Core	65.60	29
9	2016-17	NCDH-09	308561.93	2410953.62	549.2	linear	Core	80.60	19
10	2016-17	NCDH-12	308539.49	2411034.24	577	linear	Core	70.60	22
11	2016-17	NCDH-13	308658.86	2411298.03	529	linear	Core	40.00	15
12	2016-17	NCDH-14	308700.53	2411056.57	523	linear	Core	35.00	15
13	2016-17	MSDH-01	307442.72	2412175.6	559	linear	Core	40.00	17
14	2016-17	MSDH-02	307408.98	2412116.07	584	linear	Core	47.60	31
15	2016-17	MSDH-03	307457.17	2412115.67	579	linear	Core	40.00	18

BHABAGRAHI MOHAPATRA
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16	2016-17	MSDH-04	307435.58	2412033.52	586	linear	Core	[illegible]	[illegible]
17	2016-17	MSDH-05	307513.76	2412033.52	580	linear	Core	[illegible]	[illegible]
18	2016-17	RBDH-02	307487.83	2411436.2	617	linear	Core	[illegible]	[illegible]
19	2016-17	RBDH-01	307626.68	2411541.14	595	linear	Core	[illegible]	[illegible]
20	2016-17	RBDH-05	307927.06	2411515.9	577	linear	Core	[illegible]	[illegible]
21	2016-17	RBDH-06	307926.54	2411441.72	600	linear	Core	[illegible]	[illegible]
22	2016-17	RBDH-03	307542.81	2411533.1	586	linear	Core	[illegible]	[illegible]
23	2016-17	RBDH-01	307404.89	2411486.96	590	linear	Core	50.00	21
24	2016-17	RBDH-11	307853.74	2411818.48	567	linear	Core	52.50	19
25	2016-17	RBDH-09	308036.95	2411752.34	547	linear	Core	56.00	22
26	2016-17	RBDH-10	307990.26	2411807.37	552.6	linear	Core	101.60	47
27	2016-17	RBDH-08	308113.03	2411826.96	548	linear	Core	62.00	20
28	2016-17	RBDH-07	308219.92	2411842.82	533	linear	Core	52.9	16
29	2016-17	RBDH-12	308330.52	2411846.04	560	linear	Core	56.8	8
30	2016-17	RBDH-13	308422.64	2411647.79	560	linear	Core	27.6	16
31	2016-17	RBDH-14	308426.61	2411640.26	560	linear	Core	59.8	21
32	2017-18	M/80	307251.529	2413616.653	594	linear	Core	39	7
33	2017-18	M/79	307165.581	2413585.692	592	linear	Core	39	7
34	2017-18	M/74	307125.402	2413428.66	615	linear	Core	37	20
35	2017-18	M/75	307215.494	2413479.323	619	linear	Core	38.5	21
36	2017-18	M/78	307302.163	2413529.588	600	linear	Core	37	20
37	2017-18	M/77	307385.607	2413580.051	580	linear	Core	47	29
38	2017-18	M/72	307475.05	2413630.23	527	linear	Core	40	9
39	2017-18	M/73	307525.645	2413543.582	523	linear	Core	40	24
40	2017-18	M/72	307439.03	2413493.442	542	linear	Core	42	19
41	2017-18	M/71	307352.269	2413443.131	565	linear	Core	39	25
42	2017-18	M/70	307266.402	2413392.966	583	linear	Core	39.8	23
43	2017-18	M/69	307179.561	2413341.205	595	linear	Core	40	12
44	2017-18	M/61	307225.535	2413255.47	579	linear	Core	37	17
45	2017-18	M/65	307315.243	2413305.593	554	linear	Core	40	26
46	2017-18	M/66	307405.338	2413356.846	535	linear	Core	38	13
47	2017-18	M/67	307489.977	2413406.74	519	linear	Core	40	32
48	2017-18	M/68	307574.905	2413456.049	511	linear	Core	40	15
49	2017-18	M/63	307598.554	2413320.031	489	linear	Core	38	7
50	2017-18	M/62	307462.084	2413286.735	510	linear	Core	37	15
51	2017-18	M/61	307365.719	2413216.858	550	linear	Core	37	16
52	2017-18	M/60	307278.64	2413166.232	571	linear	Core	42	16
53	2017-18	M/59	307192.144	2413117.597	570	linear	Core	39.8	19
54	2017-18	M/58	307242.473	2413030.989	536	linear	Core	38.5	12
55	2017-18	M/56	307328.917	2413081.789	544	linear	Core	47	20
56	2017-18	M/57	307415.255	2413131.948	521	linear	Core	40	28
57	2017-18	M/60	307502.175	2413182.027	501	linear	Core	46	26
58	2017-18	M/54	307552.322	2413096.085	468	linear	Core	44.5	20
59	2017-18	M/53	307466.301	2413045.345	496	linear	Core	38.4	19
60	2017-18	M/52	307379.275	2412994.198	497	linear	Core	40	16
61	2017-18	M/51	307292.832	2412944.238	519	linear	Core	41	26
62	2017-18	M/50	307205.917	2412893.545	563	linear	Core	40.6	18
63	2017-18	M/45	307256.15	2412906.598	574	linear	Core	41	30
64	2017-18	M/46	307342.873	2412657.155	540	linear	Core	46	17
65	2017-18	M/47	307429.434	2412907.695	507	linear	Core	52	32
66	2017-18	M/48	307515.879	2412957.657	481	linear	Core	43.5	25
67	2017-18	M/49	307602.057	2413007.472	465	linear	Core	50	24
68	2017-18	M/44	307652.638	2412920.496	467	linear	Core	41	17
69	2017-18	M/43	307566.878	2412870.668	489	linear	Core	40	13
70	2017-18	M/42	307479.055	2412620.998	515	linear	Core	39	21
71	2017-18	M/41	307393.149	2412770.578	550	linear	Core	39.8	23
72	2017-18	M/40	307305.753	2412719.547	595	linear	Core	38	22
73	2017-18	M/36	307442.514	2412683.42	520	linear	Core	40	25
74	2017-18	M/37	307529.752	2412733.738	501	linear	Core	41	14
75	2017-18	M/38	307615.719	2412784.214	505	linear	Core	59	28
76	2017-18	M/39	307702.586	2412833.949	468	linear	Core	43	25
77	2017-18	M/29	307752.692	2412746.183	505	linear	Core	45	23
78	2017-18	M/30	307666.222	2412696.527	530	linear	Core	56	43
79	2017-18	M/31	307579.223	2412646.797	535	linear	Core	57	49
80	2017-18	M/25	307629.275	2412560.215	545	linear	Core	62	47
81	2017-18	M/27	307715.825	2412609.924	534	linear	Core	42	31
82	2017-18	M/29	307802.357	2412660.215	511	linear	Core	48	35
83	2017-18	M/21	307852.56	2412574.115	502	linear	Core	53	23

BHABAGRAHI MOHAPATRA
QUALIFIED PERSON

84	2017-18	MW22	307765.719	2412523.692	521	linear	Core	[illegible]	[illegible]
85	2017-18	MW23	307678.381	2412473.613	546	linear	Core	[illegible]	[illegible]
86	2017-18	MW5	307210.375	2412087.01	637	linear	Core	[illegible]	[illegible]
87	2017-18	MW6	307297.004	2412137.222	638	linear	Core	[illegible]	[illegible]
88	2017-18	MW8	307642.89	2412337.328	573	linear	Core	[illegible]	[illegible]
89	2017-18	MW9	307729.275	2412387.328	534	linear	Core	[illegible]	[illegible]
90	2017-18	MW20	307815.957	2412437.513	508	linear	Core	44.5	28
91	2017-18	MW10	307866.407	2412351.118	497	linear	Core	41.5	26
92	2017-18	MW11	307693.308	2412251.572	571	linear	Core	68	38
93	2017-18	MW12	307347.744	2412000.931	625	linear	Core	64	31
94	2017-18	MW13	307260.507	2412000.619	637	linear	Core	63	30
95	2017-18	MW14	307171.799	2411948.954	647	linear	Core	64	23
96	2017-18	R/66	307136.931	2411813.382	638	linear	Core	47.5	17
97	2017-18	R/69	307224.01	2411862.593	635	linear	Core	53	30
98	2017-18	R/70	307310.613	2411913.503	626	linear	Core	49.5	29
99	2017-18	M/7	307398.377	2411964.123	621	linear	Core	55	41
100	2017-18	M/9	307915.957	2412264.969	489	linear	Core	50.3	23
101	2017-18	M/8	307965.561	2412178.998	479	linear	Core	35.7	9
102	2017-18	R/64	307360.004	2411827.573	593	linear	Core	46	25
103	2017-18	R/65	307273.375	2411777.203	609	linear	Core	49	28
104	2017-18	R/60	307185.931	2411726.329	618	linear	Core	44	10
105	2017-18	R/67	307100.278	2411676.462	606	linear	Core	53	27
106	2017-18	R/60	307063.991	2411539.753	597	linear	Core	42	24
107	2017-18	R/61	307150.17	2411590.177	592	linear	Core	39	10
108	2017-18	R/62	307236.931	2411640.309	602	linear	Core	69	13
109	2017-18	R/63	307323.798	2411690.494	578	linear	Core	44	18
110	2017-18	R/56	308285.871	2412016.982	495	linear	Core	42	15
111	2017-18	R/56	308202.692	2411968.599	495	linear	Core	44	15
112	2017-18	R/57	308118.275	2411919.03	523	linear	Core	46	33
113	2017-18	R/58	308030.018	2411867.501	532	linear	Core	66.6	25
114	2017-18	R/59	307953.5	2411867.551	562	linear	Core	30.5	9
115	2017-18	R/50	307560.084	2411480.782	611	linear	Core	52	19
116	2017-18	R/51	307733.077	2411580.898	591	linear	Core	45	15
117	2017-18	R/52	307806.705	2411680.634	570	linear	Core	37.5	14
118	2017-18	R/53	308252.56	2411831.427	561	linear	Core	49.5	15
119	2017-18	R/54	308339.205	2411931.427	529	linear	Core	31	17
120	2017-18	R/42	308476.32	2411894.667	529	linear	Core	39.5	8
121	2017-18	R/43	308302.639	2411795.46	562	linear	Core	42	16
122	2017-18	R/44	308216.619	2411745.249	565	linear	Core	39	8
123	2017-18	R/45	308129.884	2411694.296	568	linear	Core	48	29
124	2017-18	R/46	307996.309	2411594.349	568	linear	Core	37	11
125	2017-18	R/47	307783.606	2411494.296	603	linear	Core	48	27
126	2017-18	R/48	307610.157	2411393.706	630	linear	Core	43	11
127	2017-18	R/36	307603.169	2411306.952	641	linear	Core	43	17
128	2017-18	R/37	307623.5	2411407.567	615	linear	Core	49	22
129	2017-18	R/38	308006.626	2411507.825	571	linear	Core	38	20
130	2017-18	R/39	308178.752	2411608.004	555	linear	Core	38.5	12
131	2017-18	R/40	308352.957	2411707.958	554	linear	Core	39	8
132	2017-18	R/41	308526.161	2411809.037	529	linear	Core	36	27
133	2017-18	R/31	308575.978	2411725.690	518	linear	Core	47	44
134	2017-18	R/32	308489.877	2411675.778	552	linear	Core	42	28
135	2017-18	R/33	308229.91	2411521.143	555	linear	Core	42.5	17
136	2017-18	R/34	308056.07	2411421.196	583	linear	Core	49	15
137	2017-18	R/35	307882.183	2411321.302	603	linear	Core	35	7
138	2017-18	R/28	308279.509	2411404.594	508	linear	Core	43	16
139	2017-18	R/29	308066.198	2411464.7	563	linear	Core	51.5	31
140	2017-18	R/30	308539.824	2411585.017	522	linear	Core	45	30
141	2017-18	R/24	308503.089	2411448.018	548	linear	Core	47.5	40
142	2017-18	R/25	308416.222	2411396.018	546	linear	Core	43.5	26
143	2017-18	R/26	308242.885	2411295.415	562	linear	Core	46	19
144	2017-18	R/27	307983.288	2411147.78	595	linear	Core	42	13
145	2017-18	R/17	307903.606	2411097.262	602	linear	Core	45	24
146	2017-18	R/18	307948.671	2411011.263	589	linear	Core	45	22
147	2017-18	R/19	308033.289	2411061.389	585	linear	Core	50	32
148	2017-18	R/20	308120.103	2411111.389	583	linear	Core	42.5	19
149	2017-18	R/21	308206.547	2411161.653	582	linear	Core	39	12
150	2017-18	R/22	308293.308	2411211.098	563	linear	Core	36	19
151	2017-18	R/23	308379.699	2411260.965	562	linear	Core	37	11

BHABAGRAHI MISHAPATRA
QUALIFIED PERSON

152	2017-18	R/16	308083.612	2410975.671	545	linear	Core	38	
153	2017-18	R/15	307966.749	2410925.366	556	linear	Core	39	
154	2017-18	N/20	307910.362	2410874.289	570	linear	Core	39.5	9
155	2017-18	N/21	307823.722	2410824.597	576	linear	Core	38	
156	2017-18	N/22	307873.799	2410736.807	606	linear	Core	47	6
157	2017-18	N/23	307960.137	2410788.181	596	linear	Core	47	
158	2017-18	N/24	308010.189	2410701.899	559	linear	Core	46	23
159	2017-18	N/25	307923.732	2410651.872	585	linear	Core	58	11
160	2017-18	N/26	307973.534	2410556.354	609	linear	Core	45	10
161	2017-18	N/27	308059.872	2410610.719	601	linear	Core	47	19
162	2017-18	N/30	308023.491	2410479.329	575	linear	Core	62	35
163	2017-18	N/31	307936.894	2410429.329	628	linear	Core	55	41
164	2017-18	N/32	307850.17	2410379.329	646	linear	Core	60	50
165	2017-18	N/33	307763.647	2410328.482	675	linear	Core	66	49
166	2017-18	N/34	307676.992	2410278.799	704	linear	Core	60	18
167	2017-18	N/35	307589.939	2410229.404	727	linear	Core	68	37
168	2017-18	N/36	307553.801	2410089.943	751	linear	Core	56	34
169	2017-18	N/37	307640.363	2410143.487	699	linear	Core	62	33
170	2017-18	N/38	307727.283	2410192.991	671	linear	Core	70	40
171	2017-18	N/39	307813.726	2410242.461	639	linear	Core	72	55
172	2017-18	N/40	307899.8	2410292.329	620	linear	Core	61	24
173	2017-18	N/41	307986.931	2410342.991	589	linear	Core	60	41
174	2017-18	N/42	308160.289	2410442.656	571	linear	Core	47	16
175	2017-18	N/43	308246.474	2410492.091	569	linear	Core	32	7
176	2017-18	N/44	308332.654	2410542.303	595	linear	Core	37.5	18
177	2017-18	N/45	308555.755	2410555.659	624	linear	Core	45	10
178	2017-18	N/46	308469.68	2410505.727	622	linear	Core	36.5	8
179	2017-18	N/47	308382.76	2410455.805	599	linear	Core	38	9
180	2017-18	N/48	308295.813	2410405.859	589	linear	Core	44.5	20
181	2017-18	N/28	308257.947	2410872.658	605	linear	Core	46	37
182	2017-18	N/49	307776.959	2410107.016	620	linear	Core	57	36
183	2017-18	N/50	307690.525	2410057.254	670	linear	Core	108	66
184	2017-18	N/51	307604.518	2410007.902	704	linear	Core	74	37
185	2017-18	N/52	307654.185	2409921.532	672	linear	Core	70	42
186	2017-18	N/53	307740.918	2409970.447	649	linear	Core	61	31
187	2017-18	N/54	309432.654	2410360.006	620	linear	Core	40.5	7
188	2017-18	N/55	308519.071	2410418.992	647	linear	Core	48	25
189	2017-18	N/56	308605.985	2410469.415	602	linear	Core	49.5	15
190	2017-18	N/29	309292.736	2410628.855	604	linear	Core	10	16
191	2017-18	N/10	309581.531	2411080.649	555	linear	Core	68.16	29
192	2017-18	N/11	309641.667	2411008.382	596	linear	Core	15	10
193	2017-18	N/10	309691.906	2410922.636	608	linear	Core	40.1	21
194	2017-18	N/18	309778.372	2410972.386	586	linear	Core	45	16
195	2017-18	N/18	309604.042	2410871.656	611	linear	Core	44.5	9
196	2017-18	N/17	309517.936	2410821.676	595	linear	Core	61.3	33
197	2018-19	R/93	308106.0	2411336.0	580	linear	Core	33.5	17
198	2018-19	R/92	308188.0	2411385.0	570	linear	Core	35.1	11
199	2018-19	R/91	308144.0	2411472.0	562	linear	Core	33.3	5
200	2018-19	R/90	307969.0	2411372.0	600	linear	Core	33.5	20
201	2018-19	R/89	308392.0	2411568.0	560	linear	Core	34	12
202	2018-19	R/88	308268.0	2411658.0	582	linear	Core	33	12
203	2018-19	R/87	308044.0	2411644.0	560	linear	Core	33	22
204	2018-19	R/86	307924.0	2411574.0	640	linear	Core	33	30
205	2018-19	R/85	307820.0	2411532.0	592	linear	Core	53	28
206	2018-19	R/84	307668.0	2411720.0	573	linear	Core	34.5	13
207	2018-19	R/83	307552.0	2411696.0	550	linear	Core	34	29
208	2018-19	R/82	307728.0	2411504.0	580	linear	Core	34	27
209	2018-19	R/81	307892.0	2411904.0	520	linear	Core	33.5	24
210	2018-19	R/80	308068.0	2412008.0	490	linear	Core	33.5	23
211	2018-19	R/79	308152.0	2412056.0	480	linear	Core	33.7	20
212	2018-19	R/78	308240.0	2412080.0	480	linear	Core	33	19
213	2018-19	R/77	307600	2411980	570	linear	Core	40	20
214	2018-19	R/76	308444	2411752	550	linear	Core	40	14
215	2018-19	R/75	307976	2411920	510	linear	Core	37	26
216	2018-19	R/74	307797.2	2411270.7	610	linear	Core	41	7
217	2018-19	R/73	307746.8	2411357.0	627	linear	Core	42	30
218	2018-19	R/72	307696.7	2411441.0	615	linear	Core	41.5	24
219	2018-19	R/71	307646.7	2411531.5	630	linear	Core	39	7

BHARAGRAM CHOWDHURY
QUALIFIED PERSON

220	2018-19	R/49	307367.408	2411380.052	614	Linear	Core	[illegible]	[illegible]
221	2018-19	N/65	307536.0	2410604.0	570	Linear	Core	[illegible]	[illegible]
222	2018-19	N/64	308704.0	2410700.0	592	Linear	Core	[illegible]	[illegible]
223	2018-19	N/63	308656.0	2410784.0	590	Linear	Core	[illegible]	[illegible]
224	2018-19	N/62	308740.0	2410836.0	610	Linear	Core	[illegible]	[illegible]
225	2018-19	N/61	308568.77	2410332.214	680	Linear	Core	[illegible]	[illegible]
226	2018-19	N/60	308758.681	2410882.06	560	Linear	Core	[illegible]	[illegible]
227	2018-19	N/59	308152.99	2010815.37	578	Linear	Core	[illegible]	[illegible]
228	2018-19	N/58	308478.3	2410776.1	594	Linear	Core	45	16
229	2018-19	N/57	308638.181	2411115.55	560	Linear	Core	54.45	29
230	2018-19	N/19	308639.401	2411411.389	499	Linear	Core	60	28
231	2018-19	M/91	307786.0	2412126.0	520	Linear	Core	33.4	13
232	2018-19	M/90	307880.0	2412216.0	497	Linear	Core	33	12
233	2018-19	M/89	307825.0	2412312.0	510	Linear	Core	33	14
234	2018-19	M/88	308004.0	2412400.0	470	Linear	Core	33	19
235	2018-19	M/87	307992.0	2412300.0	482	Linear	Core	33	25
236	2018-19	M/86	307780.0	2412300.0	520	Linear	Core	33.6	20
237	2018-19	M/85	307260.289	2413754.286	543	Linear	Core	37	5
238	2018-19	M/84	307201.836	2413703.494	556	Linear	Core	38	6
239	2018-19	M/83	307115.494	2413652.859	545	Linear	Core	38	6
240	2018-19	M/82	307425.129	2413717.309	523	Linear	Core	36.5	17
241	2018-19	M/81	307339.435	2413686.918	500	Linear	Core	10	6
242	2018-19	M/6	307740.229	2412164.916	542	Linear	Core	48.5	30
243	2018-19	BH-212	2412885	307223	622	Linear	Core	40	20
244	2018-19	BH-216	2412591	307462	551	Linear	Core	56.3	17
245	2018-19	BH-217	2412698	307858	478	Linear	Core	42	13
246	2018-19	BH-218	2412516	307558	592	Linear	Core	83.5	20
247	2018-19	BH-220	2412176	307192	588	Linear	Core	41	13
248	2018-19	BH-222	2412612	307914	478	Linear	Core	40.5	10
249	2018-19	BH-223	2411762	307076	632	Linear	Core	40.7	14
250	2018-19	BH-221	2411656	307055	617	Linear	Core	42	17
251	2018-19	BH-225	2411561	307185	567	Linear	Core	40.3	10
252	2018-19	BH-226	2411607	307372	550	Linear	Core	41	12
253	2018-19	BH-229	2411571	307509	578	Linear	Core	41	10

Copy of the Geological report is attached as Annexure–13

Location of Existing Quarry

The information from existing quarries has been taken into consideration under G1 level exploration. The details of location of these manganese quarries are furnished below:

Sl. No.	Name of Quarry	Name of Block	Grid Reference
1	Q-5	Nandagiri	2411264-2411402 & 308604-3308721
2	Q-5 Ext	-do-	2410580-2410689 & 308216-308371
3	Q-1N	-do-	2410742-2411082 & 308299-308656
4	Q-8	-do-	2410189 2410253 & 307794 307844
Total	—	—	
1	Q-6	Rajabasa	2411485-2411555 & 307361-307467
2	Q-6A	-do-	2411876-2412006 & 307871-308021
3	Q-6B & 6C	-do-	2411928-2412010 & 308369-308516
Total	—	—	
1	Q-1	Mahulsukha	2411656-2412353 & 307316 307517
2	Q-3	-do-	2411976-2412384 & 307535-307640
3	Q-7	-do-	2412322-2412436 & 307786-307891
4	Q-7B	-do-	2412300-2412586 & 307725-307772
5	Q-2	-do-	2412581-2412728 & 307372-307465
6	Q-2A	-do-	2412381-2412526 & 307350-307430
Total	—	—	
1	Q-4	Lohardanger	2413322-2413424 & 307456-307523
2	Q-4A	-do-	2413375-2413416 & 307386-307409

DIBAKAR MOHAPATRA
QUALIFIED PERSON

Status of Exploration

Area (in Ha) Explored under G1 and G2 as per UNFC as on 10.07.2020				Remaining area (in Ha) to be explored under G1 & G2 as per UNFC as on 10.07.2020	
Forest		Non-Forest		Forest	Non-Forest
G1	G2	G1	G2		
18.0(Mn)	80.978			180.15	--
103(Iron)	121.392	0.00	22.275	44.672	22.276

Level of Exploration

Level of exploration	Basis	Area (Ha)	Grid interval
G1 level	Existing Quarries (Quarry-1 and Nandagira 1N quarry) and 98 bore holes.	121	100m x 100m/ 50m x 50m
G2 Level	155 bore holes and 40 trial pits	269.317	100m x 100m/ 50m x 50m
G3 Level	--	--	--
Unexplored area (Ha)	--	--	
Total	**253 and 40 trial pits**	**390.317**	

Item of information	Lease area explored as per UNFC norms (in Ha) as on date. 10.07.2020 Total Lease area = A+B+C+D+E					Remarks/Comments including reasons for not carrying out the exploration as per UNFC norms.
	G1 Level (mineralized)	G2 Level (mineralized)	G3 Level (mineralized)	Explored and found non-mineralized with level of exploration (Remarks)	Unexplored lease area	
	A	B	C	D	E	F
Area as per level of exploration	Mn-18 Iron- 103	Mn-80.978	Nil	188.339		181nos of boreholes have been proposed during the ensuing plan period.
No. of BH Drilled	Mn-24 Iron- 90	Mn-62	Nil	77		
No. of BH considered for Resource Estimation	Mn-24 Iron- 90	Mn-62		77		
Metersge Drilled	Mn-1101.90 Iron-4167.4	Mn-2870.92		3975.59		
Grid Interval	Mn-50x50 Iron-100x100	100 x 100	Nil	100x 100m		
Scale of Mapping	1:2000	1:2000	--	1:2000		

(iii) Details of sample analysis indicating type of sample (surface, sub-surface from pits/ trenches/bore holes etc.) complete chemical analysis for entire strata for all radicals may be undertaken for selected samples from a NABL accredited Lab or Government Laboratory or equivalent.

(1) Sampling and analysis of RC/ DTH drill cuttings: The sampling and analysis of RC/ DTH drill cuttings made by the outside analytical agencies

(2) Sampling and analysis of Mn ore Present in the area. Samples of Mn ore present in the lease area have been analysed at Mitra S.K. Private Limited: an NABL accredited lab, At/PO- Barbil, Ward No.6, District: Keonjhar, Odisha-758035.

(3) Sampling & analysis of dump and Mineral Reject/ sub grade: Sampling and analysis of dump and Mineral Reject/ sub grade samples have been made at Mitra S.K. Private Limited: an NABL accredited lab, At/PO- Barbil, Ward No.6, District: Keonjhar, Odisha-758035

(4) Sampling and analysis of core drill sample: The sampling and analysis of core drill samples made by the QSS &Spectro analytical lab having NABL accredited lab.

A total of 5253nos of samples have been collected and analyzedby different NABL accredited labs to know the quality of Mn ore. The details are furnished below:

BHABAGRAHI MOHAPATRA
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Sl. No	BH_ID	No of samples collected	No of sample analysed
1	BH_1	8	8
2	BH_2	8	8
3	BH_3	8	8
4	BH_4	8	8
5	BH_5	8	8
6	BH_6	8	8
7	BH_7	8	8
8	BH_9	8	8
9	BH_12	8	8
10	BH_8	8	8
11	BH_10	8	8
12	BH_11	8	8
13	BH/02	1	1
14	BH/03	1	1
15	BH/05	1	1
16	BH/06	1	1
17	BH/07	1	1
18	BH/12	1	1
19	BH.No.0408	1	1
20	BH.No.04061	1	1
21	BH.No.04086	1	1
22	BH.No.04089	1	1
23	BH.No.04084	1	1
24	BH.No.04082	1	1
25	BH.No.04083	1	1
26	BH.No.04060	1	1
27	BH.No.04061	1	1
28	BH.No.04053	1	1
29	BH.No.04062	1	1
30	BH.No.04052	1	1
31	BH.No.04056	1	1
32	BH.No.04059	1	1
33	BH.No.04057	1	1
34	BH.No.04055	1	1
35	BH. No.04054	1	1
36	BH.No.04064	1	1
37	BH.No.04063	1	1
38	BH.No.04065	1	1
39	BH.No.04067	1	1
40	BH.No.04066	1	1
41	BH.No.04068	1	1
42	BH.No.04069	1	1
43	BH.No.04072	1	1
44	BH.No.04071	1	1
45	BH.No.04070	1	1
46	BH.No.04074	1	1
47	BH.No.04076	1	1
48	BH.No.04073	1	1
49	BH.No.04075	1	1
50	BH.No.04001	1	1
51	BH.No.04002	3	3
52	BH.No.04003	3	3
53	BH.No.04004	2	2
54	BH.No.04005	2	2
55	BH.No.04026	1	1
56	BH.No.04027	1	1
57	BH/4080	1	1
58	BH/4090	1	1
59	BH/4051	1	1
60	BH/4058	1	1
61	BH/4088	1	1
62	BH/4087	1	1
63	RC/WB/05	27	27
64	RC/WB/01	10	10
65	RC/WB/04	25	25
66	RC/WB/02	10	10
67	RC/WB/03	8	8

BHADAGHNA MOHAPATRA
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68	RC/MB/07	16	16
69	BH/4133	1	1
70	BH/4134	1	1
71	BH/4135	1	1
72	BH/4136	1	1
73	BH/4137	1	1
74	BH/4138	1	1
75	BH/4132	1	1
76	BH/4129	1	1
77	BH/4124	1	1
78	BH/4125	1	1
79	BH/4126	1	1
80	BH/4127	1	1
81	BH/4128	1	1
82	BH/4130	1	1
83	BH/4131	1	1
84	BH/06008	2	2
85	BH/06009	2	2
86	BH/06010	2	2
87	BH/06011	1	1
88	BH/06012	2	2
89	BH/06013	2	2
90	BH/06015	1	1
91	BH/06016	1	1
92	BH/06017	1	1
93	BH/06018	1	1
94	BH/06019	1	1
95	BH/06020	1	1
96	BH/06021	1	1
97	BH/06022	1	1
98	BH/06023	2	2
99	BH/06024	1	1
100	BH/06025	1	1
101	BH/06026	2	2
102	BH/06027	1	1
103	BH/06028	1	1
104	BH/06029	2	2
105	BH/06030	1	1
106	BH/06031	1	1
107	BH/06032	1	1
108	BH/06006	1	1
109	BH/06007	0	0
110	BH/06004	0	0
111	BH/06003	2	2
112	BH/06002	2	2
113	BH/06001	2	2
114	BH/06005	1	1
115	BH/6078	1	1
116	BH/6072	1	1
117	BH/6074	1	1
118	BH/6076	1	1
119	BH/6077	1	1
120	BH/6083	1	1
121	BH/6085	1	1
122	BH/1	3	3
123	BH/2	4	4
124	BH/3	2	2
125	BH/4	3	3
126	BH/5	4	4
127	BH/6	4	4
128	BH/7	3	3
129	BH/8	3	3
130	BH/9	3	3
131	BH/10	4	4
132	BH/11	3	3
133	BH/12	3	3
134	BH/13	3	3
135	BH/14	3	3

BHADAGOPINACHAPATRA
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136	BH/15	3	3
137	BH/16	3	3
138	BH/17	4	4
139	BH/18	3	3
140	BH/19	3	3
141	BH/20	4	4
142	BH/01	8	8
143	BH/02	8	8
144	BH/03	8	8
145	BH/04	8	8
146	BH/05	8	8
147	BH/06	8	8
148	BH/07	8	8
149	RC/MB/36	10	10
150	BH/01/06		
151	BH/21/06	4	4
152	BH/30/06	4	4
153	BH/22/06	3	3
154	BH/29/06	3	3
155	BH/23/06	3	3
156	BH/28/06	5	5
157	BH/24/06	4	4
158	BH/27/06	5	5
159	BH/25/06	4	4
160	BH/26/06	5	5
161	BH/4001	3	3
162	BH/4002	4	4
163	BH/4003	4	4
164	NCDH-02	20	20
165	NCDH-03	26	26
166	NCDH-01	17	17
167	NCDH-04	23	23
168	NCDH-05	43	43
169	NCDH-06	30	30
170	NCDH-07	26	26
171	NCDH-08	29	29
172	NCDH-09	19	19
173	NCDH-12	22	22
174	NCDH-13	15	15
175	NCDH-14	15	15
176	MSDH-01	17	17
177	MSDH-02	31	31
178	MSDH-03	18	18
179	MSDH-04	21	21
180	MSDH-05	22	22
181	RBDH-02	19	19
182	RBDH-04	11	11
183	RBDH-05	20	20
184	RBDH-06	14	14
185	RBDH-03	12	12
186	RBDH-01	21	21
187	RBDH-11	19	19
188	RBDH-09	22	22
189	RBDH-10	47	47
190	RBDH-08	20	20
191	RBDH-07	18	18
192	RBDH-12	9	9
193	RBDH-13	13	13
194	RBDH-14	24	24
195	M/80	7	7
196	M/79	7	7
197	M/74	20	20
198	M/75	21	21
199	M/76	20	20
200	M/77	29	29
201	M/78	9	9
202	M/73	24	24
203	M/72	19	19

BHABAGRAHI MOHAPATRA
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204	M/71	25	25
205	M/72	23	23
206	M/69	12	12
207	M/64	17	17
208	M/65	28	
209	M/66	13	
210	M/67	32	32
211	M/68	13	13
212	M/63	7	7
213	M/62	13	13
214	M/61	16	16
215	M/60	16	16
216	M/59	19	19
217	M/55	12	12
218	M/56	20	20
219	M/57	28	28
220	M/58	26	26
221	M/54	20	20
222	M/53	19	19
223	M/52	18	18
224	M/51	26	26
225	M/50	18	18
226	M/46	30	30
227	M/45	17	17
228	M/47	32	32
229	M/48	25	25
230	M/49	24	24
231	M/44	17	17
232	M/43	13	13
233	M/42	21	21
234	M/41	23	23
235	M/40	22	22
236	M/36	25	25
237	M/37	14	14
238	M/38	28	28
239	M/39	25	25
240	M/29	23	23
241	M/30	43	43
242	M/31	49	49
243	M/28	47	47
244	M/27	31	31
245	M/26	35	35
246	M/21	23	23
247	M/22	35	35
248	M/23	38	38
249	M/15	39	39
250	M/16	41	41
251	M/18	42	42
252	M/19	35	35
253	M/20	28	28
254	M/10	26	26
255	M/11	38	38
256	M/12	31	31
257	M/13	30	30
258	M/14	23	23
259	R/68	17	17
260	R/69	30	30
261	R/70	29	29
262	M/7	41	41
263	M/9	23	23
264	M/8	9	9
265	R/64	25	25
266	R/65	28	28
267	R/66	10	10
268	R/67	27	27
269	R/60	24	24
270	R/61	10	10
271	R/62	13	13

BHABAGRAHI MOHAPATRA
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272	R/53	18	
273	R/55	18	
274	R/56	15	
275	R/57	33	
276	R/58	25	
277	R/59	8	
278	R/50	19	
279	R/51	15	
280	R/52	14	14
281	R/53	19	19
282	R/54	11	11
283	R/42	8	8
284	R/43	16	16
285	R/44	8	8
286	R/45	29	29
287	R/46	11	11
288	R/47	21	21
289	R/48	14	14
290	R/36	11	11
291	R/37	22	22
292	R/38	20	20
293	R/39	12	12
294	R/40	9	9
295	R/41	27	27
296	R/31	44	44
297	R/32	26	26
298	R/33	17	17
299	R/34	15	15
300	R/35	7	7
301	R/28	16	16
302	R/29	31	31
303	R/30	30	30
304	R/24	40	40
305	R/25	26	26
306	R/26	19	19
307	R/27	13	13
308	R/17	24	24
309	R/18	22	22
310	R/19	32	32
311	R/20	19	19
312	R/21	12	12
313	R/22	19	19
314	R/23	11	11
315	R/16	16	16
316	R/15	9	9
317	N/20	9	9
318	N/21	7	7
319	N/22	6	6
320	N/23	22	22
321	N/24	23	23
322	N/25	11	11
323	N/26	10	10
324	N/27	19	19
325	N/30	35	35
326	N/31	41	41
327	N/32	50	50
328	N/33	49	49
329	N/34	18	18
330	N/35	37	37
331	N/36	34	34
332	N/37	33	33
333	N/38	40	40
334	N/39	55	55
335	N/40	24	24
336	N/41	41	41
337	N/42	16	16
338	N/43	7	7
339	N/44	18	18

BHABAGRAHI MOHAPATRA
QUALIFIED PERSON

340	N/45	10	10
341	N/46	8	8
342	N/47	9	9
343	N/48	20	20
344	N/26	37	37
345	N/49	35	35
346	N/50	66	66
347	N/51	37	37
348	N/52	42	42
349	N/53	31	31
350	N/54	7	7
351	N/55	25	25
352	N/56	15	15
353	N/29	16	16
354	N/15	29	29
355	N/11	10	10
356	N/10	21	21
357	N/18	16	16
358	N/16	9	9
359	N/17	33	33
360	R/93	17	17
361	R/92	11	11
362	R/91	6	6
363	R/90	20	20
364	R/89	12	12
365	R/88	12	12
366	R/87	22	22
367	R/86	30	30
368	R/85	26	26
369	R/84	13	13
370	R/95	29	29
371	R/82	27	27
372	R/81	24	24
373	R/80	23	23
374	R/79	20	20
375	R/78	19	19
376	R/77	20	20
377	R/76	14	14
378	R/75	26	26
379	R/74	7	7
380	R/73	20	20
381	R/72	24	24
382	R/71	7	7
383	R/49	13	13
384	N/65	11	11
385	N/64	4	4
386	N/63	5	5
387	N/62	8	8
388	N/61	11	11
389	N/60	31	31
390	N/59	9	9
391	N/58	16	16
392	N/57	29	29
393	N/19	26	26
394	M/91	13	13
395	M/90	12	12
396	M/89	18	18
397	M/88	19	19
398	M/87	25	25
399	M/86	20	20
400	M/85	5	5
401	M/84	6	6
402	M/83	6	6
403	M/82	17	17
404	M/81	6	6
405	M/8	30	30
Total		**5253**	**5253**

BHABAGRAHI MOHAPATRA
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(iv) **Expenditure incurred in various prospecting operation.**
Exploration has been carried out by old lessee M/s AMTC ltd. The expenditure of exploration work is not available in Geological Report.

(f) The surface plan of the lease area may be prepared on a scale of 1: 1000 or1 :2000 with contour interval of maximum 10m depending upon the topography andsize of the area duly marked by grid lines showing all features indicated under Rule 32 of MCDR 2017.

After execute the Mining Lease Deed in favour of M/S Patnaik Minerals Pvt. Ltd on 29.06.2020.Hence, a fresh survey through total station has been carried out within the ML area showing all features. Accordingly, a surface plan of the lease area has been updated on a scale of 1:2000 with a contour interval of 5m. As per the Rule 32 (1)(a) of MCDR 2017, all the existing features have been marked along with grid lines shown at an interval of 100m. The surface plan has been updated on 010.07.2020.(Ref Plate No- III)

(g)Geological Plan

The Geological Plan vide Plate-IVwhich is prepared on a scale of 1:2000 with contour interval of 5m showing all features under Rule 32 (1) (a) of MCDR 2017.including locations of existing as well as proposed exploration, various litho-units along with structural features and iron ore zone with grade. Geo-structural information like strike, dip and dip direction are reflected in Geological plan.

h) Geological sections.

Ref: Geological Sections vide Plate-IV (A)&IV(B)which is prepared on a scale of 1:2000 at 100m interval across iron ore zone and 50m interval across manganese ore zone in the lease area from boundary to boundary.

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

The Mahulsukha Mining Lease area was initially executed for mining of Manganese Ore, the entire potentially mineralized zone have been explored under G2 category with a grid pattern of 100m x 100m by the old Lessee within the lease area. Subsequently said lease has been awarded to M/s Patnaik Minerals Pvt ltd by the Auction process in respect of the Mahulsukha Iron and Manganese ore block. As per theprovisionsof mineral evidence rule, the area other than the manganese ore zone has been explored on under G1 level as the area explored with grid pattern of 100m x100m interval. Further, in manganese ore zone, bore holes are to be undertaken at a grid spacing of 50m x 50m for G1 level exploration. So it has been envisaged to drill 181nos of borcholes in the depth of 70m or till the end of mineralization. The details of proposed exploration will be as per the table furnished below:

BHABAGRAHI PATRA
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Sl. No	Year	Section no	BH No	Northing	Easting	Collar RL (M.)	CORE /RC /DTH	Metarage	Incilnation	Forest/Non Forest/Diverted forest	Surface Right/N Surface right
1	2021-22	3200	PBH-1	2413427	307542	517	CORE	70	-90°	Diverted-Forest	S/R
2		2900	PBH-2	2412968	307347	503	CORE	70	90°	Diverted-Forest	S/R
3		2700	PBH-3	2412747	307351	568	CORE	70	-90°	Diverted-Forest	S/R
4		2700	PBH-4	2412797	307448	524	CORE	70	90°	Diverted-Forest	S/R
5		2600	PBH-5	2412661	307411	550	CORE	70	-90°	Diverted-Forest	S/R
6		2600	PBH-6	2412711	307487	516	CORE	70	90°	Diverted-Forest	S/R
7		2600	PBH-7	2412760	307584	502	CORE	70	-90°	Diverted-Forest	S/R
8		2500	PBH-8	2412674	307634	535	CORE	70	90°	Diverted-Forest	S/R
9		2500	PBH-9	2412724	307721	515	CORE	70	-90°	Diverted-Forest	S/R
10		2400	PBH-10	2412581	307680	543	CORE	70	90°	Diverted-Forest	S/R
11		2400	PBH-11	2412677	307840	490	CORE	70	-90°	Diverted-Forest	S/R
12		2300	PBH-12	2412501	307734	537	CORE	70	-90°	Diverted-Forest	S/R
13		2200	PBH-13	2412164	307351	503	CORE	70	-90°	Diverted-Forest	S/R
14		2200	PBH-14	2412214	307437	552	CORE	70	-90°	Diverted-Forest	S/R
15		2200	PBH-15	2412264	307524	564	CORE	70	-90°	Diverted-Forest	S/R
16		2200	PBH-16	2412314	307610	574	CORE	70	-90°	Diverted-Forest	S/R
17		2200	PBH-17	2412364	307697	554	CORE	70	-90°	Diverted-Forest	S/R
18		2200	PBH-18	2412414	307784	515	CORE	70	-90°	Diverted-Forest	S/R
19		2100	PBH-19	2412227	307660	564	CORE	70	90°	Diverted-Forest	S/R
20	2022-23	2000	PBH-20	2412007	307479	585	CORE	70	-90°	Diverted-Forest	S/R
21		2000	PBH-21	2412057	307565	583	CORE	70	-90°	Diverted-Forest	S/R
22		1900	PBH-22	2411807	307332	580	CORE	70	-90°	Diverted-Forest	S/R
23		1900	PBH-23	2411857	307419	596	CORE	70	-90°	Diverted-Forest	S/R
24		1700	PBH 24	2411878	307856	535	CORE	70	-90°	Diverted-Forest	S/R
25		1700	PBH-25	2411923	307942	516	CORE	70	-90°	Diverted-Forest	S/R
26		1500	PBH-26	2411734	308006	552	CORE	70	-90°	Diverted-Forest	S/R
27		1500	PBH-27	2411784	308093	552	CORE	70	-90°	Diverted-Forest	S/R
28		1500	PBH-28	2411835	308181	550	CORE	70	90°	Diverted-Forest	S/R
29		900	PBH-29	2411439	308696	684	CORE	70	90°	Diverted-Forest	S/R
30		800	PBH-30	2411281	308621	458	CORE	70	-90°	Diverted-Forest	S/R
31		800	PBH-31	2411384	308785	452	CORE	70	-90°	Diverted-Forest	S/R
32		600	PBH-32	2410935	308422	478	CORE	70	-90°	Diverted-Forest	S/R
33		500	PBH-33	2410816	308417	545	CORE	70	90°	Diverted-Forest	S/R
34		300	PBH-34	2410221	307785	505	CORE	70	90°	Diverted-Forest	S/R
35		300	PBH-35	2410271	307872	578	CORE	70	-90°	Diverted-Forest	S/R
36	2023-24	2600	PBH-36	2412563	307276	605	CORE	70	-90°	Diverted-Forest	S/R
37		2600	PBH-37	2412633	307364	577	CORE	70	90°	Diverted-Forest	S/R
38		2500	PBH-38	2412497	307328	590	CORE	70	-90°	Diverted-Forest	S/R

BHABAGRAHI MOHAPATRA
QUALIFIED PERSON

39		2500	PBH-39	2412547	307414	561	CORE	70	-90°	Diverted-Forest	S/R
40		2400	PBH-40	2412360	307291	598	CORE	70	-90°	Diverted-Forest	S/R
41		2400	PBH-41	2412410	307378	581	CORE	70	-90°	Diverted-Forest	S/R
42		2300	PBH-42	2412374	307514	590	CORE	70	-90°	Diverted-Forest	S/R
43		2300	PBH-43	2412424	307601	590	CORE	70	-90°	Diverted-Forest	S/R
44		1900	PBH-44	2411977	307628	582	CORE	70	-90°	Diverted-Forest	S/R
45		1900	PBH-45	2412027	307714	582	CORE	70	-90°	Diverted-Forest	S/R
46		1300	PBH-46	2411256	307581	558	CORE	70	-90°	Diverted-Forest	S/R
47		1200	PBH-47	2411221	307716	528	CORE	70	-90°	Diverted-Forest	S/R
48		2400	PBH-48	2412360	307295	558	CORE	70	-90°	Diverted-Forest	S/R
49		2300	PBH-49	2412224	307254	618	CORE	70	-90°	Diverted-Forest	S/R
50		2300	PBH-50	2412274	307341	579	CORE	70	-90°	Diverted-Forest	S/R
51		2300	PBH-51	2412324	307428	590	CORE	70	-90°	Diverted-Forest	S/R
52			PBH-52	2412645	307375	522	CORE	70	-90°	Diverted-Forest	S/R
53			PBH-53	2411356	306052	529	CORE	70	-90°	Diverted-Forest	S/R
54			PBH-54	2411378	306090	539	CORE	70	-90°	Diverted-Forest	S/R
55			PBH-55	2411962	307630	555	CORE	70	-90°	Diverted-Forest	S/R
56			PBH-56	2412740	307649	521	CORE	70	-90°	Diverted-Forest	S/R
57			PBH-57	2412716	307609	525	CORE	70	-90°	Diverted-Forest	S/R
58			PBH-58	2412690	307562	515	CORE	70	-90°	Diverted-Forest	S/R
59			PBH-59	2412664	307517	525	CORE	70	-90°	Diverted-Forest	S/R
60			PBH-60	2412641	307476	522	CORE	70	-90°	Diverted-Forest	S/R
61			PBH-61	2412616	307434	540	CORE	70	-90°	Diverted-Forest	S/R
62			PBH-62	2412591	307389	570	CORE	70	-90°	Diverted-Forest	S/R
63			PBH-63	2412825	307549	576	CORE	70	-90°	Diverted-Forest	S/R
64			PBH-64	2412704	307788	505	CORE	70	-90°	Diverted-Forest	S/R
65			PBH-65	2412880	307748	515	CORE	70	-90°	Diverted-Forest	S/R
66			PBH-66	2412853	307700	525	CORE	70	-90°	Diverted-Forest	S/R
67			PBH-67	2412830	307659	542	CORE	70	-90°	Diverted-Forest	S/R
68			PBH-68	2412804	307613	586	CORE	70	-90°	Diverted-Forest	S/R
69			PBH-69	2412575	307561	584	CORE	70	-90°	Diverted-Forest	S/R
70			PBH-70	2412554	307527	587	CORE	70	-90°	Diverted-Forest	S/R
71			PBH-71	2412531	307487	576	CORE	70	-90°	Diverted-Forest	S/R
72			PBH-72	2412500	307442	588	CORE	70	-90°	Diverted-Forest	S/R
73			PBH-73	2412481	307799	504	CORE	70	-90°	Diverted-Forest	S/R
74			PBH-74	2412458	307758	520	CORE	70	-90°	Diverted-Forest	S/R
75			PBH-75	2412431	307712	540	CORE	70	-90°	Diverted-Forest	S/R
76			PBH-76	2412406	307668	553	CORE	70	-90°	Diverted-Forest	S/R
77			PBH-77	2412381	307626	580	CORE	70	-90°	Diverted-Forest	S/R

BHABAGRAHI PRUSTY PATRA
QUALIFIED PERSON

78			PBH-78	2412356	307584	575	CORE	70	-90°	Diverted-Forest	S/R
79			PBH-79	2410900	308681	605	CORE	70	-90°	Diverted-Forest	S/R
80		400	PBH-80	2412558	307454	598	CORE	70	-90°	Diverted-Forest	S/R
81		400	PBH-81	2412380	307281	604	CORE	70	-90°	Diverted-Forest	S/R
82		400	PBH-82	2412440	307328	615	CORE	70	-90°	Diverted-Forest	S/R
83			PBH-83	2412206	307324	603	CORE	70	-90°	Diverted-Forest	S/R
84			PBH-84	2412384	307850	490	CORE	70	-90°	Diverted-Forest	S/R
85			PBH-85	2412372	307812	502	CORE	70	-90°	Diverted-Forest	S/R
86			PBH-86	2412345	307764	518	CORE	70	-90°	Diverted-Forest	S/R
87			PBH-87	2412321	307722	550	CORE	70	-90°	Diverted-Forest	S/R
88			PBH-88	2412294	307677	568	CORE	70	-90°	Diverted-Forest	S/R
89		400	PBH-89	2410879	308725	530	CORE	70	-90°	Diverted-Forest	S/R
90		400	PBH-90	2410908	308774	574	CORE	70	90°	Diverted-Forest	S/R
91			PBH-91	2410810	308707	612	CORE	70	-90°	Diverted-Forest	S/R
92		300	PBH-92	2410769	308734	602	CORE	70	-90°	Diverted-Forest	S/R
93			PBH-93	2410726	308756	605	CORE	70	-90°	Diverted-Forest	S/R
94			PBH-94	2412216	307334	583	CORE	70	90°	Diverted-Forest	S/R
95			PBH-95	2412374	307860	601	CORE	70	-90°	Diverted-Forest	S/R
96		2100	PBH-96	2412277	307746	580	CORE	70	-90°	Non-Forest	S/R
97			PBH-97	2412251	307701	589	CORE	70	-90°	Diverted-Forest	S/R
98			PBH-98	2412794	307697	595	CORE	70	-90°	Diverted-Forest	S/R
99		1000	PBH-99	2410859	308745	588	CORE	70	90°	Diverted-Forest	S/R
100			PBH-100	2412308	307899	492	CORE	70	-90°	Diverted-Forest	S/R
101			PBH-101	2412295	307861	505	CORE	70	-90°	Diverted-Forest	S/R
102			PBH-102	2412267	307815	518	CORE	70	-90°	Diverted-Forest	S/R
103			PBH-103	2412233	307768	530	CORE	70	-90°	Diverted-Forest	S/R
104			PBH-104	2412208	307726	550	CORE	70	-90°	Diverted-Forest	S/R
105			PBH-105	2412182	307683	576	CORE	70	-90°	Diverted-Forest	S/R
106			PBH-106	2412555	307521	595	CORE	70	-90°	Diverted-Forest	S/R
107		1000	PBH-107	2412534	307587	594	CORE	70	-90°	Diverted-Forest	S/R
108		1000	PBH-108	2412581	307437	590	CORE	70	-90°	Diverted-Forest	S/R
109		2000	PBH-109	2412114	307664	585	CORE	70	-90°	Diverted-Forest	S/R
110		1100	PBH-110	2412620	307542	575	CORE	70	-90°	Diverted-Forest	S/R
111		1100	PBH-111	2412624	307587	578	CORE	70	-90°	Diverted-Forest	S/R
112		1100	PBH-112	2412621	307446	588	CORE	70	-90°	Diverted-Forest	S/R
113			PBH-113	2411946	307473	606	CORE	70	-90°	Diverted-Forest	S/R
114			PBH-114	2411921	307429	612	CORE	70	-90°	Diverted-Forest	S/R
115			PBH-115	2411896	307385	614	CORE	70	-90°	Diverted-Forest	S/R
116			PBH-116	2411873	307344	612	CORE	70	-90°	Diverted-Forest	S/R

BHAGAGRAHI VISHWAKARMA
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117		1900	PBH-117	2411953	307588	581	CORE	70	-90°	Diverted-Forest	S/R
118		1900	PBH-118	2411926	307541	590	CORE	70	-90°	Diverted-Forest	S/R
119		1900	PBH-119	2411901	307497	592	CORE	70	-90°	Diverted-Forest	S/R
120		1600	PBH-120	2411829	307366	590	CORE	70	-90°	Diverted-Forest	S/R
121		1600	PBH-121	2411443	307304	590	CORE	70	-90°	Diverted-Forest	S/R
122			PBH-122	2411418	307258	598	CORE	70	-90°	Diverted-Forest	S/R
123		1600	PBH-123	2411544	307478	578	CORE	70	-90°	Diverted-Forest	S/R
124			PBH-124	2411558	307501	583	CORE	70	-90°	Diverted-Forest	S/R
125			PBH-125	2411502	307506	590	CORE	70	-90°	Diverted-Forest	S/R
126			PBH-126	2411475	307456	595	CORE	70	-90°	Diverted-Forest	S/R
127			PBH-127	2411424	307370	598	CORE	70	-90°	Diverted-Forest	S/R
128			PBH-128	2411400	307328	605	CORE	70	-90°	Diverted-Forest	S/R
129			PBH-129	2411375	307283	612	CORE	70	-90°	Diverted-Forest	S/R
130		1500	PBH-130	2411358	307354	620	CORE	70	-90°	Diverted-Forest	S/R
131		1500	PBH-131	2411407	307440	611	CORE	70	-90°	Diverted-Forest	S/R
132		1500	PBH-132	2411509	307617	609	CORE	70	-90°	Diverted-Forest	S/R
133			PBH-133	2411463	307638	618	CORE	70	-90°	Diverted-Forest	S/R
134			PBH-134	2411437	307594	625	CORE	70	-90°	Diverted-Forest	S/R
135			PBH-135	2411411	307548	627	CORE	70	-90°	Diverted-Forest	S/R
136			PBH-136	2411388	307506	623	CORE	70	-90°	Diverted-Forest	S/R
137			PBH-137	2411362	307461	628	CORE	70	-90°	Diverted-Forest	S/R
138		1400	PBH-138	2411338	307419	630	CORE	70	-90°	Diverted-Forest	S/R
139		1400	PBH-139	2411318	307488	645	CORE	70	-90°	Diverted-Forest	S/R
140		1400	PBH-140	2411369	307575	637	CORE	70	-90°	Diverted-Forest	S/R
141		1400	PBH-141	2411385	307619	632	CORE	70	-90°	Diverted-Forest	S/R
142		1400	PBH-142	2411419	307658	625	CORE	70	-90°	Diverted-Forest	S/R
143			PBH-143	2411301	307556	655	CORE	70	-90°	Diverted-Forest	S/R
144			PBH-144	2411325	307602	648	CORE	70	-90°	Diverted-Forest	S/R
145			PBH-145	2411352	307643	636	CORE	70	-90°	Diverted-Forest	S/R
146			PBH-146	2411379	307691	631	CORE	70	-90°	Diverted-Forest	S/R
147			PBH-147	2411400	307730	624	CORE	70	-90°	Diverted-Forest	S/R
148			PBH-148	2411427	307779	608	CORE	70	-90°	Diverted-Forest	S/R
149			PBH-149	2411451	307817	600	CORE	70	-90°	Diverted-Forest	S/R
150			PBH-150	2411475	307859	605	CORE	70	-90°	Diverted-Forest	S/R
151			PBH-151	2411501	307904	587	CORE	70	-90°	Diverted-Forest	S/R
152			PBH-152	2411527	307948	577	CORE	70	-90°	Diverted-Forest	S/R
153			PBH-153	2411551	307991	568	CORE	70	-90°	Diverted-Forest	S/R
154		1300	PBH-154	2411535	308062	582	CORE	70	-90°	Diverted-Forest	S/R
155		1300	PBH-155	2411483	307969	576	CORE	70	-90°	Diverted-Forest	S/R

BHARAGRA PRADHAN PATRA

156		1300	PBH-156	2411433	307887	605	CORE	70	-90°	Diverted-Forest	S/R
157		1300	PBH-157	2411385	307802	620	CORE	70	90°	Diverted-Forest	S/R
158		1300	PBH-158	2411334	307714	633	CORE	70	90°	Diverted-Forest	S/R
159		1300	PBH-159	2411282	307621	650	CORE	70	90°	Diverted-Forest	S/R
160			PBH-160	2411240	307650	652	CORE	70	90°	Diverted-Forest	S/R
161			PBH-161	2411264	307693	640	CORE	70	90°	Diverted Forest	S/R
162			PBH-162	2411289	307735	632	CORE	70	90°	Diverted-Forest	S/R
163			PBH-163	2411315	307780	625	CORE	70	-90°	Diverted-Forest	S/R
164			PBH-164	2411339	307825	620	CORE	70	-90°	Diverted-Forest	S/R
165			PBH-165	2411364	307867	605	CORE	70	-90°	Diverted-Forest	S/R
166			PBH-166	2411392	307911	600	CORE	70	90°	Diverted-Forest	S/R
167			PBH-167	2411414	307951	602	CORE	70	90°	Diverted Forest	S/R
168			PBH-168	2411440	307997	584	CORE	70	-90°	Diverted Forest	S/R
169			PBH-169	2411464	308038	573	CORE	70	-90°	Diverted-Forest	S/R
170			PBH-170	2411493	308087	564	CORE	70	-90°	Diverted-Forest	S/R
171			PBH-171	2411515	308128	556	CORE	70	90°	Diverted Forest	S/R
172		1200	PBH-172	2411445	308110	570	CORE	70	-90°	Diverted-Forest	S/R
173		1200	PBH-173	2411396	308021	590	CORE	70	-90°	Diverted Forest	S/R
174		1200	PBH-174	2411346	307933	605	CORE	70	-90°	Diverted Forest	S/R
175		1200	PBH-175	2411293	307849	605	CORE	70	90°	Diverted Forest	S/R
176		1200	PBH-176	2411244	307758	622	CORE	70	-90°	Diverted Forest	S/R
177			PBH-177	2411201	307785	604	CORE	70	-90°	Diverted-Forest	S/R
178			PBH-178	2411226	307830	600	CORE	70	-90°	Diverted Forest	S/R
179			PBH 179	2411336	308018	498	CORE	70	90°	Diverted Forest	S/R
180			PBH 180	2411373	308071	502	CORE	70	-90°	Diverted-Forest	S/R
181			PBH 181	2411409	308730	510	CORE	70	-90°	Diverted Forest	S/R

The Summery of future tentative excavation programme planned in next five years as in table below: -

Year	No. of boreholes (Core/RC/DTH)	Grid interval	Total meterage
2020-21	Nil		
2021-22	19-Core	100 x 50	1330
2022-23	16-Core	50 x 50	1120
2023-24	146-Core	50 x 50	10220
2024-25	Nil		

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i) Reserves and Resources as per UNFC with respect to the threshold value [illegible] **be furnished in a tabular form as given below: (Area explored under different level of exploration may be marked on the geological plan and UNFC code for area considered for different categories of reserve/resources estimation may also be marked on geological cross sections).**

Parameters considered during estimation of the reserve/resource.

In the Geological Report, G1 category of resource of Manganese ore has been estimated based on the existing quarries namely Quarry-1 and Nandagira quarry. Further, G2 level of resource estimation has been carried out based on the core type of bore hole drilled during 2016-17 to 2018-19. A total of 263 bore holes and 40 trial pits have been taken into consideration for the resource estimation of iron ore and Manganese ore under G2 category.Cross sectional area method was adopted for estimation of reserve/resource.The drill hole data and existing quarries were became the basis to estimate the resource.The threshold value of ROM manganese ore was taken as +10%Mn. The recovery percentages of manganese ore was considered as 34%.

The category wise reserve and resources estimated in the Geological Reportas 1. 04 2019 given below:

Level of Exploration	Resources of Mn Ore(Ton)	Grade	Average Grade of Ore (Mn%)
Measured(G1)	27279.27	10 to 20% Mn	14.74
	200047.96	20% Mn& Above	28.66
Indicated Resource (G2)	65293.83	10 to 20% Mn	14.74
	478821.43	20% Mn& Above	28.66
Total	**771442.49**	**10% Mn& Above**	**25.95**

Level of Exploration	Resources of Iron Ore(Ton)		Grade	Average Grade of Ore (Fe%)
	Lumps @38.22%	Fines @ 61.78%		
Indicated Resource (G2)	8152103	13177313	45 to 55% Fe	49.88
	4389594	7095476	55% Fe & Above	58.99
Total	**12541697**	**20272789**	**45% Fe & Above**	**53.07**

Depletion of Reserves:

A total production of 39935.087 MTofMn ore has been obtained during 2019-20.So the total balance resource of manganese ore is 731507.403 MT. The updated reserve of manganese ore within the ML area as on 10.07.2020 has been furnished by deducting reserve from earlier reserve as aporoved. The depletion and updated resource is given below

Residual Reserve/Resources:(as on 10.07.2020)

Reserve/ resources	Type	UNFC Code	Manganese ore (t)	Grade	Iron ore(t)	Grade
Reserves	Proved	111	161314.403	+10%Mn	—	+45%Fe
	Probable	121	—		—	
		122	482412.00		26783298	
Sub-Total (a)	—	—	**643726.403**		**26783298**	
Remaining resources	Feasibility	211	26078		—	
	Pre-feasibility	221	61703		—	
		222	—		6031188	
	Measured	331	—			
	Indicated	332	—			
	Inferred	333	—			
	Reconnaissance	—	—			
Sub-Total(b)	—	—	87781		6031188	
Total(a+ b)	—		731507.403		32814486	

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Updated reserves established category-wise (with basis of parameters)

A detail geological report has been prepared and scrutinized by the committee constituted by state govt. Based on the geological report the resource of iron and Manganese ore has been categorised as follows:

Measured Mineral Resources (G1)

There are two major quarries namely Quarry-1 and Nandagira quarry which have gone about 60m depth from the surface. These two quarries are giving valuable information about the ore body configuration and occurrence of Manganese ore as well as iron ore. The scale of exploration at these two quarries has been considered under G1 category.

Indicated Resource (G2):

A total of 253 core type bore holes have been drilled from 2016-17 to 2018-19 and 40 nos of trial pits have been put at different locations. These bore holes are drilled at 50-200m grid interval. Hence, all these 253 bore holes and trial pits with their lateral influence of 50m are considered under G2 categories.

During drilling some of the bore holes in south western part has encountered goethitic ore, soft laminated ore etc. Samples of these litho units have been analyzed. Accordingly, resource has been estimated under indicated (G2) category.

Parameters considered for Resource Estimation

- As per guidelines of IBM threshold value of iron ore is considered as 45% Fe and calculation of resource is done under different range of Fe% i.e. 45 to 55% Fe and 55 % Fe above. Similarly, for manganese ore the threshold value has been considered as +10%Mn. For calculation of resource of Manganese ore different range of Mn% i.e 10-20%Mn and +20%Mn have been taken into consideration.
- Considering the above factors the grade - wise calculation of updated iron ore and manganese ore resources, in the ML area in all the deposits are done.
- Considering the geological plan, Thirty six numbers of cross sections are prepared in 1:2000 scale covering the total area and from lease boundary to boundary.
- Position of holes are well shown on the cross sections and the lithology as encountered in each of the bore holes were plotted indicating the run wise grade of ore encountered in the hole. The ore zones are plotted in each of the bore holes of respective cross sections and are connected to arriving sectional area of different grade of the ore zone for that section.

Bulk density of Iron and Manganese ore

As per the Geological Report a detail bulk density test has been undertaken by a NABL Accredited lab. Based on the study the bulk density of iron ore and manganese is as follows:

BHABAGRAHI MOHAPATRA
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Sample Details	BD (T/m^3)
Iron Ore-S1	3.25
Iron Ore-S2	2.75
Iron Ore-S3	3.00
Mn Ore-S4	2.60
Mn Ore-S5	2.70
Mn Ore-S6	2.50

Summary of the Bulk Density Test:

Based on the study the bulk density of iron ore and manganese ore is as follows:

Ore Type	Bulk density(T/cum)
Iron ore(+45 % Fe)	3.0
Manganese ore(+10% Mn)	2.6

The copy of the analysis result in geological report attached as**Annexure-- 13**

❖ **Recovery Factor Study:**

A detail recovery factor study has been undertaken for the bore hole samples by a NABL Accredited lab. Based on the study, the recovery factor of iron ore and manganese is as follows:

Sample Details	Grade	Recovery %	Grade	Recovery %
Iron Ore-S1	+45 % Fe to 55% Fe	63	+ 55% Fe	37
Iron Ore-S2	+45 % Fe to 55% Fe	64	+ 55% Fe	36
Iron Ore-S3	+45 % Fe to 55% Fe	67	+ 55% Fe	33
Mn Ore-S1	+10% Mn to 20% Mn	12	+ 20% Mn	88
Mn Ore-S2	+10% Mn to 20% Mn	11	+ 20% Mn	89
Mn Ore-S3	+10% Mn to 20% Mn	13	+ 20% Mn	87

Summary of the Recovery Factor Study:

Based on the study the recovery % of iron ore and manganese ore is as follows:

Ore Type	Recovery %
Iron ore(45 to 55% Fe)	64.67 say 65
Iron ore(+ 55% Fe)	35.33 say 35
Manganese ore (10 to 20% Mn)	12
Manganese ore (+ 20% Mn)	88

The copy of the analysis result in geological report attached as Annexure-- 13

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The details of parameters considered are tabulated below:

Sl. No.	Parameters		Assumptions	
			Iron ore	Mn ore
1	No of Sections		36nos	5nos
2	Length of Influence		100m & 200m	50 to 100m
3	No of bore holes considered		116	60nos
4	Threshold value		+45%Fe	+10%Mn
5	Mineral rejects considered		+45%Fe to -55%Fe	10-20%Mn
6	Cut-off grade		+55% Fe	+20%Mn
7	Bulk Density		3.0 t/m^3	2.6MT/cum
8	Bore Hole Sample	Recovery factor of useable/Saleable Ore	35% w.r.t total ore zone (+55%Fe)	88% w.r.t total ore zone (+20%Mn)
		Recovery factor of mineral reject	65% w.r.t total ore zone (45-55%Fe)	12% of total ore zone (10-20%Mn)
9	No of bore holes considered for resource estimation		116	60
10	Maximum depth of the borehole		108m	108m
11	Minimum depth of the borehole		27.60m	32.00m

(k) Detail calculation of reserves/resources section wise

The updated resource and reserve calculated as on 010.07.2020 have been furnished as below:

Measured Resource (331)

CS	CS Area in m²	Length of Influence (m)	Volume in m³	Volume of ore @ 34% (m3)	Total Quantity of ore @ 2.6 T/m³	Quantity (T) +20% Mn @ 88%	Quantity (T) +10 to 20% Mn @12%
500	2167	50	108350	36839	95761.4	84267.632	11493.768
800	759.25	50	37912.5	12890.25	33514.65	29492.892	4021.758
2300	259.9	50	12995	4418.3	11487.58	10108.0704	1379.5096
2100	709.5	50	35475	12061.5	31359.9	27596.712	3763.188
2200	345.2	50	17260	5868.4	15257.9	13380.776	1871.824
Total	5143.15		211907.5	72048.55	187326.23	164912.9954	22479.1476

Indicated Resource(332)

CS	CS area in m²	Length of Influence (m)	Volume in m³	Volume of ore @ 34% (m3)	Quantity of ore @ 2.6 T/m3	Quantity (T) +20% Mn @ 88%	Quantity (T) +10 to 20% Mn 12%
300	312.1	50	15,605	5,305.70	13794.82		
400	244.2	50	12,210	4,151.40	10793.64	9498.4	1295.24
800	129.3	50	6,465	2,198.10	5715.06	5029.25	685.81
900	1,196.90	50	59,845	20,347.30	52902.98	46554.62	6348.36
1200	79.4	50	3,970	1,349.80	3509.48	3088.34	421.14
1500	1,213.30	50	60,665	20,626.10	53627.86	47192.52	6435.34
1600	581	50	29,050	9,877.00	25680.2	22598.58	3081.62
1700	452.1	50	22,605	7,685.70	19982.82	17584.88	2397.94
1900	48.5	50	2,425	824.5	2143.7	1886.46	257.24
2000	252.2	50	12,610	4,287.40	11147.24	9809.57	1337.67
2100	1 726.10	50	86,305	29,343.70	76293.62	67138.39	9155.23
2200	2,192.00	50	1,09,600	37,264.00	96886.4	85260.03	11626.37
2300	1,469.90	50	74,495	25,328.30	65853.58	57951.15	7902.43
2400	697	50	34,850	11,849.00	30807.4	27110.51	3696.89

BHABAGRAHI MAHAPATRA
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2500	519.3	50	25,965	8,828.10	22953.06	20190.69	54
2600	410.1	50	20,505	6,971.70	18126.42	15951.25	75
2700	140.7	50	7,035	2,391.90	6219.94	5472.67	46.25
2900	303.1	50	15,155	5,152.70	13397.02	11789.38	1107.64
3200	135.6	50	6,780	2,305.20	5993.52	5274.3	719.32
3300	187.5	50	9,375	3,187.50	8287.5	7293	994.5
Total	12,310.30		6,15,515	209275.1	544115.26	478821.43	65293.83

Summarized Statement of Resource

Category of Resource	Saleable ore (MT) (+20%Mn)	Mineral Rejects (MT) (10-20%Mn)	Total ROM (MT)
Measured (331)	164912.9954	22479.1476	187392.143
Indicated (332)	478821.43	65293.83	544115.26
Total	**643668.5124**	**87772.9776**	**731507.403**

Mineable Reserve

Mineable reserve has been estimated under proved (111) and probable(122) category.The details of calculation of Mineable Reserve are furnished below

Proved Reserve (111)

CS	CS Area in m²	Length of Influence	Volume in m³	Volume of ore@ 34% (m3)	Total Quantity of ore @ 2.6 T/m3	Quantity (T) +20% Mn @ 88%	Quantity (T) +10 to 20% Mn @12%
500	1577	50	78850	26809	69703.4	61339.992	8364.408
600	758.25	50	37912.5	12890.25	33514.65	29492.892	4021.758
2000	259.9	50	12995	4418.3	11487.58	10109.0704	1378.5096
2100	709.5	50	35475	12061.5	31359.9	27596.712	3763.188
2200	345.2	50	17260	5868.4	15257.9	13426.949	1831.924
Total	**3649.85**		**182492.5**	**62047.55**	**161323**	**141964.618**	**19350**

Probable (122)

CS	CS area in m²	Length of Influence(m)	Volume in m³	Volume of ore @ 34% (m3)	Quantity of ore @ 2.6 T/m3	Quantity (T) +20% Mn @ 88%	Quantity (T) +10 to 20% Mn 12%
300	312.1	50	15605	5305.7	13795	12139	1656
400	244.2	50	12210	4151.4	10794	9498	1296
800	129.3	50	6465	2198.1	5715	5029	686
900	236.9	50	11845	4027.3	10471	9214	1257
1200	79.4	50	3970	1349.8	3509	3088	421
1500	1213.3	50	60665	20626.1	53628	47193	6435
1600	551	50	29050	9877	25680	22599	3082
1700	452.1	50	22605	7685.7	19983	17585	2398
1900	48.5	50	2425	824.5	2144	1886	257
2000	252.2	50	12610	4287.4	11147	9810	1338
2100	1726.1	50	86305	29343.7	76294	67138	9155
2200	2192	50	109600	37264	96886	85260	11626
2300	1469.9	50	74495	25328.3	65854	57951	7902
2400	697	50	34850	11849	30807	27111	3697
2500	317.3	50	15865	5394.1	14026	12342	1683
2600	360.1	50	18005	6121.7	15916	14006	1910
2700	140.7	50	7035	2391.9	6219	5473	746
2900	119.1	50	5955	2024.7	5264	4633	632
3200	135.6	50	6780	2305.2	5994	5274	719
3300	187.5	50	9375	3187.5	8288	7293	995
Total	**12310.3**		**545715**	**185543.1**	**482412.06**	**424523**	**57889**

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Summarized Statement of Mineable Reserve

Category of Resource	Saleable ore (MT) (+20%Mn)	Mineral Rejects (MT) (10-20%Mn)	Total ROM (MT)
Proved Reserve (111)	141965	19350	161314
Probable Reserve (122)	424523	57889	482412
Total	**566488**	**77239**	**643726**

Non-Mineable Resource
Feasibility Mineral Resource (211)

CS	CS Area in m²	Length of Influence	Volume in m³	Volume of ore@ 34% (m3)	Total Quantity of ore @ 2.6 T/m3	Quantity (T) +20% Mn @ 88%	Quantity (T) +10 to 20% Mn @12%
500	590	50	29500	10030	26078	22948.64	3129.36
600	0	50	0	0	0	0	0
2000	0	50	0	0	0	0	0
2100	0	50	0	0	0	0	0
2200	0	50	0	0	0	0	0
Total	**590**		**29500**	**10030**	**26078**	**22948.64**	**3129.36**

Pre-Feasibility Mineral Resource (222)

CS	CS area in m²	Length of Influence(m)	Volume in m³	Volume of ore @ 34% (m3)	Quantity of ore @ 2.6 T/m3	Quantity (T) +20% Mn @ 88%	Quantity (T) +10 to 20% Mn 12%
300	0	50	0	0	0	0	0
400	0	50	0	0	0	0	0
800	0	50	0	0	0	0	0
900	960	50	48000	16320	42432	37340.16	5091.84
1200	0	50	0	0	0	0	0
1500	0	50	0	0	0	0	0
1600	0	50	0	0	0	0	0
1700	0	50	0	0	0	0	0
1900	0	50	0	0	0	0	0
2000	0	50	0	0	0	0	0
2100	0	50	0	0	0	0	0
2200	0	50	0	0	0	0	0
2300	0	50	0	0	0	0	0
2400	0	50	0	0	0	0	0
2500	202	50	10100	3434	8926.4	7056.992	1071.408
2600	50	50	2500	850	2210	1944.8	265.2
2700	0	50	0	0	0	0	0
2900	184	50	9200	3128	8132.8	7156.864	975.936
3200	0	50	0	0	0	0	0
3300	0	50	0	0	0	0	0
Total	12310.3		69800	23732	61703	54299	7404

Summarized Statement of Non-Mineable Resource

Category of Resource	Saleable ore (MT) (+20%Mn)	Mineral Rejects (MT) (10-20%Mn)	Total ROM (MT)
Feasibility Resource (211)	22949	3129	26078
Pre- Feasibility Resource (222)	54299	7404	61703
Total	**77248**	**10533**	**87781**

Iron ore
Indicated Resources (332)

Name of the section	Cross sectional Area (m²)	Length of Influence (m)	Volume of ore Zone (m³)	Volume of ore @ 58% recovery	Quantity of ore @ 3T/Cum	Qnantity (T) (+45 to 55%Fe)	Quantity(T) (+55%Fe)
3500 CS	108	100	10800	6264	18792	12214.8	6577.2
3400 CS	3861	100	386100	223938	671814	436679.1	235134.9
3300 CS	6271	100	627100	363718	1091154	709250.1	381903.9
3200 CS	4362	100	436200	252996	758988	493342.2	265645.8
3100 CS	2262	100	226200	131196	393588	255832.2	137755.8

DHANANJAY CHOPATRA
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3000 CS	3944	100	394400	228752	686256	[illegible]	[illegible]
2900 CS	1983	100	198300	115014	345042	[illegible]	[illegible]
2800 CS	7079	100	707900	410582	1231746	[illegible]	[illegible]
2700 CS	4383	100	438300	254214	762642	[illegible]	[illegible]
2600 CS	570	100	57000	33524	100572	[illegible]	[illegible]
2500 CS	831	100	83100	48198	144594	93986.1	[illegible]
2400 CS	1441	100	144100	83578	250734	162977.1	87756.9
2300 CS	3523	100	352300	204334	613002	398451.3	214550.7
2200 CS	11414	100	1141400	662012	1986036	1290923.4	695112.6
2100 CS	9321	100	932100	540618	1621854	1054205.1	567648.9
2000 CS	7600	100	760000	452400	1357200	882180	475020
1900 CS	627	100	62700	36366	109098	70913.7	38184.3
1800 CS	1332	100	133200	77256	231768	150649.2	81118.8
1700 CS	4555	100	455500	264190	792570	515170.5	277399.5
1600 CS	3407	100	340700	197606	592818	385331.7	207486.3
1500 CS	10032	100	1003200	581856	1745568	1134619.2	610948.8
1400 CS	3604	100	360400	220632	661896	430232.4	231663.6
1300 CS	2906	100	290600	168548	505644	328608.6	176975.4
1200 CS	5668	100	566800	328744	986232	641050.8	345181.2
1100 CS	7061	100	706100	409538	1228614	798599.1	430014.9
1000 CS	4457	100	445700	258506	775518	504086.7	271431.3
900 CS	3946	100	394600	228868	686604	446292.6	240311.4
800 CS	0	100	0	0	0	0	0
700 CS	0	100	0	0	0	0	0
600 CS	8023	100	802300	465334	1396002	907401.3	488600.7
500 CS	12788	100	1278800	741704	2225112	1446322.8	778789.2
400 CS	21504	100	2150400	1247232	3741696	2432102.4	1309593.6
300 CS	9712	100	971200	563296	1689888	1098427.2	591460.8
200 CS	10738	100	1073800	622804	1868412	1214467.8	653944.2
100 CS	8868	100	886800	514344	1543032	1002970.8	540061.2
Total Resources			**18858900**	**10938162**	**32814486**	**21329415.9**	**11485070.1**

Summarized Statement of Resource

Category of Resource	Saleable ore (MT) (+55%Fe)	Mineral Rejects (MT) (45-55%Fe)	Total ROM (MT)
Indicated (332)	21329415.9	11485070.1	32814486

Mineable Reserve

Probable Reserve (122)

Name of the section	Cross sectional Area (m^2)	Length of influence (m)	Volume of ore Zone (m^3)	Volume of ore @ 58% recovery	Quantity of ore @ 3T/Cum	Quantity (T) (+45 to 55%Fe)	Quantity(T) (+55%Fe)
3500 CS	108	100	10800	6264	18792	12214.8	6577.2
3400 CS	3674	100	367400	213092	639276	415529.4	223746.6
3300 CS	6101	100	610100	353858	1061574	690023.1	371550.9
3200 CS	4362	100	436200	252996	758988	493342.2	265645.8
3100 CS	2262	100	226200	131196	393588	255832.2	137755.8
3000 CS	3944	100	394400	228752	686256	446066.4	240189.6
2900 CS	883	100	88300	51214	153642	99867.3	53774.7
2800 CS	3079	100	307900	178582	535746	348234.9	187511.1
2700 CS	4143	100	414300	240294	720882	468573.3	252308.7
2600 CS	365	100	36500	21170	63510	41281.5	22228.5
2500 CS	551	100	55100	31958	95874	62318.1	33555.9
2400 CS	1441	100	144100	83578	250734	162977.1	87756.9
2300 CS	3523	100	352300	204334	613002	398451.3	214550.7
2200 CS	10914	100	1091400	633012	1899036	1234373.4	664662.6
2100 CS	8869	100	886900	514402	1543206	1003083.9	540122.1
2000 CS	7750	100	775000	449500	1348500	876525	471975
1900 CS	627	100	62700	36366	109098	70913.7	38184.3
1800 CS	1152	100	115200	66556	205668	133684.2	71983.8
1700 CS	3885	100	388500	225330	675990	439393.5	236596.5

BHARAGRAM MOHAPATRA
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1600 CS	3407	100	340700	197606	592818	385331.7	[illegible]
1500 CS	9332	100	933200	541256	1623768	1055449.2	[illegible]
1400 CS	3604	100	360400	220632	661896	430232.4	2[illegible]
1300 CS	2906	100	290600	168548	505644	328668.6	176975.4
1200 CS	4660	100	466000	282344	847032	550570.8	296461.2
1100 CS	6461	100	646100	374738	1124214	730739.1	393474.9
1000 CS	3157	100	315700	183106	549318	357056.7	192261.3
900 CS	2246	100	224600	130268	390804	254022.6	136781.4
800 CS	0	100	0	0	0	0	0
700 CS	0	100	0	0	0	0	0
600 CS	7123	100	712300	413134	1239402	805611.3	433790.7
500 CS	9154	100	915400	530932	1592796	1035317.4	557478.6
400 CS	18018	100	1801800	1045044	3135132	2037835.8	1097296.2
300 CS	5845	100	584500	339184	1017552	661408.8	356143.2
200 CS	3136	100	313600	181888	545664	354681.6	190982.4
100 CS	6904	100	690400	394632	1183896	769532.4	414363.6
Total Resources			15392700	8927766	26783298	17409143.7	9374154.3

Summarized Statement of Mineable Reserve

Category of Resource	Saleable ore (MT) (+55%Fe)	Mineral Rejects (MT) (45-55%Fe)	Total ROM (MT)
Probable Reserve (122)	17409143.7	9374154.3	26783298

Summarized Statement of Non- Mineable Reserve

Name of the section	Cross sectional Area (m2)	Length of Influence (m)	Volume of ore Zone (m3)	Volume of ore @ 58% recovery	Quantity of ore @ 3T/Cum	Quantity (T) (+45 to 55%Fe)	Quantity(T) (+55%Fe)
3500 CS	0	100	0	0	0	0	0
3400 CS	187	100	18700	10846	32538	21149.7	11388.3
3300 CS	170	100	17000	9860	29580	19227	10353
3200 CS	0	100	0	0	0	0	0
3100 CS	0	100	0	0	0	0	0
3000 CS	0	100	0	0	0	0	0
2900 CS	100	100	10000	5800	17400	11310	6090
2800 CS	400	100	40000	23200	69600	45240	24360
2700 CS	240	100	24000	13920	41760	27144	14616
2600 CS	213	100	21300	12354	37062	24090.3	12971.7
2500 CS	280	100	28000	16240	48720	31668	17052
2400 CS	0	100	0	0	0	0	0
2300 CS	0	100	0	0	0	0	0
2200 CS	500	100	50000	29000	87000	56550	30450
2100 CS	452	100	45200	26216	78648	51121.2	27526.8
2000 CS	50	100	5000	2900	8700	5655	3045
1900 CS	0	100	0	0	0	0	0
1800 CS	150	100	15000	8700	26100	16965	9135
1700 CS	670	100	67000	38860	116580	75777	40803
1600 CS	0	100	0	0	0	0	0
1500 CS	700	100	70000	40600	121800	79170	42630
1400 CS	0	100	0	0	0	0	0
1300 CS	0	100	0	0	0	0	0
1200 CS	800	100	80000	46400	139200	90480	48720
1100 CS	600	100	60000	34800	104400	67860	36540
1000 CS	1300	100	130000	75400	226200	147030	79170
900 CS	1700	100	170000	98600	295800	192270	103530
800 CS	0	100	0	0	0	0	0
700 CS	0	100	0	0	0	0	0
600 CS	900	100	90000	52200	156600	101790	54810
500 CS	3634	100	363400	210772	632316	411005.4	221310.6
400 CS	3480	100	348000	202188	606564	394266.6	212297.4
300 CS	3964	100	396400	229912	689736	448318.4	241417.6
200 CS	7602	100	760200	440916	1322748	859786.2	462961.8
100 CS	2051	100	205100	118958	356874	232028.1	124845.9
Total Resources			3466200	2010396	6031188	3920272.2	2110915.8

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Summarized Statement of Non-Mineable Resource

Category of Resource	Saleable ore (MT) (+55%Fe)	Mineral Rejects (MT) (45-55%Fe)	Total (MT)
Pre- Feasibility Resource (222)	3920272.2	2110915.8	6031188

(I) Mineral Reserves/ Resources:

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

Level of Exploration	Resources of Mn ore in tonne	Grade	Resources of Iron ore in tonne	Grade
G1-Detail Exploration	187392.143	+10%Mn	–	+45%Fe
G2-General Exploration	544115.26		32814486	
G3-Prospecting	–		–	
G4- Reconnaissance	–		–	
Total	731507.403		32814486	

Final Reserve & Grade as per United Nations Framework Classification :(As on 10.07.2020)

Reserve/ resources	Type	UNFC Code	Saleable ore (MT) (+20%Mn)	Mineral Rejects (MT) (10-20%Mn)	Manganese ore (t)	Saleable ore (MT) (+55%Fe)	Mineral Rejects (MT) (45-55%Fe)	Iron ore(t
Reserves	Proved	111	141965	19350	161315			–
	Probable	121			–			–
		122	424523	57889	482412	17409144	9374154	26783298
Sub-Total (a)	—	---	**566488**	**77239**	**643727**	17409144	9374154	**26783298**
Remaining resources	Feasibility	211	22949	3129	26078			–
	Pre-feasibility	221	54299	7404	61703			–
		222			–	3920272	2110916	6031188
	Measured	331			–			
	Indicated	332			–			
	Inferred	333			–			
	Reconnaissance	---			–			
Sub-Total(b)	—	---	77248	10533	87781	3920272	2110916	6031188
Total(a+ b)	—		643736	87772	731508	21329416	11485070	32814486

As per the UNFC guide line a feasibility Study report is enclosed as Annexure - 14

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.

6.6.5Justifications for Economical axis as per MEMC Rules'2015 (In terms of Item no. 17, 18 & 19 of Part-I)

Ref Geological Report attached as Annexure 13

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JUSTIFICATION OF UNFC

Under UNFC, the reserves have been categorized by attributing 3-digit codes of (E) economic axis, (F) feasibility axis and (G) geological axis. The key parameter considered for mineral resource estimation under the axes of UNFC are (a) Exploration already done (drilling & analysis of ore samples), (b) Reserves updated as on date, (c) Processing technique adopted/to be adopted for saleable ore, (d) Approval of mining plan/scheme of mining with PMCP, (e) Forest Clearance, (f) Environmental Clearance and (g) Prevailing cost of mining/tonne of ore and sale value.

Economic Axis	Feasibility Axis	Geological Axis	Code
E1 (Economic)	**F1 (Feasibility Study)**	**G1(Detailed exploration)**	
1. **Exploration** Total 253 boreholes along with existing quarries within the lease area were taken into consideration for estimation of resources under G1 categories. The depth of the bore hole where the mineralization ends was considered as the depth of measured ore zone (G1). However, the thickness of the ore body is variable from section to section. The geological map has been prepared on a scale of 1:2000.Based on the borehole data, existing quarries and surface geology, measured resource was estimated. The depth of the bore hole where the mineralization ends has been considered as the depth of measured ore zone (G1). **2. Mining report/mining plan/ working mines.** Mining plan and subsequent Scheme of Mining has been approved by Indian Bureau of Mines, GOI time to time for working the mines systematically and scientifically. **3. Specific knowledge of forest/non-forest and other land use data.** Land schedule of total ML area over 390.317Hs is already exists. **4.Cost Benefit Analysis** Cost analysis has been carried out in the feasibility study report. (Ref Annexure-	Geological information has been detailed. Part of the ML area has been explored in detail through bore hole and by exposures in the existing quarry. The level of exploration in this part is high and hence falls under G1 category. Feasibility study has been undertaken based on the following factors: 1. **Mining:** As the mining operation is going on within the lease area, details of method of Mining, Bench parameter, deployment of machineries, employment of man power, development of infrastructure etc has already been established within the lease. 2. **Processing:** Detail screen tests on the ROM ores from the mine have been done which has indicated its amenability to segregate the mineral in different sizes. Crusher and screening plants have been established within the ML area based on the existing production capacity and characteristic of ore body. 3.**Costing:** Cost analysis has been carried out in the feasibility study report. (Ref Annexure-16) **4.0Statutory Clearances** i. **Mining Plan/Scheme:** The Mining Plan under Rule 22 of MCR 1960 has been approved by IBM. Subsequently, the scheme of Mining has been approved under Rule 12 of MCDR 1988 in favor of earlier lessee. 2. **Forest Clearance** As per the memo no-2809/6F, dated 29.03.2016 of the DFO, Bonai, the forest area within the mining lease comes to 377.563 as against 340.332 Ha of forest land as per the approval DP. The NPV of the additional forest area was paid on 30.03.2016 through RTGS. The lessee has obtained forest clearance over an area of 227.00Ha on 18.08.2008 vide MoEF letter No F.No.8 – 93/2004-FC.The copy of the forest clearance is enclosed as Annexure-7. ii. Environment Clearance The Ministry of Environment and Forest has granted the Environmental Clearance for the production capacity of 0.040MTPA Manganese	Geological plan has been prepared showing the detailed topographical cum geological details including surface features, extent of deposit, location of borehole etc on a scale of 1:2000. Geological sections have been prepared based on the borehole data and mine development on a scale of 1:2000. Samples collected from the boreholes have been analyzed by NABL Accredited Lab. Total 253 boreholes along with existing quarries within the lease area were taken into consideration for estimation of resources under G1 categories. The data from these bore holes have been considered for the preparation of geological map. Based on these drilled borehole data and existing quarries, measured resource has been estimated. The depth of the bore hole where the mineralization ends has been considered as the depth of measured ore zone (G1). However, the thickness of the ore body is variable from section to section. Further, a lateral influence of 50m from both sides of the quarry edges or bore hole is considered for estimation of the resource/ reserve.	111

B. ROADCHANDRA PATRA
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16) Therefore, the reserve of iron ore has been kept under E1 category.	ore vides the letter No-J-11015/412/2005-IA.II (M) dated 5.04.2007. The copy of the Environmental Clearance is enclosed as Annexure-5. Therefore mineable reserve from the measured resource has been kept under F1 Axis.		
E1 (Economic)	**F2 (Feasibility Study)**	**G2 (Detailed exploration)**	**Code**
1. Exploration Total 253 boreholes along with existing quarries within the lease area were taken into consideration for estimation of resources under G1 categories. The depth of the bore hole where the mineralization ends; was considered as the depth of measured ore zone (G1). However, the thickness of the ore body is variable from section to section. The geological map has been prepared on a scale of 1:2000.Based on the borehole data, existing quarries and surface geology, measured resource was estimated. The depth of the bore hole where the mineralization ends has been considered as the depth of measured ore zone (G1). **2.Mining report/mining plan/ working mines.** Mining plan and subsequent Scheme of Mining has been approved by Indian Bureau of Mines, GOI time to time for working the mines systematically and scientifically. **3.Specific knowledge of forest/non-forest and other land use data.** Land schedule of total ML area over 390.317Ha is already exists. **5.Cost Benefit Analysis** Cost analysis has been carried out in the feasibility study report. (Ref Annexure-16) Therefore, the reserve of iron ore has been kept under	Geological information has been detailed. Part of the ML area has been explored in detail through bore hole and by exposures in the existing quarry. The level of exploration in this part is moderate and hence falls under G2 category. 1. **Mining:** As the mining operation is going on within the lease area, details of method of Mining, Bench parameter, deployment of machineries, employment of man power, development of infrastructure etc has already been established within the lease. **2. Processing:** Detail screen tests on the ROM ores from the mine have been done which has indicated its amenability to segregate the mineral in different sizes. Crusher and screening plants have been established within the ML area based on the existing production capacity and characteristic of ore body. **3.Costing:** Cost analyses has been carried out in the feasibility study report. (Ref Annexure-16) **4. 0Statutory Clearances** **iii. Mining Plan/Scheme:** The Mining Plan under Rule 22 of MCR 1960 has been approved by IBM. Subsequently, the scheme of Mining has been approved under Rule 12 of MCDR 1988 in favor of earlier lessee. **3. Forest Clearance** As per the memo no-2809/6F, dated 29.03.2016 of the DFO, Bonai, the forest area within the mining lease comes to 377.563 as against 340.332 Ha of forest land as per the approval OP. The NPV of the additional forest area was paid on 30.03.2016 through RTGS. The lessee has obtained forest clearance over an area of 227.00Ha on 18.08.2008 vide MoEF letter No – F.No.8 93/2004-FC.The copy of the forest clearance is enclosed as Annexure-7. iv. Environment Clearance The Ministry of Environment and Forest has granted the Environmental Clearance for the production capacity of 0.040MTPA Manganese ore vides the letter No-J-11015/412/2005-IA.II (M) dated 5.04.2007. The copy of the Environmental Clearance is enclosed as	Geological plan has been prepared showing the detailed topographical -cum-geological details including surface features, extent of deposit, location of borehole etc. Geological sections have been prepared based on the borehole data and mine development. Samples collected from the boreholes have been analyzed by NABL Accredited Lab. About 253 bore holes have been considered for indicated category.. The bore holes within manganese ore zone are drilled at 50 x 50m/ 100m x 100m grid interval whereas bore holes within iron ore zone are drilled at 200m x 200m grid interval. About 100m influence on either side of bore holes have been taken in iron ore zone to make resource assessment under indicated category. Similarly 50m influence have been taken on either side of bore holes in Manganese ore zone to make assessment of Manganese ore resources under Indicated(G2) category. The geological map has been prepared on a scale of 1:2000. Based on these drilled borehole data and existing quarries, measured resource has been estimated. The depth of the bore hole where the mineralization ends has been considered as the depth of measured ore zone (G1). However, the thickness of the ore body is variable from section to section. Further, a lateral influence of 50m from both sides of the proved limit is considered for	122

BHAGABAN JAGATAPATRA
QUALIFIED PERSON

E1category.	Annexure-8. Therefore mineable reserve from the Indicated resource has been kept under F2 Axis.	estimation of the resource/reserve.
E2 (Intrinsically Economic)	**F1 (Feasibility Study)**	**G1 (Detailed exploration)**
The blocked ore within the safety zone, ultimate pit slope cannot be mined out. Hence, the reserve of this category has been kept under the E2 category of UNFC norms.	Geological information has been detailed. Part of the ML area has been explored in detail through bore hole and by exposures in the existing quarry. The level of exploration in this part is high and hence falls under G1 category. Feasibility study has been undertaken based on the following factors: 1. Mining: As the mining operation is going on within the lease area, details of method of Mining, Bench parameter, deployment of machineries, employment of man power, development of infrastructure etc has already been established within the lease. 2. Processing: Detail screen tests on the ROM ores from the mine have been done which has indicated its amenability to segregate the mineral in different sizes. Crusher and screening plants have been established within the ML area based on the existing production capacity and characteristic of ore body. 3.Costing: Cost analysis has been carried out in the feasibility study report.(Ref Annexure-16) 40Statutory Clearances v. Mining Plan/Scheme: The Mining Plan under Rule 22 of MCR 1960 has been approved by IBM. Subsequently, the scheme of Mining has been approved under Rule 12 of MCDR 1988 in favor of earlier lessee. 4. Forest Clearance As per the memo no-2809/61 , dated 29.03.2016 of the DFO, Bonai, the forest area within the mining lease comes to 377.563 as against 340.332 Ha of forest land as per the approval DP. The NPV of the additional forest area was paid on 30.03.2016 through RTGS. The lessee has obtained forest clearance over an area of 227.00Ha on 15.08.2008 vide MoEF letter No – F.No 8 93/2004-FC.The copy of the forest clearance is enclosed as Annexure-7. vi. Environment Clearance The Ministry of Environment and Forest has granted the Environmental Clearance for the production capacity of 0.040MTPA Manganese ore vides the letter No-J-11015/412/2005-IA.II (M) dated 5.04.2007. The copy of the Environmental Clearance is enclosed as Annexure-8. Therefore mineable reserve from the measured resource has been kept under F1 Axis.	Geological plan has been prepared showing the detailed topographical cum geological details including surface features, extent of deposit, location of borehole etc on a scale of 1:2000. Geological sections have been prepared based on the borehole data and mine development on a scale of 1:2000. Samples collected from the boreholes have been analyzed by NABL Accredited Lab. About 253 bore holes have been considered for indicated category. The bore holes within manganese ore zone are drilled at 50 x 50m/ 100m x 100m grid interval whereas bore holes within iron ore zone are drilled at 200m x 200m grid interval. About 100m influence on either side of bore holes have been taken in iron ore zone to make resource assessment under indicated category. Similarly 50m influence have been taken on either side of bore holes in Manganese ore zone to make assessment of Manganese ore resources under Indicated(G2) category. The geological map has been prepared on a scale of 1:2000. Based on these drilled borehole data and existing quarries, measured resource has been estimated. The depth of the bore hole where the mineralization ends has been considered as the depth of measured ore zone (G1). However, the thickness of the ore body is variable from section to section. Further, a lateral influence of 50m from both sides of the proved limit is considered for estimation of the resource/reserve.

BHABAGRAHI MOHAPATRA
QUALIFIED PERSON

Economic Axis(E2)	Feasibility Axis(F2)	Geological Axis(G2)
The blocked ore within the safety zone, ultimate pit slope cannot be mined out. Hence, the reserve of this category has been kept under the E2 category of UNFC norms.	Geological information has been detailed. Part of the ML area has been explored in detail through bore hole and by exposures in the existing quarry. The level of exploration in this part is moderate and hence falls under G2 category. 1. **Mining:** As the mining operation is going on within the lease area, details of method of Mining, Bench parameter, deployment of machineries, employment of man power, development of infrastructure etc has already been established within the lease. 2. **Processing:** Detail screen tests on the ROM ores from the mine have been done which has indicated its amenability to segregate the mineral in different sizes. Crusher and screening plants have been established within the ML area based on the existing production capacity and characteristic of ore body. 3. **Costing:** Cost analysis has been carried out in the feasibility study report. (Ref Annexure-16) **4. 40Statutory Clearances** **vii.Mining Plan/Scheme:** The Mining Plan under Rule 22 of MCR 1960 has been approved by IBM. Subsequently, the scheme of Mining has been approved under Rule 12 of MCDR 1958 in favor of earlier lessee. 5. **Forest Clearance** As per the memo no-2809/6F, dated 29.03.2016 of the DFO, Bonai, the forest area within the mining lease comes to 377.563 as against 340.332 Ha of forest land as per the approval DF. The NPV of the additional forest area was paid on 30.03.2016 through RTGS. The lessee has obtained forest clearance over an area of 227.00Ha on 18.08.2008 vide MoEF letter No – F.No.8 – 93/2004-FC.The copy of the forest clearance is enclosed as Annexure-7. vii. Environment Clearance: The Ministry of Environment and Forest has granted the Environmental Clearance for the production capacity of 0.040MTPA Manganese ore vides the letter No-J-11015/412/2005-IA.II (M) dated 5.04.2007. The copy of the Environmental Clearance is enclosed as Annexure-8. Therefore mineable reserve from the indicated resource has been kept under F2 Axis.	Geological plan has been prepared showing the detailed topographical-cum-geological details including surface features, extent of deposit, location of borehole etc. Geological sections have been prepared based on the borehole data and mine development. Samples collected from the boreholes have been analyzed by NABL Accredited Lab. About 253 bore holes have been considered for indicated category. The bore holes within manganese ore zone are drilled at 50 x 50m/ 100m x 100m grid interval whereas bore holes within iron ore zone are drilled at 200m x 200m grid interval. About 100m influence on either side of bore holes have been taken in iron ore zone to make resource assessment under indicated category. Similarly 50m influence have been taken on either side of bore holes in Manganese ore zone to make assessment of Manganese ore resources under indicated(G2) category. The geological map has been prepared on a scale of 1:2000. Based on these drilled borehole data and existing quarries, measured resource has been estimated. The depth of the bore hole where the mineralization ends has been considered as the depth of measured ore zone (G2). However, the thickness of the ore body is variable from section to section. Further, a lateral influence of 50m from both sides of the proved limit is considered for estimation of the resources/reserve.

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CHAPTER-II

2.0 MINING

Open cast mining

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

2.1.1Existing method of mining:

Earlier the mine was operated by M/s AMTC for Manganese ore. It was A- category mines and operated by other than fully mechanized Method in two shift basis.The details of salient description of existing method of mining undertaken by previous lessee are furnished below:

Salient description of Present Mining Methods(As per Approved Scheme of Mining)

		Description
SlNo	**Salient features**	**Manganese ore**
1)	Method of Mining	Fully Mechanized (FM)
2)	Targeted production capacity	40000 MT
3)	Type of ore	Pyrolusite, psilomelane etc.
4)	Deployment of machineries	DTH drills with associated compressors,excavator-0.9cum, dumper 10-20t etc
5)	Bench height and width	6m / 10m
6)	Stripping ratio (t/m3) (Ore: OB)	1: 5.17 to 1 : 10.09
7)	Over all slope	31°
8)	Transportation ore to the stacking yard	Through dumper & tippers
9)	Nature of overburden	Generally soft and consists of shales, and Laterites
10)	Blasting proposal	Deep hole blasting is carried on to dislodge the boulders.
11)	Mineral beneficiation	Manually sorting and sizing

2.1.2 Details of the Existing Quarry

A total of 15 quarries are opened in the lease area in all 4 blocks. So far, 4 quarries have been developed in Nandagira Block, 3 quarries in Rajabasa Block, 6 quarries in Mahulsukha Block and 2 quarries in Loharcangar Block. Quarry-1 & Quarry-3 in Mahulsukha block and Quarry-1N in Nandagira block has been developed adequately. Presently, quarry-1N is under active operation & Quarry-3 is exhausted. The details of the existing quarries with respect to length, breadth and maximum depth are given as follows:

Sl. No.	Name of Quarry	Name of Block	Avg.Length (m)	Avg. width (m)	Area Utilized (m^2)	Grid Reference
1	Q-5	Nandagira	180	60	10800	2411264-2411452 & 308604-3308721
2	Q-5 top	-do-	116	40	4640	2410580-2410689 & 308246-308371
3	Q-1N	-do-	420	185	77700	2410742-2411062 & 308299-308656
4	Q-8	-do-	74	25	1850	2410189-2410253 & 307794-307844
Total	—	—	—	—	**94,990**	
1	Q-6	Rajabasa	100	75	7500	2411485-2411555 & 307361-307451
2	Q-6A	-do-	150	60	9000	2411876-2412006 & 307874-308024
3	Q-6B & 6C	-do-	160	55	8800	2411920-2412040 & 308369-308518
Total	—	—	—	—	**25,300**	
1	Q-1	Mahulsukha	450	160	72000	2411856-2412353 & 307316-307517
2	Q-3	-do-	420	130	54600	2411976-2412384 & 307535-307640
3	Q-7	-do-	100	30	3000	2412322-2412436 & 307796-307854
4	Q-7B	-do-	80	22	1760	2412300-2412386 & 307725-307772
5	Q-2	-do-	140	60	8400	2412581-2412728 & 307372-307465
6	Q-2A	-do-	140	40	5600	2412381-2412526 & 307350-307430
Total	—	—	—	—	**145,360**	

BHAGABAN MOHAPATRA
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1	Q-4	Lohandagar	116	45	5220	2413322-2413[illegible]
2	Q-4A	-do-	40	30	1200	2413375-2413[illegible]
Total	—	—	—	---	6,420	
Grand Total	—	—	—	---	272,070	

2.1.3 The Details of the Existing Dumps

Number of Dumps	OB/ Waste		Grid Reference
	Area (ha)	Status	
1	6.3	Dead	2412330-2412710 and 307415-307640
2	0.7	Dead	2412105-2412275 and 3017240 - 307335
3	4.9	Dead	2411780 – 2412350 and 307400-307750
4	7.005	Active	2410970 – 2411450 and 308660-308940
5	0.54	Dead	2410570 – 2410595 and 308360-308440
6	0.304	Dead	24101025 – 2410110 and 308360-308470
Total	19.749		

3.0 PROPOSED METHOD OF MINING:

On account of exposures of iron ore as well as manganese ore and its limited depth of occurrence, opencast mechanized method of mining will continue on three shift basis with the deployment of drills, associated compressors, dumpers/tippers, excavators and other auxiliary equipment for development, production, processing, protection of environment and safety. As per the MCDR, 2017, the mine comes under Category -A (Fully Mechanized) Mine.

Selection of area for development

As per the Geological Report, iron ore occurs at south western part of the block. Hence, it has been planned to produce iron ore from this proposed area only. Production of iron ore will be obtained from 3rd year onwards. During 1st and 2nd year, pre-mining development work will be carried out to start the mining operation. In addition to iron ore manganese ore will be produced from Nandagira, and Mahulsukha (Quarry-1) to obtain the targeted production.

Strategy For Development:

In the approved Mining Plan,Nandagirapilwas proposed to be developed to produce @ 0.04 million tons of manganese ore (ROM) per annum. However, after allotment of block to the new lessee, M/s Patnaik Mineral PvtLtd,Iron ore has been included within the block. Hence it has been planned to produce both iron and manganese ore during plan period. During plan period, production of iron ore will be obtained @ 1.00MTPA which will be achieved from 3rd year onwards. Similarly, manganese ore will be produced @ 0.150MTPA which will be obtained during the 5th year of plan period.

To obtain the production @1.0MTPA of iron ore per annum during plan period it has been envisaged to make a new pit in south western part of the lease area. During plan period, Nandagira quarry, and Quarry-1 has been selected for development to obtain the production of manganese ore @ 0.150MTPA. The height and width of the benches for iron ore and manganese ore will be kept at 6m and 9m respectively.

BHABAGRAHI BHOPATRA
QUALIFIED PERSON

Haul Road:

The layout of roads for haulage of ore/ waste and access to different installation in the mine will be developed complying with the statutory regulations stipulated in the Metalliferous Mines Regulations, 1961. Waste and sub-grade ore /mineral reject will be dispatched to the dumping and stacking sites located in the lease area. Nine meter wide haul road will be developed in the lease area as per need at a gradient up to 1:16. Regular maintenance will be done throughout the mine life to protect the road from damage and vehicles from wear & tear.

Site Services:

As far as day to day mine operation is concerned, the infrastructure such as site office, weigh bridge, rest shed, First-aid Centre, blasting shed, security house, etc. are already made available in the lease area.

Machineries to be deployed.

Drilling and blasting

Drilling is proposed to be done using 115mm diameter drills with 10% sub grade drilling. Blasting will be done by adopting the State of Art technology by using mostly SME (Site Mixed Emulsion Explosives) along with conventional explosives such as PGC, toe blast. Controlled blasting along with shock tube initiation system / NONEL system will be practiced for getting optimum blast results and minimization of hazards. Boulders generated during the course of blasting will be broken in to smaller pieces by using rock breaker.

Excavation, Loading and transportation

The mine will be operated in a three shift basis. Process of excavation and loading of overburden/waste will be done by deploying hydraulic excavators and dumpers. Excavators of 2.1m^3 to 3.2m^3 capacities will be deployed for excavation & loading of ROM ore and dumpers 20T/35T capacity shall be deployed for transportation of ore and OB. The blasted material will be excavated by shovels of 2.1 cum - 3.2cum capacity and loaded onto 20 - 35T dumpers for transportation of the ROM, mineral reject and waste. Loading will be done mechanically. The ROM ore from different mining faces will be transported by dumpers of 20 -35T in a pre-determined proportion (for blending different qualities of ore), and delivered to the processing plant. ROM will be evacuated from the lease area by road to the destination point. Similarly for manganese ore, will be loaded to the tipper of 20t capacity.

Mineral processing

Iron ore (ROM) excavated from the lease area will be sent to outside the lease area to make it different sizes.

BHARAGHAR MOHAPATRA
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It is proposed to set up a beneficiation facility at a suitable location where further grading of the ore will be carried out. A Ferro Alloy plant will also be put up for further value addition.

Pre-production development work:

During 1st year of mine plan period all the pre-production activities will be achieved for iron ore. It has been envisaged that the pre-production development will be carried out in the following order.

(i) Clearing the areas to be opened up of forest growth for main and access road as well as for bench preparation.
(ii) Preparation of access road to the benches as well as roads leading to waste dump.
(iii) Removal of top soil if any from the benches to be developed and simultaneously construction of the main mine road.
(iv) Advancing the upper bench to permit development of adequate working width at the lower bench.

For carrying out the pre-production development work certain equipment like hydraulic excavator, dumper, bull dozer, blast hole drill etc will be procured well in advance to be supplemented later by main production equipment. In order to complete the pre-production development work in time, action for procurement of all equipment necessary for this work, will be initiated immediately, with the start of the project.

Year Wise Excavation Proposal
Development during (2020-21)

During this year only Manganese ore will be produced. It has been planned to produce 44964TPA of Manganese ore (ROM) by developing the Nandagira quarry and Quarry - 1. Height and width of the benches will be maintained at 6m and 9m respectively. The individual bench slope will be maintained at 85° whereas the gradient of the proposed road will be maintained at 1:16 and at ramp the gradient will be at 1:12.

Manganese ore strata will be loosened through drilling and blasting. Blasted rocks in each bench will be carried by mechanized means to the processing unit. Drilling is proposed to be done using 115mmdiameter drills with 10% sub grade drilling. Blasting will be done by adopting the State of Art technology by using mostly SME (Site Mixed Emulsion Explosives) along with conventional explosives such as PGC, Toe blast. Controlled blasting along with shock tube initiation system/NONEL system will be practiced for getting optimum blast results and minimization of hazards. Boulders generated during the course of blasting will be broken in to smaller pieces by using rock breaker.

BHABAGRAHI MOHAPATRA
QUALIFIED PERSON

Excavators of 2.1m³ capacities will be deployed for excavation & loading of ROM ore and dumpers 20Tcapacity shall be deployed for transportation of ROM ore. Sub grade ore O

The details of production will be as follows:

Particulars		Mn-Ore	
		Quarry-1	Nandagira block
Level	Higher adjoining ground level (m. RL)	582	589
	Lower adjoining ground level (m. RL)	570	551
	Quarry bottom level (m. RL)	564	552
Bench Geometry	Height	6m	6m
	Width	9m	9m
	Bench slope angle	85°	85°
Pit / quarry development	Direction of advancement	SW	SE
	Size of the quarry(m x m)	150 x 85	270 x 60
	Overall quarry slope angle	33°	26°
	Production of saleable ore (MT)	9773	29794
	Generation of Mineral Reject (MT)	1333	4,063
	Inter burden(MT)	16584	50556
	Side burden(MT)	57120	65800
	Total waste(MT)	190060	
	ROM (Saleable ore + mineral reject)	44964	

The section wise and RL wise calculation of production details are given below:

Name of the Quarry	Section Line	RL (m)	Cross Sectional Area (m2)	Length of influence (m)	Total Excavation (m3)	Volume of ore @ 34% (m3)	Total Quantity of ore @ 2.6 T/m³	Quantity (T) +20% Mn @ 88%	Quantity (T) +10 to 20% Mn @12%	Waste in ton
A	B	C	D	e	f=dXe	g=fx0.34	h=gx2.6	i=hx0.88	j=hx0.12	k=hx0.66
Nandagira Block	N2-LS	564	15	100	1500	510	1326	1167	159	990
	N2-LS	558	122	100	12200	4148	10784	9491	1,294	8087
	N2-LS	552	160	100	16000	5440	14144	12447	1,697	10560
	N3-LS	558	20	100	2000	680	1768	1556	212	1320
	N3-LS	552	66	100	6600	2244	5834	5134	700	4356
	Sub Total				38300	13022	33857	29794	4,063	25273
Q - 01	2100	570	160.5	70	10534	3581	9312	8194	1118	6952
	2100	564	29	70	2030	690	1795	1579	215	1340
	Sub Total				12564	4271	11107	9773	1333	8292
Grand Total					50864	17293	44964	39567	5396	33570

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Side burden Generation

Name of the Quarry	Section Line	RL (m)	Cross Sectional Area (m2)	Length of Influence (m)	Volume of OB & SB (MT)
A	B	C	D	E	F=DXE
Nandagira Block	N2-LS	582	40	100	4000
		576	62	100	6200
		570	70	100	7000
		564	37	100	3700
	N3-LS	564	62	100	6200
		556	48	100	4800
		552	10	100	1000
Sub Total					32900
Q – 01	21(X)	576	170	70	11900
		570	151	70	10570
		564	87	70	6090
	Sub Total				28560
Grand Total					61460

Development during (2021-22)

During this year only Manganese ore will be produced. It has been planned to produce 44964TPA of Manganese ore (ROM) by developing the Nandagira quarry and Quarry - 1. Height and width of the benches will be maintained at 6m and 9m respectively. The individual bench slope will be maintained at 85^0 whereas the gradient of the proposed road will be maintained at 1:16 and at ramp the gradient will be at 1:12.

Manganese ore strata will be loosened through drilling and blasting. Blasted rocks in each bench will be carried by mechanized means to the processing unit. Drilling is proposed to be done using 115mm diameter drills with 10% sub grade drilling. Blasting will be done by adopting the State of Art technology by using mostly SME (Site Mixed Emulsion Explosives) along with conventional explosives such as PGC, Toe blast, Controlled blasting along with shock tube initiation system / NONEL system will be practiced for getting optimum blast results and minimization of hazards. Boulders generated during the course of blasting will be broken in to smaller pieces by using rock breaker.

Excavators of $2.1m^3$ capacities will be deployed for excavation & loading of ROM ore and dumpers 35T capacity shall be deployed for transportation of ROM ore, Sub grade and OB.

Particulars		Mn-Ore	
		Quarry-1	Nandagira block
Level	Higher adjoining ground level (m. RL)	593	560
	Lower adjoining ground level (m. RL)	574	543
	Quarry bottom level (m. RL)	561	546
Bench Geometry	Height	6m	6m
	Width	9m	9m
	Bench slope angle	85^0	85^0
Pit / quarry development	Direction of advancement	NW & SW	NE & SW
	Size of the quarry(m x m)	150 x 122	283 x 106
	Overall quarry slope angle	33^0	26^0
	Production of saleable ore (MT)	11096	29472
	Generation of Mineral Reject (MT)	1513	3883
	Inter burden(MT)	25574	48312
	Side burden(MT)	55020	20600
	Total waste(MT)	149506	
	ROM (Saleable ore + mineral reject)	40028	

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The section wise and RL wise calculation of production details are given below:

Name of the quarry	Section line	RL(m)	Cross sectional area(m²)	Length of Influence (m)	Total Excavation (m3)	Volume of ore @ 34% (m3)	Total Quantity of ore @ 2.6 T/m³	Quantity (T) +20% Mn @ 88%	Quantity (T) +18 to 20%, Mn @12%	Waste
A	B	c	D	e	f=dXe	g=fx0.34	h=gx2.6	i=hx0.88	j=hx0.12	k=fx0.66
Nandagira block	N1-LS	546	300	50	15000	5100	13260	11669	1591	9900
	N2-LS	546	160	100	16000	5440	14144	12447	1697	10560
	N3-LS	546	56	100	5600	1904	4950	4356	594	3696
Sub Total					36600	12444	32354	28472	3883	24156
Q – 01	2100	584	142	70	9944	3374	8773	7720	1053	9923
	2100	581	62	70	4340	1476	3837	3376	460	2864
	Sub Total				14284	4850	12610	11096	1513	12787
Grand Total					50864	17294	44964	39568	5396	33570

Generation of Over Burden/Side Burden

Name of the Quarry	Section Line	RL (m)	Cross Sectional Area (m2)	Length of Influence (m)	Volume of OB & SB (m^3)
A	B	c	D	e	f=dxe
Nandagira block	N1-LS	546	206	50	10300
Q – 01	2100	582	94	70	6580
		576	82	70	5740
		570	152	70	10640
		564	65	70	4550
Sub Total					**27510**
Grand Total					**37810**

Development during (2022-23)

During this year both Iron and Manganese ore will be produced. For iron ore a new quarry will be developed in the South Western part of the lease area. After pre-production development work, production of iron ore will be obtained. It has been planned to make 5,00,059MT of ROM production during planned period. Though it has been planned to work from ultimate pit limit so, height and width of the benches will be maintained at 6m and 6m respectively.

It has been planned to produce 59228TPA of Manganese ore (ROM) by developing the Nandagira quarry. Height and width of the benches will be maintained at 6m and 9m respectively. The individual bench slope will be maintained at 85^0 whereas the gradient of the proposed road will be maintained at 1:16 and at ramp the gradient will be at 1:12.

Iron and Manganese ore strata will be loosened through drilling and blasting. Blasted rocks in each bench will be carried by mechanized means to the processing unit. Drilling is proposed to be done using 115mm diameter drills with 10% sub grade drilling. Blasting will be done by adopting the State of Art technology by using mostly SME (Site Mixed Emulsion Explosives) along with conventional explosives such as PGC, Toe blast. Controlled blasting along with shock tube initiation

BHABAGRAHI MOHAPATRA
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system/NONEL system will be practiced for getting optimum blast results and minimization of hazards. Boulders generated during the course of blasting will be broken in to smaller pieces by using rock breaker.

Excavators of 2.1m^{3}to 3.5cum capacities will be deployed for excavation & loading of ROM ore and dumpers 20T/35T capacity shall be deployed for transportation of ROM ore, Sub grade and OB.

Particulars		Mn Ore Nandagira block	Iron-Ore
Level	Higher adjoining ground level (m. RL)	560	740
	Lower adjoining ground level (m. RL)	543	690
	Quarry bottom level (m. RL)	540	677
Bench Geometry	Height	6m	6m
	Width	9m	6m
	Bench slope angle	85^0	85^0
Pit / quarry development	Direction of advancement	NW	West
	Size of the quarry(m x m)	272 x 81	280 x 60
	Overall quarry slope angle	26^0	29^0
	Production of saleable ore (MT)	52121	326039
	Generation of Mineral Reject (MT)	7107	175021
	Inter burden(MT)	88440	241408
	Side burden(MT)	28000	271150
	Total waste(MT)	116440	512558
	ROM (Saleable ore + mineral reject)	59228	500060

MANGANESE ORE

The section wise and RL wise calculation of production details are given below:

Name of the Quarry	Section Line	RL (m)	Cross Sectional Area (m2)	Length of Influence (m)	Total Excavation (m3)	Volume of ore @ 34% (m3)	Total Quantity of ore @ 2.6 T/m 3	Quantity(T) +20% Mn @ 88%	Quantity (T) 110 to 20% Mn @12%	Waste in cum
A	B	C	D	E	f=dXe	g=fx0.34	h=gx2.6	i=hx0.88	j=hx0.12	k=fx0.66
Nandagira Block	N1-LS	540	420	50	21000	7140	18564	16336	2228	13860
	N2-LS	540	380	100	38000	12920	33592	29561	4031	25080
	N3-LS	540	80	100	8000	2720	7072	6223	849	5280
Grand Total					67000	22780	59228	52121	7107	44220

Generation of side burden/over burden waste

Name of the Quarry	Section Line	RL (m)	Cross Sectional Area (m2)	Length of Influence (m)	Volume of OB & SB (m^3)
A	b	C	D	e	f =dXe
Nandagira Block	N1-LS	540	130	50	6500
	N2-LS	540	22	100	2200
	N3-LS	540	53	100	5300
	Grand Total				14000

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The section wise and RL wise calculation of production details are given below:

Name of the section	RL CONSIDERED	Cross-sectional Area(m^2)	Length of Influence (m)	Volume of ore Zone(m^3)	Volume of ore @58% recovery	Quantity of ore @3T/Cum	Quantity(T) (+55 [illegible])	[illegible] (-45 to [illegible])	* Inter-calated waste in cum
100 CS	695	15	70	1050	606	1827	1166	[illegible]	441
	689	56	70	3920	3490	10475	6808	3668	2028
	683	169	70	11830	6861	20584	13380	7204	4969
	677	236	70	16520	9582	28745	18684	10061	6938
200 CS	719	58	70	4060	2355	7064	4592	2473	1708
	713	175	85	14875	8628	25883	16824	9058	6248
	707	265	95	25175	14602	43805	28473	15332	10574
	701	344	95	32680	18954	56863	36961	19902	13720
	695	502	95	47690	27660	82981	53937	29043	20030
	689	511	95	48545	28156	84468	54904	29564	20389
	683	456	95	43320	25126	75377	48995	26382	18194
	677	375	95	35625	20663	61988	40292	21696	14963
TOTAL				267390	166686	500059	325039	175021	120704

Generation of side burden/over burden waste

Name of the section	RL. CONSIDERED	Cross sectional Area(m^2)	Length of Influence (m)	Volume of OB & SB (m^3)
100 CS	713	51	70	3570
	707	143	70	10010
	701	257	70	17990
	695	331	70	23170
	689	297	70	20790
	683	267	70	18690
	677	242	70	16940
200 CS	689	32	95	3040
	683	121	95	11495
	677	104	95	9880
TOTAL				135575

Development during (2023-24)

As earlier explained, a new quarry developed during 2022-23, will be further developed laterally and depth ward to achieve the required production. During this year it has been planned to make production of 6,03,519 MT of iron ore (ROM). Height and width of benches will be kept at 6m and 6m respectively to obtain the production of said production. The individual bench slope will be maintained at 850 whereas the gradient of the proposed road will be maintained at 1:16 and at ramp the gradient will be at 1:12.

It has been planned to produce 80002TPA of Manganese ore (ROM) by developing the Nandagira quarry. Height and width of the benches will be maintained at 6m and 9m respectively. The individual bench slope will be maintained at 85^0 whereas the gradient of the proposed road will be maintained at 1:16 and at ramp the gradient will be at 1:12.

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Both Iron and Manganese ore strata will be loosened through drilling and blasting. The total rocks in each bench will be carried by mechanized means to the processing unit. Drilling is proposed to be done using 115mm diameter drills with 10% sub grade drilling. Blasting will be done by adopting the State of Art technology by using mostly SME (Site Mixed Emulsion Explosives) along with conventional explosives such as PGC. Toe blast. Controlled blasting along with shock tube initiation system / NONEL system will be practiced for getting optimum blast results and minimization of hazards. Boulders generated during the course of blasting will be broken in to smaller pieces by using rock breaker.

Excavators of 2.1m^3 capacities will be deployed for excavation & loading of ROM ore and dumpers 20T/35T capacity shall be deployed for transportation of ROM ore, Sub grade and OB.

Particulars		Mn Ore	Iron-Ore
		Nandagira block	
Level	Higher adjoining ground level (m. RL)	594	680
	Lower adjoining ground level (m. RL)	551	670
	Quarry bottom level (m. RL)	540	647
Bench Geometry	Height	6m	6m
	Width	9m	6m
	Bench slope angle	85°	85°
Pit / quarry development	Direction of advancement	NW	East
	Size of the quarry(m x m)	277 x 195	320 x 50
	Overall quarry slope angle	26°	29°
	Production of saleable ore (MT)	70402	392286
	Generation of Mineral Reject (MT)	9600	211230
	Inter burden(MT)	119460	291354
	Side burden(MT)	290800	178800
	Total waste(MT)	410260	470154
	ROM (Saleable ore + mineral reject)	80002	603516

Manganese ore

The section wise and RL wise calculation of production details are given below:

Name of the Quarry	Section Line	RL (m)	Cross Sectional Area (m2)	Length of Influence (m)	Total Excavation (m3)	Volume of ore @ 34% (m3)	Total Quantity of ore @ 2.6 T/m^3	Quantity (T) +20% Mn @ 88%	Quantity (T) +10 to 20% Mn @12%	Waste in cum
A	B	c	d	e	f=dXe	g=fx0.34	h=gx2.6	i=hx0.88	j=hx0.12	k=fx0.66
NANDAGIRA BLOCK	N1-LS	564	20	50	1000	340	884	778	106	660
		558	86	50	4300	1566	4332	3812	520	3234
		552	180	50	9000	3060	7956	7001	955	5940
		546	175	50	8750	2975	7735	6807	928	5775
		540	176	50	8900	3026	7869	6923	944	5874
		534	495	50	24750	8415	21879	19254	2625	16335
	N2-LS	552	80	100	8000	2720	7072	6223	849	5280
		546	120	100	12000	4080	10608	9335	1273	7920
		540	132	100	13200	4488	11669	10269	1400	8712
Grand Total					90500	30770	80002	70402	9600	59730

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Generation of side burden/over burden waste

Name of the Quarry	Section Line	RL (m)	Cross Sectional Area (m2)	Length of Influence (m)	Volume of OB & SB (m³)
A	B	c	D	e	F=dXe
NANDACIRA BLOCK	N1-LS	570	80	50	4000
		564	81	50	4050
		558	60	50	3000
		534	125	50	6250
	N2-LS	588	160	100	16000
		582	122	100	12200
		576	120	100	12000
		570	122	100	12200
		564	122	100	12200
		558	120	100	12000
		552	86	100	8600
		546	61	100	6100
		540	48	100	4800
		534	320	100	32000
	Grand Total				145400

IRON ORE

The section wise and RL wise calculation of production details are given below:

Name of the section	RL Considered	Cross sectional Area(m²)	Length of Influence (m)	Volume of ore Zone(m³)	Volume of ore @58% recovery	Quantity of ore @3T/Cum	Quantity(T) (+55%Fe)	Quantity(T) (+45 to 55%Fe)	Inter collated waste in cum
100 CS	671	325	75	24375	14138	42413	27568	14844	10238
	665	435	75	32625	18923	56768	36899	19869	13703
	659	504	75	37800	21924	65772	42752	23020	15876
	653	523	75	39225	22751	68252	44363	23888	16475
	647	651	75	48825	28319	84956	55221	29734	20507
200 CS	671	356	100	35600	20648	61944	40264	21680	14952
	665	355	100	35500	20590	61770	40150	21619	14910
	659	365	100	36500	21170	63510	41281	22228	15330
	653	323	100	32300	18734	56202	36531	19671	13566
	647	241	100	24100	13978	41934	27257	14677	10122
TOTAL				**346850**	**201173**	**603519**	**392286**	**211230**	145677

Generation of overburden/side burden

Name of the section	RL CONSIDERED	Cross sectional Area(m²)	Length of Influence (m)	Volume of OB & SB (m³)
100 CS	671	201	75	15075
	665	184	75	13800
	659	174	75	13050
	653	171	75	12825
	647	170	75	12750
200 CS	671	59	100	5900
	665	38	100	3800
	659	37	100	3700
	653	40	100	4000
	647	45	100	4500
TOTAL				**89400**

Development during (2024-25)

As earlier explained, a new quarry developed during 2023-24, will be further developed laterally and depth ward to achieve the required production. During this year it has been planned to make production of 1.0MTPA of iron ore (ROM). Height and width of benches will be kept at 6m and 6m respectively to obtain the production of said production. The individual bench slope will be maintained

SHADAGRAHI MOHAPATRA
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at 85° whereas the gradient of the proposed road will be maintained at 1:16 and at ramp the gradient will be at 1:12.

It has been planned to produce 150000TPA of Manganese ore (ROM) by developing the Nandagira quarry. Height and width of the benches will be maintained at 6m and 9m respectively. The individual bench slope will be maintained at 85° whereas the gradient of the proposed road will be maintained at 1:16 and at ramp the gradient will be at 1:12.

Iron and Manganese ore strata will be loosened through drilling and blasting. Blasted rocks in each bench will be carried by mechanized means to the processing unit. Drilling is proposed to be done using 115mm diameter drills with 10% sub grade drilling. Blasting will be done by adopting the State of Art technology by using mostly SME (Site Mixed Emulsion Explosives) along with conventional explosives such as PGC, Toe blast. Controlled blasting along with shock tube initiation system / NONEL system will be practiced for getting optimum blast results and minimization of hazards. Boulders generated during the course of blasting will be broken in to smaller pieces by using rock breaker.

Excavators of 2.1m^3 capacities will be deployed for excavation & loading of ROM ore and dumpers 20T/35T capacity shall be deployed for transportation of ROM ore, Sub grade and OB.

Particulars		Mn Ore	Iron-Ore
		Nandagira block	
Level	Higher adjoining ground level (m. RL)	588	653
	Lower adjoining ground level (m. RL)	551	610
	Quarry bottom level (m. RL)	516	617
Bench Geometry	Height	6m	6m
	Width	9m	6m
	Bench slope angle	85°	85°
Pit / quarry development	Direction of advancement	NW	West
	Size of the quarry(m x m)	272 x 81	290 x 80
	Overall quarry slope angle	26°	29°
	Production of saleable ore (MT)	132013	650008
	Generation of Mineral Reject (MT)	18002	350005
	Inter burden(MT)	224004	482764
	Side burden(MT)	1033500	180200
	Total waste(MT)	1257504	662964
	ROM (Saleable ore + mineral reject)	150015	1000013

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Manganese ore

The section wise and RL wise calculation of production details are given below:

Name of the Quarry	Section Line	RL (m)	Cross Sectional Area (m2)	Length of Influence (m)	Total Excavation (m3)	Volume of ore @ 34% (m3)	Total Quantity of ore @ 2.8 T/m³	Quantity (T) +20% Mn @ 38%	Quantity (T) +20% Mn @ 32%	Inter collated waste in cum
A	B	C	D	E	f=dXe	g=fx0.34	h=gx2.8	i=hx0.88	j=hx0.12	k=fx0.66
NANDAGIRA BLOCK	N1-LS	646	40	50	2000	680	1904	1676	229	1320
		640	70	50	3500	1190	3332	2932	400	2310
		634	140	50	7000	2380	6664	5864	800	4620
		628	460	50	23000	7820	21896	19268	2628	15180
		622	160	50	8000	2720	7616	6702	914	5280
		616	383	50	19400	6596	18469	16253	2216	12804
	N2-LS	652	10	100	1000	340	952	838	114	660
		646	120	100	12000	4080	11424	10053	1371	7920
		634	300	100	30000	10200	28560	25133	3427	19800
		628	280	100	28000	9520	26656	23457	3199	18480
		622	240	100	24000	8160	22848	20106	2742	15840
		616	88	100	8800	2992	8378	7373	1005	5808
Grand Total					169700	57698	150015	132013	18002	112002

Generation of overburden

Name of the Quarry	Section Line	RL (m)	Cross Sectional Area (m2)	Length of Influence (m)	Volume of OB & SB (m³)
a	B	C	d	E	f=dXe
NANDAGIRA BLOCK	N1-LS	570	220	50	11000
		564	216	50	10800
		558	215	50	10750
		552	216	50	10800
		546	162	50	8100
		540	127	50	6350
		534	76	50	3800
		528	99	50	4950
		522	76	50	3800
	N2-LS	588	613	100	61300
		582	388	100	38800
		576	388	100	38800
		570	388	100	38800
		564	388	100	38800
		558	388	100	38800
		552	360	100	36000
		546	388	100	38800
		540	280	100	28000
		534	310	100	31000
		528	388	100	38800
		522	96	100	9600
		516	85	100	8500
	Grand Total				516750

Iron ore

The section wise and RL wise calculation of production details are given below:

Name of the section	RL considered	Cross sectional Area(m²)	Length of influence (m)	Volume of ore Zone(m³)	Volume of ore @58% recovery	Quantity of ore @3T/Cum	Quantity (T) (+55%Fe)	Quantity (T) (+45 to 55%Fe)	Inter collated waste in cum
100 CS	641	1004	85	85340	49497	148492	96520	51972	35843
	635	1280	85	108800	63104	189312	123053	66259	45696
	629	1300	85	110500	64090	192270	124975	67294	46410
	623	1311	85	111435	64632	193897	126033	67864	46803
	617	597	85	50745	29432	88296	57393	30904	21313
200 CS	641	379	100	37900	21982	65946	42865	23081	15918
	635	108	100	10800	6264	18792	12215	6577	4536
	629	209	100	20900	12122	36366	23638	12728	8778
	623	178	100	17800	10324	30972	20132	10840	7476
	617	205	100	20500	11890	35670	23185	12484	8610
Total				574720	333338	1000013	650008	350005	241382

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Generation of overburden

Name of the section	RL Considered	Cross sectional Area (m^2)	Length of Influence (m)	Volume of OB & SB (m^3)
100 CS	641	139	85	11
	635	103	85	87
	629	109	85	92
	623	222	85	19
	617	267	85	23
200 CS	641	40	100	4000
	635	45	100	4500
	629	45	100	4500
	623	29	100	2900
	617	28	100	2800
Total				**90100**

Summarized Statement of production of Iron and Manganese ore

Year	Iron ore Zone			Mn ore Zone		
	Salable Ore (MT)	Mineral reject (MT)	Total in (MT)	Salable Ore (MT)	Mineral reject (MT)	Total in (MT)
2020-21	0	0	0	39568	5396	44964
2021-22	0	0	0	39568	5396	44964
2022-23	325039	175021	500060	52121	7107	59228
2023-24	392280	211230	603510	70402	9600	80002
2024-25	650008	350005	1000013	132013	18002	150015
Total	**1367333**	**736256**	**2103589**	**333672**	**45501**	**379173**

Summarized Statement of waste

Year	Iron ore Zone			Mn ore Zone			Total Waste(m^3)
	I/C waste (m^3)	Volume of OB & SB (m^3)	Total Waste (m^3)	I/C waste (m^3)	Volume of OB & SB (m^3)	Total Waste (m^3)	
2020-21	0	0	0	33570	61460	95030	95030
2021-22	0	0	0	33570	37810	71380	71380
2022-23	120704	135575	256279	44220	14000	58220	314499
2023-24	145677	89400	235077	59730	145400	205130	440207
2024-25	241382	90100	331482	112002	516750	628752	960234
Total	507763	315075	822838	275689	775420	1058512	1881350

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

I. In situ Tentative Excavation (cum)

Manganese ore

Year	Name of Quarry	Total Excavation (m^3)	Top Soil (m^3)	Grid Location	OB/SB/IB (m^3)	ROM (m^3)		Ratio (cum/cum)
						Ore (m^3)*	Mineral reject (m^3)	
2020-21	Nandagira Quarry-1N	71200	Nil	2411057-2410806 & 308415-308582	58178	11459	1563	1: 4.47
	Quarry-1	41123	Nil	2411956-2412091 & 307459-307601	36852	3759	513	1: 14.06
	Sub-total	112323	Nil		95030	15217	2076	1: 5.94
2021-22	Nandagira Quarry-1N	46800	Nil	2410804-2411083 & 308297-308640	34456	10951	1493	1: 2.77
	Quarry-1	41774	Nil	2411933-2412109& 307431-307001	36824	4268	582	1: 11.26
	Sub-total	88574	Nil		71380	15219	2075	1: 4.39
2022-23	Nandagira Quarry-1N	81000	Nil	2410749 2411064& 308308-308597	58220	20046	2734	1: 2.56
2023-24	Nandagira Quarry-1N	235900	Nil	2410731-2411065& 308308-308610	205130	27079	3682	1: 6.67
2024-25	Nandagira Quarry-1N	686450	Nil	2410715-2411082&308297-308639	628752	50774	6924	1: 10.50
G Total		1193130			1051109	124079	17042	1 : 8.40

Iron ore

Year	Name of Quarry	Total Excavation (m^3)	TopSoil (m^3)	OB/SB/IB (m^3)	ROM (m^3)		ROM / Waste Ratio (cum/cum)
					Ore (m^3)*	Mineral reject (m^3)	
2022-23	Quarry-8	422906	Nil	256279	108348	58340	1: 1.54
2023-24	Quarry-8	436249	Nil	235077	130762	70410	1: 1.17
2024-25	Quarry-8	664520	Nil	331482	216670	116688	1: 0.99
G Total		1524034		822838	455778	245419	1: 1.17

*Tentative tonnage of the ore may be arrived by computing approximate bulk density and recovery factor as these data are variable and may be established on time series.

NOTE:Mineral rejects include all the excavated materials that do not constitute useful material, such material may be either grade or size reject. The mineral reject may be (i) chemically sub-grade which is below the acceptable limits of specifications that is below the cutoff grade and above the threshold value. (ii) materials of physical characteristics not acceptable to the market, (iii) material having deleterious constituents.

ROM constitutes the material excavated from mineralized zone and includes mineral reject and useable mineral component.

OB: Means overburden capping waste

SB: means side burden waste on both hang wall and foot wall sides of the ore body

IB : means intermediate burden waste between two or more ore body.

Based on present mining practices and processing (crushing & screening), the following assumptions have been considered to calculate waste, Mineral reject and saleable ore:

Ore Type	Recovery %
Iron ore(45 to 55% Fe)	64.67 say 65
Iron ore(+ 55% Fe)	35.33 say 35
Manganese ore (10 to 20% Mn)	12
Manganese ore (+ 20% Mn)	88

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Thus, keeping in view the market demand and resource availability in respect of reserve & grade, the optimum of development & production is proposed to be as follows:

In situ Tentative Excavation (MT)
Manganese ore

Year	Name of Quarry	Total Excavation (MT)	Top Soil(MT)	Grid location	OB/SB/IB (MT)	ROM (MT)		ROM / Waste Ratio (MT/MT)
						Ore (MT)	Mineral reject (MT)	
2020-21	Nandagra Quarry-IN	150213	Nil	2411057-2410806 & 308415-308562	118356	29794	1063	1 : 28:30.0
	Quarry-	84811	Nil	2411956-2412091 & 307459-307601	73004	9774	1333	1 : 37:11.9
	Sub-total	235024	Nil		190060	39568	5396	1 : 37:15.6
2021-22	Nandagra Quarry-IN	101267	Nil	2410804-2411063 & 308297-308640	68912	28477	3988	1 : 07:00.9
	Quarry 1	86457	Nil	2411993-2412109 & 307431-307601	73648	11096	1513	1 : 55:59.9
	Sub-total	187721	Nil		142760	39568	5396	1 : 10:45.1
2022-23	Nandagra Quarry-IN	175669	Nil	2410748-2411064 & 308308-308597	116440	52121	7107	1 : 10:39.1
2023-24	Nandagra Quarry-IN	490262	Nil	2410731-2411065 & 308308-308610	410260	70402	9600	1 : 04:29.7
2024-25	Nandagra Quarry-IN	1407519	Nil	2410715-2411082 & 308297-308638	1257504	132013	18002	1 : 10:49.6
G Total		**2471473**			**2102216**	**324845**	**44310**	**1 : 38.06.7**

Iron ore

Year	Name of Quarry	Total Excavation (MT)	Top Soil (MT)	Grid location	OB/SB/IB (MT)	ROM (MT)		ROM / Waste Ratio (MT/MT)
						Ore (MT)	Mineral reject (MT)	
2022-23	Quarry-8	1012618	Nil	2409842-2410109 & 307518-307662	512558	325039	175021	1: 1.02
2023-24	Quarry 8	1073670	Nil	2409842-2410109 & 307518-307662	470154	392286	211230	1: 0.78
2024-25	Quarry-8	1662977	Nil	2409871-2410144 & 307537-307736	662964	650008	350005	1: 0.66
G Total		**3749265**			**1645676**	**1367333**	**736256**	**1: 0.78**

Summary of year wise production

Year	Iron ore Zone			Mn ore Zone		
	Salable Ore (MT)	Mineral reject (MT)	Total in (MT)	Salable Ore (MT)	Mineral reject (MT)	Total in (MT)
2020-21	0	0	0	39568	5396	44964
2021-22				39568	5396	44964
2022-23	325039	175021	500060	52121	7107	59228
2023-24	392286	211230	603516	70402	9600	80002
2024-25	650008	350005	1000013	132013	18002	150015
Total	**1367333**	**736256**	**2103589**	**333672**	**45501**	**379173**

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

Not proposed

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Thus, keeping in view the market demand and resource availability in respect of reserve & grade the quantum of development & production is proposed to be as follows:

In situ Tentative Excavation (MT)

Manganese ore

Year	Name of Quarry	Total Excavation (MT)	Top Soil(MT)	Grid location	OB/SB/IB (MT)	ROM (MT)		ROM / Waste Ratio (MT/MT)
						Ore (MT)	Mineral reject (MT)	
2020-21	Nandagira Quarry-IN	150213	Nil	2411057-2410806 & 308415-308562	118556	23794	1063	1 : 28:30.0
	Quarry-I	84811	Nil	2411956-2412091 & 307459-307601	73704	9774	1333	1 : 37:11.9
	Sub-total	235024	Nil		192060	39568	5396	1 : 37:15.6
2021-22	Nandagira Quarry-IN	101267	Nil	2410804-2411063 & 308297-308640	68912	29472	3883	1 : 07:00.9
	Quarry-I	86457	Nil	2411933-2412109 & 307431-307601	73848	11096	1513	1 : 55:59.9
	Sub-total	187724	Nil		142760	39568	5396	1 : 10:45.1
2022-23	Nandagira Quarry-IN	176869	Nil	2410749-2411064 & 308308-308587	118440	52121	7107	1 : 10:59.1
2023-24	Nandagira Quarry-IN	490262	Nil	2410731-2411065 & 308308-308618	410280	70402	9600	1 : 04:29.7
2024-25	Nandagira Quarry-IN	1407519	Nil	2410715-2411082 & 308297-308639	1257504	132013	18002	1 : 10:40.9
G Total		**2471473**			**2102218**	**324845**	**44310**	**1 : 38:06.7**

Iron ore

Year	Name of Quarry	Total Excavation (MT)	Top Soil (MT)	Grid location	OB/SB/IB (MT)	ROM (MT)		ROM / Waste Ratio (MT/MT)
						Ore (MT)	Mineral reject (MT)	
2022-23	Quarry-8	1012618	Nil	2409842-2410109 & 307518-307662	512558	325039	175021	1: 1.02
2023-24	Quarry-8	1073670	Nil	2409842-2410109 & 307518-307662	470154	392286	211230	1: 0.78
2024-25	Quarry-8	1662977	Nil	2409871-2410144 & 307597-307736	662964	650008	350005	1: 0.66
G Total		3749265			1645676	1367333	736256	1: 0.78

Summary of year wise production

Year	Iron ore Zone			Mn ore Zone		
	Salable Ore (MT)	Mineral reject (MT)	Total in (MT)	Salable Ore (MT)	Mineral reject (MT)	Total in (MT)
2020-21	0	0	0	39568	5396	44964
2021-22				39568	5396	44964
2022-23	325039	175021	500060	52121	7107	59228
2023-24	392286	211230	603516	70402	9600	80002
2024-25	650008	350005	1000013	132013	18002	150015
Total	1367333	736256	2103589	333672	45501	379173

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

Not proposed

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Excavation, Loading and transportation

The mine will be operated in a three shift basis. Process of excavation and loading of overburden/waste will be done by deploying hydraulic excavators and dumpers. Excavators of 2.1m^3 to 3.2m^3 capacities will be deployed for excavation & loading of ROM ore and dumpers 20T/35T capacity shall be deployed for transportation of ore and OB. The blasted material will be excavated by shovels of 2.1 cum – 3.2cum capacity and loaded onto 20 - 35T dumpers for transportation of the ROM, mineral reject and waste. Loading will be done mechanically. The ROM ore from different mining faces will be transported by dumpers of 20 -35T in a pre-determined proportion (for blending different qualities of ore), and delivered to the processing plant. ROM will be evacuated from the lease area by road to the destination point. Similarly for manganese ore, will be loaded to the tipper of 20t capacity.

The lease is having Mn ore of soft and friable in nature. Therefore, drilling and blasting will be adopted for loosening of hard rock mass containing Manganiferous laterite which is about 50% of the total excavation. Blastholes will bedrilled by DTH drills.The drilling details are as follows:

Extent of Mechanization

Iron ore is mostly soft and friable in nature. Blue dust also occurs in the ore zone. Therefore, drilling and blasting will be adopted for loosening of hard rock mass containing massive & laminated ore which is about 60% of the total excavation. Similarly, manganese ore zone is soft in nature and 50% of ore zone is amenable to mining without drilling & blasting. Blast holes will be drilled by DTH drills. The drilling details are as follows:

Drills

Drilling Parameters	Iron Ore Zone	Manganese Ore Zone
Burden m	2.0	2.0
Spacing m	2.5	2.5
Bench height	6	6
Output / hole m3	2.0 x 2.5 x 6 = 30 m^3	2.0 x 2.5 x 6.0 = 30m^3
Sub-grade drilling (S) (10% of the height of the bench)	0.1	0.1
Depth of the hole m	6.1	6.1
Drill diameter mm	100	32
Drilling speed m/hr	30	10
Working hours in a shift	8	8
Number of shifts per day	3	3
Annual working days	300	300
Expected utilization	85%	85%
Operating efficiency	85%	85%
Meters to be drilled/ drill / annum	30 x 8 x 3 x 300 x 80% x 80%	10 x 8 x 3 x 300 x 85%x 80%
Total Meters per annum	**156060**	**48960**

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❖ **Drilling machines required**

Item	Fe-Ore Zone	Mn-Ore Zone
Volume of excavation (Max) m3	864820	686450
Volume to be loosened through drilling and blasting	60%	50%
	398982	343225
Annual requirement of holes	13299	11440
Meterage of drilling required	79794	68640
No. of drills required to be in operation	0.511	1.40
No. of drills required (Rounded)	1	2

BLASTING:

As the nature of the ore is hard, about 60% of the total production will be obtained through blasting within iron ore zone and 50% in manganese ore zone. The proposed mining will have 6.0m height benches in iron ore zone & in manganese ore zone. Drilling will be done for blast hole by 100mmdia DTH in iron ore zone and in manganese ore zone fed by compressed air. These holes will be drilled in staggered pattern with burden and spacing of 2.0m and 2.5m in both iron and manganese ore zone. No secondary blasting will be done. Rock breaker will be utilized for the purpose.

Drilling Parameters	Iron Ore Zone	Manganese Ore Zone
Burden m	2.0	2.0
Spacing m	2.5	2.5
Bench height	6	6
Output / hole m3	2.0 x 2.5 x 6 = 30 m^3	2.0 x 2.5 x 6.0 = 30m^3
Sub-grade drilling (S) (10% of the height of the bench)	0.1	0.1
Depth of the hole m	6.1	6.1
Drill diameter mm	100	32
Drilling speed m/hr	30	10
Working hours in a shift	8	8
Number of shifts per day	3	3
Annual working days	300	300
Expected utilization	85%	85%
Operating efficiency	85%	85%
Meters to be drilled/ drill / annum	30 x 8 x 3 x 300 x 80% x 80%	10 x 8 x 3 x 300 x 85%x 80%
Total Meters per annum	**155060**	**48960**

Powder factor

Calculation of powder factor:-

Output / hole m3 – 30 cum or 90 tone

Explosive required 2/3rd of the hole – 14 Kg

Powder factor- 90/14 = 6.4

A powder factor of 7 tonne of saleable ore per Kg explosive is considered for estimating explosive requirement. However, this may suitably be changed depending upon the type of ore and other site conditions.

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Type of explosive to be used:

High explosives will be loaded by bottom charging or deck charging. The stemming length is proposed to be one third of the hole depth. The explosive column will be blasted under 'V' type blasting pattern initiated by detonator & NONEL and safety fuse. The calculation is however made as follows:

Particulars		Iron ore zone	Mn ore zone
Max Annual Excavation in a year	=	1000000 T	150000
Production to be obtained from blasting	=	1000000x 0.6	150000 x 0.5
	=	600000	75000
Powder factor	=	7.0t / kg	
Explosive requirement per annum	=	600000/7	75000/7
	=	85714Kg or 85TPA	10714kg or 10.714TPA

Storage of Explosive

Explosive shall be out sourced from external agencies having explosive license

The major hazards associated with blasting are as follows:

i) Ground vibration and resulting damage to structure and surrounding rock strata.
ii) Fly rock
iii) Noise and air overpressure and
iv) Dust and fumes

Some of measures proposed to be adapted to restrict these hazards with acceptable limit are:

i) Provision of a safe zone of about 500m radius around the blasting location, wherever feasible.
ii) Adopting the safe charge per day to restrict the peak particle velocity (ppv) of ground vibration as per blasting test results.
iii) Avoiding holes of uneven depth of blocked holes from tie-up sequence.
iv) Avoiding water accumulation in the holes, and if there is any water accumulation in the hole, the same has to be dewatered wherever practicable.
v) Muffing the blasting, as far as practicable , particularly where safe zone is not possible to be adhered to and
vi) Covering the detonating cords by soil layers.

Precautions Proposed to be taken for Storage and Handling of Ammonium Nitrate.

Stock of ammonium nitrate will be maintained in the store. The precautions proposed to be taken for storage and handling of ammonium nitrate are given below:

i) Ammonium nitrate would not be stored with other explosives in the magazine. It would be stored separately in waterproof bags.
ii) Ammonium nitrate should be handled like gasoline. Under all normal circumstances, the material is quite safe to handle.
iii) Under conditions of extreme heat, confinement or open flame, ammonium nitrate can be dangerous and therefore these situations will not be allowed to arise.

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iv) Fertilizer grade ammonium nitrate should be stored on dry, clean floor. The floor should be constructed with non-combustible materials unless it is protected against impregnation with ammonium nitrate. Floor drains into which molten nitrate could flow and be confined in case of a fire, should be eliminated. These precautions would be taken.

v) It would be stored in a building with good ventilation.

vi) The storage premises would be of waterproof construction and on raised ground not liable to flooding.

vii) Ammonium nitrate should not be stored in close proximity to steam pipes, light bulbs and similar sources of heat.

viii) The bags of ammonium nitrate shall be stacked in piles, each pile being not more than 1m high and shall be readily accessible in case of fire.

ix) Metallic substances in powder form, combustible materials (including diesel oil and other fuels) of acids should not be left in the same storage premises.

x) The ammonium nitrate should be used in sequence of delivery to prevent accumulation of old materials.

xi) Smoking, naked light or open flame should not be allowed in the vicinity of ammonium nitrate.

xii) Flooding with water is the only effective way to fight a nitrate fire as the nitrate has its own built-in oxygen supply

Excavation and Loading: Run-off-mine iron ore will be excavated & loaded in the 20T/35T dumpers by 2.1&3.2 m^3 capacity excavators. The detailed calculation is as follows:

❖ **Excavation parameters**

Excavators			
Excavators Parameters	For Iron ore		For Manganese
C =Nominal Bucket Capacity m3	3.2	2.1	2.1
F =Bucket fill factor	85%	85%	85%
S =Swell factor (at 25% swell)	82%	82%	82%
t =Time cycle per pass at 90 degree swing in seconds	60	60	60
e=Overall efficiency working shift	80%	80%	80%
T =Seconds per hour	3600	3600	3600
n=Number of working shifts/day	3	3	3
h =Hours per shift	8	8	8
W = Working days in a year	330	330	330
A = Availability of machine	75%	75%	75%
U = Utilization Factor	75%	75%	75%

Rate of Production

Output/shovel/hour	(C x F x S x T)/(t)	133.824	87.822	87.822
	Or says (TPH)	134	88	88
Output/shovel/ year	O x h x n x w x e x A x U	1343628	374220	374220

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Number of Excavators

Volume to be handled/ annum m3	396892	265828	686450
No. of excavator proposed	0.296	0.710	1.83
No. of excavator proposed (Rounded)	1	1	2
Additional (standby)	1	1	
Total No. of excavator proposed	2	2	2

HAULAGE & TRANSPORT EQUIPMENT FOR ORE, WASTE & MINERAL REJECTS:

Waste will be dumped and R.O.M ore will be transported to the crushing / screening / manual processing site for sizing. However, shovel dumper matching calculation has been made as follows:

❖ **Dumper / Tipper Parameters**

Parameters	Unit	Iron Ore Zone	Manganese Ore Zone
Dumper Capacity	Tonne	35	20
Average bucket capacity	Cum	3.2	2.1
Bucket fill factor		0.85	0.85
Swell factor		0.8	0.8
Tonnage factor	t/m3	3	2.3
Tonnes per pass	Tonne	=3.2 X 0.85 X 0.8 X 3 = 5.1 t	=2.5 X 0.85 X 0.8 X 2.3 = 3.91 t
	Tonne	6.5	3.91
No. of passes		Tonnage rating of tipper/tons per pass = 35 / 6.5	Tonnage rating of tipper/tons per pass = 35 / 3.91
	Nos.	5.3	8.95
	Nos.	5	9.0

❖ **Dumper / Tippers requirement**

Particular	Unit	ROM	OB	Mn
Loading time seconds	Second	360	420	540
Lead (One way)	Km	1.5	2.5	0.5
Load travel time seconds @ 10 KMPH	Second	540	900	180
Empty travel time seconds @ 15 KMPH	Second	360	600	120
Spotting time	Second	60	60	60
Dumper cycle time	Second	1320	1980	900
Number of rear dump trucks required /shovel	Nos.	3.14	3.13	1.50
Number of excavators		2	2	1
Number of Dumpers required in all total		6	6	2

Requirement of loader

Loading will be done by mechanized method. The usable ore, mineral rejects and waste material will be loaded by the loader to the dumper. The bucket capacity of the loader will be 2.5Cu.m. The detail calculation of loader will be as follows:

Loader Parameters	For Iron ore	For Iron Mn
C =Nominal Bucket Capacity m^3	2.5	1.5
F =Bucket fill factor	80%	80%
S =Swell factor (at 25% swell)	85%	85%
t =Time cycle per pass at 90 degree swing in seconds	120	120
e=Overall efficiency working shift	50%	80%

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T =Seconds per hour	3600	36
n=Number of working shifts/day	3	3
h =Hours per shift	8	8
W = Working days in a year	330	330
A = Availability of machine	85%	
U = Utilization Factor	80%	80%
B. D. = Bulk Density	3	2.5

Rate of Production

Output / Loader / hour	(C x F x S x T)/(t)	51	30.6
	Or says (TPH)	153	76
Output / Loader / Year	O x h x n x w x e x A x U		
	Or says (TPA)	826200	410400

Number of Loaders

Volume to be handled/ annum Tonne			
During Shifting			150000
During Final Dispatch		1000000	150000
Rate of production per Annum	TPA	1157904	4,95,475
No. of Loader proposed (Rounded)	Nos.	1.20 say 2	1
10% Additional (standby)		1	
Total No. of loader proposed		3	2

Loading Machine Details

Type	Nos	Size/Capacity
Loader	3	2.5 cum
Loader	2	1.5 cum

Note: Crushing and screening will be done outside the lease area. Hence, calculation of crusher and screen has not been envisaged.

List of Machinery / equipment: Mining operation will be continued as Category-A (fully mechanized) mine. Heavy earth moving machine (HEMM) population is required to be arranged in the following manner:

Sl. No.	HEMM Requirement	Size	HEMM Required during peak rated capacity		
			Requirement	Standby	Total
A. Excavation & Loading					
1	Shovel	3.2	2	1	3
1	Shovel	2.5 Cum	2	1	3
2	Shovel(Mn)	2.5 Cum	1	1	2
3	Loaders	2.5cum	2	1	3
4	Loaders	1.5 cum	1	1	2
B. Hauling					
1	Dumper	20 T	2	2	4
2	Dumper	35 T	12	2	14
D. Drilling					
2	Drill Machine	100 mm	1	1	2
3	Drill Machine	85 mm	2	1	3
E. Auxiliary Equipment					
1	Dozer	400 - 440 HP	1		1

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2	Grader	120 HP	1		1
3	Rock Breaker		1		1
4	Ambulance		1		1
5	Water tanker	20 KL	4		4
6	Diesel Browser		2		2
7	Mobile Maintenance Van		4		4
8	Crane		1		1
11	Excavator for Quick Dispatch System	1 Cum	2	1	3
12	Staff bus		1		1

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

Lay out of mine working

It has been planned to develop Nandagira Quarry and quarry-1 for manganese ore. The existing benches within the quarries will be moved due South East and downward to achieve the production. In the Nandagira quarry, benches will be moved due down ward upto534m.RL as per the requirement and then benches will be formed in both lateral and depth ward direction. The benches of Q-1,Nandagira quarry will be extended in all direction both laterally and depth ward.

Similarly, a new pit will be developed during plan period to produce iron ore in the south western part of the block. At the end of plan period the dimension of the proposed quarries will be as follows:

Sl. No.	Name of the ore zone	Name of the Quarry	Dimension				Top RL	Bottom RL
			Length (m)	Breadth (m)	Area (m^2)	Area (ha)	(m)	(m)
1	-do-	Nandagira	315	225	70875	7.0875	586	528
2	-do-	Q-1	295	170	50150	5.015	582	561
3	-do-	Proposed Quarry(Iron)	330	175	57750	5.775	719	617

PIT ROAD LAYOUT

Existing Haul Road

The width of main haul road has been kept at 15m. However, width of the benches within the Nandagira quarry has been kept at 9m which is acting as haul road and is joined with the main haul road. The width of the existing haul road quite sufficient for movement of fleets smoothly.

Proposed Haul Road

The width of main haul road is kept at 15-20m which is the way for the entry into the Nandagira quarry. Further, the benches of the proposed quarry will be utilized for haul road. The bench width has been kept at 9mand after putting the berm width of 1m, the bench width will remain 8m.It is proposed to deploy 20t dumper for the transportation purpose which can smoothly pass through the proposed road. The gradient of the haul road 1:16. In case of ramp the gradient will be maintained at 1:12

Similarly for Iron ore the width of main haul road has been kept at 15-20m and the width of benches of proposed quarry will be 9m and after putting the berm width of 1m, the berch width will remain 8m.It is proposed to deploy 35t dumper for the transportation purpose which can smoothly pass within the proposed road.

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LAYOUT OF FACES

Name of the quarry	Description	2020-21	2021-22	2022-23	2023-24	2024-25
Nandagira Quarry	Face RL	589-552	552-516	516-510	510-534	534-528
	Length of face	280m	295m	315m	330m	345m
	Direction of advancement	Due East and SE	Due East and SE	Due East and SE	Due East and SE	Due East and SE
Quarry-1	Face RL	580-564	603-561	--	--	--
	Length of face	236m	300m	--	--	--
	Direction of advancement	Due west and south west	Due west and down ward	--	--	--
Proposed Iron Quarry	Face RL	--	--	719-683	683-647	719-611
	Length of face	--	--	280m	315m	345m
	Direction of advancement	--	--	Due East	Due East	Due East

Site for disposal of waste along with ground preparation

Selection of dumping site mostly depends upon the factors like topography, drainage, land use, mineral inventory, pit configuration, mine waste characteristics, its volume of generation and economy in transportation. Dumping will be done over existing dump-4 for Nandagira quarry and back-filling will be carried out within the exhausted part of quarry-3 for quarry-1. Hence, no ground preparation is required for the waste disposal. Retaining walls of laterite/BHJ boulders has been created all along the down sides of dump area. Boulders will be cemented and boulder walls will be plastered by cement and sand in the proportion of 1: 6. Weep holes will be kept at 8m interval to release the storm water outside.

Waste from Iron ore quarry will be dumped within virgin area. Hence, ground preparation is required for the purpose. Necessary tree felling order will be obtained in the said area before creation of dump. Retaining wall, followed by garland drain will be constructed before dumping. The dumping area has already been proved as barren.

Garland drain will be made all around the retaining wall to receive the wash-off materials coming out of the retaining wall during rain. Finally, run-off water in garland drain will be allowed to pass through a settling tank to settle the silt content and release clean water to the natural drainage course. Silt content settled by the retaining wall, garland drain and settling tank will be cleared periodically.

Site for disposal of mineral rejects alongwith ground preparation

The proposed mineral rejects will be stored temporarily near camp site over the granted surface right area. No ground preparation is required as stacking of mineral reject stock are already continuing in the same area.

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

- **LIFE OF THE MINE**

	Particulars	Manganese ore	Iron ore
A.	Total reserves under proved & probable category	643726	26783298
B.	Production during 5 years of plan period	379173	2109589
C	Balance reserves for conceptual period	264553	24679709
D	Production per annum	150000	1000000
E	No of years production will be carried out during Conceptual period	1.76	24
F	Life of the mine(plan period + conceptual period)	5+1.76=6.76	5+24=29

Further, the life of the mines may not hold constant for all the time. Based on the market demands the life of the deposit may increase or decrease, accordingly the life of mine may vary from time to time.

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- **TIME FRAMES FOR COMPLETION OF EXPLORATION WITHIN THE LEASEHOLD AREA**

The lease area has been explored both in G1 and G2 level. However, it has been planned to cover the entire potential mineralized area under G1 level. For this a total of51nos of Bore holes have been proposed during 5th year of plan period. Accordingly, the reserve may be changed based on the bore hole results.

- **ULTIMATE EXTENT & SIZE OF THE PIT**

Existing pit position

At present 51.067Ha is already degraded due to mining. None of the area has been exhausted till date.

Pit position during plan period:

Sl. No.	Name of the ore zone	Name of the Quarry	Dimension				Top RL	Bottom RL
			Length (m)	Breadth (m)	Area (m^2)	Area (ha)	(m)	(m)
1	do-	Nandagira quarry	315	225	70875	7.0875	586	528
2	-do-	Q-1	295	170	50150	5.015	582	561
3	-do-	Proposed Quarry(Iron)	330	175	57750	5.775	719	617

Pit position at the end of conceptual period:

The ultimate pit limit for iron and manganese ore has been delineated considering the mineability of ore at the end of the life of the mine. Ultimately, there will be sixpit at the end of life of the mine for manganese ore and one pit for iron ore. Ultimate extent and size of the quarries will be as follows:

Name of the UPL	Type of Ore	Size (m x m)	Ultimate Extent		Top RL	Bottom RL
			(m^2)	(in hectares)		
UPL-1	Iron &Manganese ore	600 x 364	218400	21.8	584	487
UPL-2		552x 276	152352	15.2	552	474
UPL-3		539 x 428	230692	23.09	598	484
UPL-4		783 x 213	166779	16.7	640	580
UPL-5		515 x 104	53560	5.4	550	496
UPL-6		496 x 138	68448	6.8	508	478
UPL-7		365 x 230	83950	8.4	586	510
UPL-8	(Iron ore)	800 x 187	149600	15.0	719	553
Total	---	---	1123781	112.39		

Optimum Exploitation & Utilization of Minerals: Based on the exploratory evidences, the ultimate working depth will be 474mRL. Height and width of the benches will be kept at 9m each for iron ore and 6m each for manganese ore to (a) mine out the optimum amount of ores from the quarries, (b) keep the ultimate pit slope safe & stable and (c) maintain final slope angle of the pit at around 45° with the horizontal.

Final slope angle at the close of mine:

The individual bench slope would be kept nearly vertical, height and width of the benches would be kept at 6m for iron ore and Mn ore. The individual bench slope will be kept at 85° with the horizontal whereas the overall quarry slope angle would be maintained at 31° to the horizontal during plan period as well as at the end of the life of the mine.

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Ultimate capacity of dump

The dump has been planned to be created considering the topography, barrenness of the mineral, ultimate pit limit. Within quarry-3, Manganese ore has been exhausted over part of the quarry-3. Hence, it has been planned to back-fill the same area during plan period. The details of back-filling during plan period are furnished below:

Plan period

Waste generation

Year	Iron ore Zone			Mn ore Zone			Total Waste(m^3)
	Intercalated waste (m^3)	Overburden and side burden (m^3)	Total Waste (m^3)	Intercalated waste (m^3)	Overburden and side burden (m^3)	Total Waste (m^3)	
2020-21	0	0	0	33570	61460	95030	95030
2021-22	0	0	0	33570	37810	71380	71380
2022-23	120704	135575	256279	44220	14000	58220	314499
2023-24	145677	89400	235077	59730	145400	205130	440207
2024-25	241382	90100	331482	112002	516750	628752	960234
Total	**507763**	**315075**	**822838**	**275689**	**775420**	**1058512**	**1881350**

Waste management during plan period

As per the above table, it is envisaged that 822838cum from iron ore zone and 1058512 cum from manganese ore zone will be generated. It has been planned that about 10% of generation will be utilized for road maintenance and balance waste will be disposed of at earmarked site. The details of utilization of waste will be as follows:

Waste Management during plan period

Dumping

Iron ore zone

Year	Iron ore Zone		Total Waste (m^3)	Management				Location
	Intercalated waste (m^3)	Overburden and side burden (m^3)		Road Maintenance	Dumping	Area (m2)	TOP RL	
2020-21	0	0	0	0	0	0	--	
2021-22	0	0	0	0	0	0	--	
2022-23	120704	135575	256279	25627.9	230651.1	15376	625	2410510-2410590 and 307920-307900
2023-24	145677	89400	235077	23507.7	211569.3	14101	625	
2024-25	241382	90100	331482	33148.2	298333.8	19888	640	
Total	507763	315075	822838	82283.8	740554.2			

Manganese ore zone

Year	Waste from Nandagira quarry	Road Maintenance @10%	Dumping over existing dump-4	Utilization		Location
				Area of dumping (m2)	RL(m)	
2020-21	95030	9503	85527	3500	592	2424800-2421970N and 317230-317390E
2021-22	71380	7138	64242	2100	607	
2022-23	58220	5822	52398	3500	607	
2023-24	205130	20513	184617	12300	622	2424250-2424400N and 317275-317475E
2024-25	628752	62875.2	565876.8	37725	622	
Total	**1058512**	**105851.2**	**952660.8**			

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Back-filling

Waste to be generated from quarry-1 will be disposed of in the exhausted part of quarry-1. The details of back-filling will be as follows:

Year	Waste from quarry-1	Road Maintenance	Volume of waste to be Back-filled	Utilization		
				Area of back-filling (m2)	RL(m)	Location
2020-21	36852	7031	29821	4214	570	2412219-2412300 307593-307662
2021-22	40297	17413	29915	5472	570	2412134-2412235 307661-307630
Total	77149	24444	59736			

Quantity of waste to be generated during conceptual period.

The waste generated during conceptual period will be as side burden/over burden. The details of waste to be generated during conceptual period are furnished below:

Particulars		Iron ore zone	Manganese ore zone
Side burden/over burden removal during conceptual period	=	1467805cum	2794590cum
Intercalated waste	=		
Volume of ore available during conceptual period.		15392700cum	728122cum
Volume of waste @ 42% from iron ore zone and 66% from Manganese ore zone.	=	6464934	480560
Intercalated Waste during plan period	=	507763	283092
Intercalsted Waste available during conceptual period	=	5957171	197468
Total waste generation	=	1467805+ 5957171 7424976cum	2794590+197468 2992058cum

Utilization of conceptual waste

As per the above table, waste generation during conceptual period is 7424976cum from iron ore zone and 2992058cum from Manganese ore zone. The total waste so generated will be utilised for back-filling of mined out land. This will be utilised for back-filling of exhausted pit during conceptual period. The details of back-filling during conceptual period will be as follows:

Year	Back-filling No	Area(m2)	Volume of waste to be back-filled (m3)	Top RL
Beyond 2024-25	1	5484	54840	595
	2	47858	382864	489
	3	64074	512592	484
	4	5170	62040	520
	5	1150	4600	500
	6	26794	589468	580
	7	4454	53448	480
	8	5018	60216	592
	9	167030	6050123	550
	10	53927	542073	604
	11	68298	546384	502
	12	10196	81568	538
	13	31536	756864	558
	14	1921	23052	586
	15	59259	711108	572
	Total	**551769**	**10417034**	10424437

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Bench plantation during the conceptual Period

A total of 57.224Ha will be covered under plantation during conceptual period. The details of bench plantation will be as follows:

YEAR	Bench Plantation No	Area(m2)	Top RL	Bottom RL	Nos of Plants(@ 1600/Ha.)
Beyond 2024-25	1	166866	614	468	26699
	2	161379	598	464	25821
	3	125682	642	566	20109
	4	14663	586	562	2346
	5	13212	604	574	2114
	6	90446	753	572	14471
	Total	**572248**			91560

Generation of Mineral Rejects:

	Iron ore zone	Manganese ore zone
Volume of ore zone(cum)	15392700	728122
Recovery of ROM(cum)	8927766	247561.48
Volume of Mineral Reject(cum)	5803047.9 (@65% of total ROM)	29707.378(@12% of total ROM)

Note: It has been envisaged that total ROM will be sent to out side the lease area for processing of the Same

Environmental Aspects

Land Degradation/Utilization: An area of 124.469hectares land is already degraded/ utilized for mining, dumping, office, road etc. At the end of the plan period, 144.285Ha will be utilized for mining and allied activities. The details of land use pattern is furnished below:

Sl. No.	Type of land use	As at present (ha)	As at the end of plan period (ha)	As at the end of Conceptual period (life of mine) (ha)
1	Area under excavation	27.207	32.107	112.39
2	Storage for Topsoil	0.00	0.05	1.05
3	Overburden dump	19.894	21.094	21.094
4	Mineral Storage	17.804	28.804	28.804
5	Infrastructure facilities (weigh bridge, work shop, office, etc.)	3.984	5.50	5.50
6	Road	11.00	12.20	12.20
7	Railways	0	0	0
8	Plantation	0	0	0
9	Tailing Pond	0	0	0
10	Effluent Treatment Plant	0.630	0.630	0.630
11	Mineral processing Plant/ Beneficiation plant/site services	0	0	0
12	Others (Green belt/plantation)	43.900	43.900	43.900
	Total	**124.469**	**144.285**	**225.567**

Grass Seeding: -

It is suggested to sow grass seeds along the slope of terrace of waste dump and bench slope for preservation of top soil during the process of reclamation and rehabilitation of conceptual period. The grass shall be fresh free from weed and rank vegetation but leaving rhizome with sufficient nodes. Other soil forming local grasses like dichathiumannulum ,cenchruscilierlisandpanniciumrepones (lemon grass) vertiver grass, elephant grass, citrella A. baughanvilla, would also be useful-preferably a mix of the above grass.

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Afforestation and Reclamation/Rehabilitation: Till date an area of 43.90 hectares has been covered under plantation including the safety zone. During plan period, 4.00 hectares area will be planted within the safety zone area. Beyond plan period, 5.00 hectares is anticipated to be planted within the safety zone by the available local species. Cumulatively, total area under plantation will be 43.90 (Existing) + 4.0 (Plan period) + 5.0(Beyond) = 52.90 hectares. Plantation Schedule during ensuing plan period: The proposed plantation schedule is given here under:

Year	Location	Area Proposed(Ha)	No. of saplings
2021-22	Safety Zone	1.00	2000
2022-23	-do-	1.00	2000
2023-24	-do-	1.00	2000
2024-25	Dump	1.00	2000
Total		**4.00**	**8000**

RECLAMATION / REHABILITATION

Existing:

Around 27.207 hectares of land has already been degraded due to mining activity. None of the area has been reclaimed till date.

Proposed:

During ensuing plan period 4.90ha additional area will be utilized for mining activities. Hence,at the end of 2024-25 total area under mining will be 32.107Ha.

Reclamation & rehabilitation measures during ensuing plan period.

Existing

About 0.042ha of area within quarry-3 has been back-filled till date by previous lessee.

During plan period

Year wise generation and utilization of waste

Year	Back-filling (cum)	Area of Back-filling (m2)	Avg Height (m)	RL(m)	Name of the quarry
2020-21	33134	4214	7	570	Quarry-3
2021-22	33239	5472	8	570	
Total	66373	9686			

Details of back-filling

Year	Name of the block	Grid location of proposed back-filling	Waste to be back-filled	Area to be back-filled (ha)	Level of back-filling	plantation
2020-21	Quarry-3	21122°9-2412300 307590-307662	29620.8	0.42	570mRL	–
2021-22		2412134 2412235 307581-307630	29815.1	0.54	570mRL	Plantation over 0.92 Hs will be done to reclaim the back-filled area with 1500 nos of saplings.
Total				0.96		

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Dump plantation:

The dump will be stabilized by means of plantation. As shown in the Reclamation plan after proper terracing, the dump over an area of 1.90 Ha will be reclaimed by means of afforestation plantation at dump-4. Plantation over the dump will be under taken from 2023-24 onwards.

Post Mining Land use Pattern

Based on the existing exploration status, ultimate pit limits have been earmarked. Infrastructures will be demolished. Road will be left as such for public use. Mineral separation plant area will be rehabilitated by way of plantation after cessation of mineral processing. However, the post mining land use pattern will be as follows:

Sl. No.	Type of land use	Post Mining land use plan (ha)	Method of reclamation
1	Area under excavation	112.39	Regrassing and Plantation
2	Storage for Topsoil	1.05	Plantation
3	Overburden dump	21.094	Regrassing and Plantation
4	Mineral Storage	28.804	Plantation
5	Infrastructure facilities (weigh bridge, work shop, office, etc.)	5.50	Plantation
6	Road	12.20	Public Use
7	Railways	0	
8	Plantation	0	
9	Tailing Pond	0	
10	Effluent Treatment Plant	0.630	Plantation
11	Mineral processing Plant/ Beneficiation plant/site services	0	
12	Others (Green belt/plantation)	43.900	Plantation
	Sub Total	**225.567**	
	Un used	**164.75**	
	Total	**390.317**	

B. Underground Mining

Not Applicable

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CHAPTER-III

3.0 Mine Drainage

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

The ground water table occurs at a depth of 35m (at 435mRL) to 45m (at 425mRL) from general surface / ground level (470mRL).

3.2 Indicate maximum and minimum depth of Workings.

Mining will be done between the levels 628mRL and 534mRL in plan period of 2 years and ground water table fluctuates between 435mRL to 425mRL. Therefore, there is no possibility of ground water puncture during the scheme period of 5 years as well as beyond.

Name of the Quarry	Existing depth in (mRL)		At the end of plan period (mRL)	
	Top	Bottom	Top	Bottom
Q-5	540	500	540	500
Q-5 top	610	605	610	605
Q-1N	601	544	601	528
Q-8	640	635	640	617
Q-6	585	570	585	570
Q-6A	540	500	540	500
Q-6B & 6C	520	500	520	500
Q-1	627	558	627	561
Q-3	583	560		–
Q-7	510	490	510	490
Q-7B	530	520	530	520
Q-2	570	541	570	541
Q-2A	566	553	566	553
Q-4	520	515	520	515
Q-4A	540	535	540	535

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

Working quarries being located on slopes and open ended towards the general slope, the working quarries are / will be of self-draining. The maximum depth of working quarry will be 490mRL in quarry-7. In Nandagiri quarry the ultimate depth will be 534m.RL. As the ground water will be at 435m.RL there is no chance of intersection of ground water during plan period. However, the natural draining system will be made only in monsoon season since there is no intersection or chance of seepage of ground water. The floor of the quarry as well as benches is proposed to be inclined towards the natural slope so that the direct precipitated water will be drained down the slope automatically which will be canalized to nearby surface water bodies through settling tank. There is no proposal of deployment of water pumps since ground water will not be intersected during plan period.

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

Drainage: The core zone (lease area) is made up four hilly blocks dissected by the natural streams at many places with varying slope. Two perennial nalas flow from the eastern part and one perennial nala locally known

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as Rajabasanala flow from the SW part of the lease area. These perennial nalas merge to form the Bhutudanala which flows towards north and finally drains into Kurarhinala in the north part outside ML area. Eastern part in buffer zone is drained by KhandadharNala and GagarNala which flow due east. Their confluence point exists a distance of 6km from the lease area. From the confluence point, Hansarachinala starts flowing towards further east.

South-North trending dissected hill range that dominates the northern part of the buffer zone seasonal nala& starting from the hill range joins with a perennial nala flowing north parallel to the eastern lease boundary of Lohadangar block (ref : Plate-III). Finally, water flows into SarkandaNala in the North, an important tributary of the buffer zone.

Through there is another perennial nala known as KhandadharNala exists at a distance of 8 km from southern lease boundary and flows due west there is no scope of drainage of southern most Nandagira hill block. The entire drainage which has a broad dendritic pattern is controlled by this tributary in the northern part.

Rainfall : There is a wide variation of rainfall in the catchment area and around 10kms radius of buffer zone of this mine. The average annual rainfall of Sundergarh Dist. has been computed by taking the data of last 10 years which comes to 1364.66mm, out of which 92% occur in monsoon months. The average annual rainfall of this mine area is affected by steep hills, forest cover etc. The average rainfall is 1325.16 mm.

Kurarhinala with many perennial & seasonal streams and tributaries of the different order constitutes the main dendritic pattern of drainage system in the area. Two perennial nalas flow from the eastern part and one perennial nala locally known as Rajabasanala flow from the SW part of the lease area. These perennial nalas merge to form the Bhutudanala which flows towards north and finally drains into Kurarhinala in the north part outside ML area. Bhutudanala constitutes the nearest source of water for the M.L. area under consideration.

Average annual rainfall is 1325mm. The south-west monsoon lasts from mid-June to mid-September and the area receives more than 80% of the annual rainfall during the period. Likely quantity of rain water / annum is 339.838 hectares x 1325mm = 3398380m^2 x 1.325m = 5,297,854 m^3. Keeping in view the evapo-transpiration and seepage into sub-surface at 40%, water flow within lease area will be 5,297,854 x 60% = 3,178,712 m^3 which will be (1) harvested in the rain water harvesting pond for incustrial use, plantation etc. and (2) drained through the Bhutudanala& finally drained to Kurarhinala.

In the southern side of the lease area with active mining zone(Nandgira block), a part of the surface water is allowed to settle in the Q-1N and the rest runs through garland drains, check dams and settling ponds before discharge to nearby water courses. In the northern part of the lease area (Mahulsukha block), the surface runoff is channelized through channel drains, settling ponds and rainwater harvesting pond before discharge to Bhutudanala.

Surface water run off management

From the topography it can be observed that the perennial water flow is due North & NE. It has been planned to make surface run off management for flowing of water during rainy season. The seasonal drains will be channelized in such a way that the rain water from the catchment area will allow to flow through check weirs/settling pond so that clear water will be enter into the nala. The existing and proposed protective measures like retaining wall, garland drain and settling pond will act as barrier for restricting the wash offs from the dumps/stocks etc.

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Protective measures already carried out for Run-off Management: Fairly good run-off water management practices are being followed by the lessee to prevent the flow of silt along with the run off to outside during monsoon period. The mine has constructed eight nos. of check dam cum siltation pond inside the mine lease area; five of them have been washed out partly and will be repaired. Retaining wall and garland drains have been provided at strategic locations. The accumulated silts in these facilities during monsoon period are being de-silted at regular intervals.

Retaining Wall

Sl. No.	LOCATION	Dimension(m)		
		Length	Width	Height
1	Around OB Dump-1	572	1	1
2	Around OB Dump-3	712	1	1
3	Around OB Dump-4	1004	1	1
4	Around OB Dump-5	184	1	1
5	Around OB Dump-6	245	1	1
6	Safety Zone in side Quarry 1N-Nandagira (upper line)	298	1	1
7	Safety Zone in side Quarry 1N-Nandagira (lower line)	119	1	1
8	Safety Zone in side Quarry 1N-Nandagira	72	1	1
9	Old road side- Western side of Quarry 1N(Nandagira)	190	1	1

Garland Drain

Sl. No.	Location	Dimension(m)		
		Length	Width	Depth
1	Behind Magazine	150.00	1.60	1.0
2	Around OB Dump-1	85	1	1.5
3	Around OB Dump-4	220	1	1
4	Near Security Post (Plot No. 8)	60.00	2.90	1.5
5	Plot No. 8	200.00	2.00	1.0
6	Plot No. 9 (Processing & Stack Yard)	200	2.30	1.0
7	Nandagira Mines Bottom	12.60	2.00	1.0
8	Old Mine Road	22.00	1.50	1.0
9	Below Plot No. 16	156.00	2.00	1.0
10	Kalidhara	36.00	2.00	1.0

Settling Pond

Sl. No.	Location	Dimension(m)			GPS Coordinate	
		Length	Width	Depth	Latitude	Longitude
1	Behind Magazine	4.30	3.80	1.90	21°48'23.44"	85°08'31.20"
2	Behind Magazine	7.00	6.60	2.10	21°48'23.44"	85°08'31.20"
3	Near Security Post (Plot No. 8)	6.00	4.30	2.60	21°48'20.88"	85°08'33.11"
4	Near Security Post (Plot No. 8)	7.10	3.20	2.00	21°48'20.88"	85°08'33.11"
5	Plot No. 8	5.70	3.50	2.00	21°48'19.40"	85°08'34.51"
6	Plot No. 8	18.00	10.10	1.90	21°48'16.88"	85°08'34.76"
7	Plot No. 9 (Near OB)	10.50	3.80	2.00	21°48'25.98"	85°08'20.51"
8	Plot No. 9 (Near Stack Yard)	7.80	4.70	2.50	21°48'26.21"	85°08'24.65"
9	Near Office	8.00	6.20	2.80	21°48'13.86"	85°08'33.43"
10	Near Temple	7.10	5.40	3.00	21°48'10.76"	85°08'34.91"
11	Nandagira Mines Bottom	6.70	6.00	3.30	21°47'33.47"	85°08'48.48"
12	Old Mine Road	10.00	6.80	3.40	21°47'29.51"	85°08'42.22"
13	Old Mine Road	7.00	4.50	3.70	21°47'29.51"	85°08'42.22"
14	Near Plot No. 16	14.70	10.60	3.40	21°47'41.35"	85°08'57.23"
15	Old Quarry	33.00	21.00	7.00	21°47'45.38"	85°08'55.72"

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Sl. No.	Location	Dimension(m)			GPS Coordinate	
		Length	Width	Depth	Latitude	Longitude
15	Kalidhara	10.00	7.70	4.00	21°47'47.51"	85°09'57.19"
17	Kalidhara	7.60	6.40	2.60	21°47'47.51"	85°09'57.19"
18	Active Dump Nandagira	10.00	8.00	2.50	21°47'45.24"	85°09'04.18"

Check Dam

Sl. No.	Location	Dimension(m)			GPS Coordinate		Remarks
		Length	Width	Height	Latitude	Longitude	
1	West of Q-1N(Nandagira)	4.50	3.00	1.00	21°47'32.08"	85°08'46.09"	---
2	West of Q-1N(Nandagira)	4.50	3.00	1.00	21°47'31.02"	85°08'43.94"	---
3	West of Q-1N(Nandagira)	6.00	3.50	1.00	21°47'29.83"	85°08'42.83"	---
4	B. Singh Huting (Nandagira)	16.00	3.00	1.00	21°47'30.16"	85°08'40.56"	Partly washed out. To be re-constructed
5	Kalidhara	11.50	3.00	1.30	21°47'48.58"	85°08'55.32"	Partly washed out. To be re-constructed
6	Near Temple	13.40	3.00	1.30	21°48'1.20"	85°08'35.81"	Partly washed out. To be re-constructed
7	Near Huting	10.60	3.20	1.00	21°48'13.90"	85°08'36.24"	Partly washed out. To be re-constructed
8	Across Seasonal Nala	15.00	3.00	1.30	21°47'43.61"	85°08'53.27"	Partly washed out. To be re-constructed

Rain water harvesting pond: Rain water harvesting pond is made for conservation and augmentation of ground water. The runoff water is channelized to rain water pond through channel drains and settling pits. The Water from the rain water pond will be used for dust suppression & watering the plants. The outlet side of the rain water pond has been made with stone pitching to control wash offs and sliding during monsoon. The outlet passage is fitted with coco filters to arrest solid particles and to facilitate flow of water outside ML area.

Rainwater Harvesting Pond

Sl. No.	Location	Dimension(m)			GPS Coordinate	
		Length	Width	Depth	Latitude	Longitude
1	Behind Magazine	14.3	12.5	1.7	21°48'24"	85°08'31"

Proposed protective measures:

The details have been furnished in Ch-IV

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CHAPTER – IV

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

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

Nature of Waste:

In the Mahulsukha manganese block, mainly two types of waste is being generated. The waste encountered during the mining operation is as follows:-

Topsoil: Mineable area exposes manganiferrous shale, laterite and manganese ore. There is no topsoil in the mineable area. However, topsoil encountered incidentally during the course of mining will be scrapped off, transported and spread over the dead portion of the waste dump for concurrent rehabilitation. Prior to stripping, the area will be cleared by removing the unwanted growth. The proposed procedure for soil handling includes soil handling measures in order to optimize retention of soil characteristics (in terms of nutrients and micro-organisms) conducive to growth of plant..

OB/SB/IB/IW:

Overburden waste: Containing laterites & shale, above the manganese ore body.

Intercalated waste: Found in between the ore zone having no or negligible mineral content less than the threshold value of Mn ore (i.e. below 10% Mn).

The waste incidental to the exploitation of manganese ore to be generated in form of overburden and intermediate waste are lateritic soil, laterite, shale and BHJ in certain cases. The tonnage factor of waste is taken as 2.2t/m3. Yearwise and quarry wise generation of these waste materials will be as follows:

Quantity of yearly generation of waste (-10%Mn) & mineral rejects (10-20%Mn):

Both intercalated waste and side burden having -10%Mn will be generated during the plan period. The intercalated waste will be 66% of the total excavation. Further, there will be handling of side burden/intermediate burden (mainly shale/BHJ) during ensuing plan period.

Mineral rejects (10-20%Mn) will be generated @ 4% out of the total volume of ore zone. The generation vis-à-vis storage/blending have been furnished in the following table.

Year	Iron ore Zone			Mn ore Zone			Total Waste(m^3)
	Intercalated waste (m^3)	Overburden and side burden (m^3)	Total Waste (m^3)	Intercalated waste (m^3)	Overburden and side burden (m^3)	Total Waste (m^3)	
2020-21	0	0	0	33570	61460	95030	95030
2021-22	0	0	0	33570	37810	71380	71380
2022-23	120704	135575	256279	44220	14000	58220	314499
2023-24	145677	89400	235077	59730	145400	205130	440207
2024-25	241382	90100	331482	112002	516750	628752	960234
Total	**507763**	**315075**	**822838**	**283092**	**775420**	**1058512**	**1881350**

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

Selection of dumping site mostly depends upon the factors like topography, drainage, land use, mineral inventory, pit configuration, mine waste characteristics, its volume of generation and economy in transportation

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etc. Keeping in view the above physical as well as techno-economic factors and non mineralized zone it has been planned to dispose of the waste materials four separate locations.

The waste to be generated during plan period will be disposed of at two separate locations no. at dump-4 and exhausted part of quarry-3. The area under querry – 3 has been proved as barren by 7 no of DTH holes and exposed shale. Earlier before dumping at Dump no.-4, 5nos of DTH were put to know the bareness of the dumping ground. Accordingly Dump-4 has been created. The waste generated from iron ore zone shall be kept at Dump-8.

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

Method and manner of disposal of waste:

Waste generation

Year	Iron ore Zone			Mn ore Zone			Total Waste(m^3)
	Intercalated waste (m^3)	Overburden and side burden (m^3)	Total Waste (m^3)	Intercalated waste (m^3)	Overburden and side burden (m^3)	Total Waste (m^3)	
2020-21	0	0	0	33570	61460	95030	95030
2021-22	0	0	0	33570	37810	71380	71380
2022-23	120704	135575	256279	44220	14000	58220	314499
2023-24	145677	89400	235077	59730	145400	205130	440207
2024-25	241382	90100	331482	112002	516750	628752	960234
Total	**507763**	**315075**	**822838**	**283092**	**775420**	**1058512**	**1881350**

Waste management during plan period

As per the above table, it is envisaged that 822838cum from Iron ore zone and 1058512 cum from manganese ore zone will be generated. It has been planned that about 10% of generation will be utilized for road maintenance and balance waste will be disposed of at earmarked site. The details of utilization of waste will be as follows:

Waste Management during plan period

Dumping

Iron ore zone

Year	Iron ore Zone			Management				Location
	Intercalated waste (m^3)	Overburden and side burden (m^3)	Total Waste (m^3)	Road Maintenance	Dumping	Area (m2)	TOP RL	
2020-21	0	0	0	0	0	0	–	
2021-22	0	0	0	0	0	0	–	
2022-23	120704	135575	256279	25627.9	230651.1	15376	620	2410510-2410590 and 307820-307900
2023-24	145677	89400	235077	23507.7	211569.3	14104	620	
2024-25	241382	90100	331482	33148.2	298333.8	10888	631	
Total	**507763**	**315075**	**822838**	**82283.8**	**740554.2**			

Manganese ore zone

Year	Waste from Nandagira quarry	Road Maintenance @10%	Dumping over existing dump-4
2020-21	95030	9503	85527
2021-22	71380	7138	64242
2022-23	58220	5822	52398
2023-24	205130	20513	184617
2024-25	628752	62875.2	565876.8
Total	**1058512**	**105851.2**	**952660.8**

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Back-filling

Waste to be generated from quarry-1 will be disposed of in the exhausted part of quarry-3. The details of back-filling will be as follows:

Year	Waste from quarry-1	Road Maintenance	Volume of waste to be Back-filled	Area of proposed back-filling (m2)	Top RL(m)
2020-21	36652	7031	29621	4214	570
2021-22	40297	17413	29915	5472	570
2022-23	0	0	0		
2023-24	0	0	0		
2024-25	0	0	0		
Total	77149	24444	59736		

Precaution for confinement of dump to prevent pollution of surface water bodies/ courses:

The waste generated from the mines shall be dumped in the non-mineralized area earmarked in the plan. The precautionary and protective measures to be adopted during waste disposal are as follows:

- The ultimate dump slope shall be maintained at 20-27° with individual terrace slopes not exceeding 37°
- Each terrace will have inward slope with catch drain at the inward slope of terrace.
- Catch drain of the individual terrace shall be connected to the garland drain outside the periphery of dump. Catch drain preferably to be made up of the half concrete open pipes followed by settling tanks to avoid wash offs and have provision of berms at the outer side to reduce gully formation due to rain water wash offs.
- Toe wall, garland drain and settling tank will be constructed around the dump. The details of existing and proposed protective measures will be as follows:

PROTECTIVE MEASURES

Protective measures already carried out for Run-off Management: Fairly good run off water management practices are being followed by the lessee to prevent the flow of silt along with the run off to outside during monsoon period. The mine has constructed eight nos. of check dam cum siltation pond inside the mine lease area; five of them have been washed out partly and will be repaired. Retaining wall and garland drains have been provided at strategic locations. The accumulated silts in these facilities during monsoon period are being de-silted at regular intervals.

Retaining Wall

Sl. No.	LOCATION	Dimension(m)		
		Length	Width	Height
1	Around OB Dump-1	572	1	1
2	Around OB Dump-3	712	1	1
3	Around OB Dump-4	1004	1	1
4	Around OB Dump 5	184	1	1
5	Around OB Dump-6	245	1	1
6	Safety Zone in side Quarry 1N-Nandagira (upper line)	288	1	1
7	Safety Zone in side Quarry 1N-Nandagira (lower line)	119	1	1
8	Safety Zone in side Quarry 1N-Nandagira	72	1	1
9	Old road side- Western side of Quarry 1N(Nandagira)	199	1	1

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Garland Drain

Sl. No.	Location	Dimension(m)		
		Length	Width	Depth
1	Behind Magazine	150.00	1.80	1.0
2	Around OB Dump-1	85	1	1.5
3	Around OB Dump-4	220	1	1
4	Near Security Post (Plot No. 8)	60.00	2.90	1.5
5	Plot No. 8	200.00	2.00	1.0
6	Plot No. 9 (Processing & Stack Yard)	200	2.30	1.0
7	Nandagira Mines Bottom	12.60	2.00	1.0
8	Old Mine Road	22.00	1.50	1.0
9	Below Plot No. 16	156.00	2.00	1.0
10	Kalidhara	36.00	2.00	1.0

Settling Pond

Sl. No.	Location	Dimension(m)			GPS Coordinate	
		Length	Width	Depth	Latitude	Longitude
1	Behind Magazine	4.30	3.80	1.90	21°48'23.44"	85°08'31.20"
2	Behind Magazine	7.00	6.60	2.10	21°48'23.44"	85°08'31.20"
3	Near Security Post (Plot No. 8)	6.00	4.30	2.60	21°48'20.88"	85°08'33.11"
4	Near Security Post (Plot No. 8)	7.10	3.20	2.00	21°48'20.88"	85°08'33.11"
5	Plot No. 8	5.70	3.50	2.00	21°48'19.40"	85°08'34.51"
6	Plot No. 8	18.00	10.10	1.90	21°48'16.88"	85°08'34.76"
7	Plot No. 9 (Near OB)	10.50	3.80	2.00	21°48'25.99"	85°08'20.51"
8	Plot No. 9 (Near Stack Yard)	7.80	4.70	2.50	21°48'26.21"	85°08'24.65"
9	Near Office	8.00	6.20	2.80	21°48'13.86"	85°08'33.43"
10	Near Temple	7.10	5.40	3.00	21°48'10.76"	85°08'34.91"
11	Nandagira Mines Bottom	6.70	6.00	3.30	21°47'33.47"	85°08'48.48"
12	Old Mine Road	10.00	6.80	3.40	21°47'29.51"	85°08'42.22"
13	Old Mine Road	7.00	4.50	3.70	21°47'29.51"	85°08'42.22"
14	Near Plot No. 16	14.70	10.60	3.40	21°47'41.35"	85°08'57.23"
15	Old Quarry	33.00	21.00	7.00	21°47'45.38"	85°08'55.72"
15	Kalidhara	10.00	7.70	4.00	21°47'47.51"	85°08'57.19"
17	Kalidhara	7.60	6.40	2.60	21°47'47.51"	85°08'57.19"
18	Active Dump Nandagira	10.00	8.00	2.50	21°47'45.24"	85°09'04.18"

Check Dam

Sl. No.	Location	Dimension(m)			GPS Coordinate	
		Length	Width	Height	Latitude	Longitude
1	West of Q-1N(Nandagira)	4.50	3.00	1.00	21°47'32.06"	85°08'45.56"
2	West of Q-1N(Nandagira)	4.50	3.00	1.00	21°47'31.02"	85°08'43.94"
3	West of Q-1N(Nandagira)	6.00	3.50	1.00	21°47'29.83"	85°08'42.83"
4	B. Singh Hutting(Nandagira)	16.00	3.00	1.00	21°47'30.16"	85°08'40.56"
5	Kalidhara	11.50	3.00	1.30	21°47'48.59"	85°08'55.32"
6	Near Temple	13.40	3.00	1.30	21°48'11.20"	85°08'35.81"
7	Near Hutting	10.60	3.20	1.00	21°48'13.90"	85°08'36.24"
8	Across Seasonal Nala	15.00	3.00	1.30	21°47'43.51"	85°08'53.27"

Rain water harvesting pond: Rain water harvesting pond is made for conservation and augmentation of ground water. The runoff water is channelized to rain water pond through channel drains and settling pits. The Water from the rain water pond will be used for dust suppression & watering the plants. The outlet side of the

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rain water pond has been made with stone pitching to control wash offs and sliding during monsoon. The outlet passage is fitted with coco filters to arrest solid particles and to facilitate flow of water outside ML area.

Rainwater Harvesting Pond

Sl. No.	Location	Dimension(m)			GPS Coordinate	
		Length	Width	Depth	Latitude	Longitude
1	Behind Magazine	14.3	12.5	1.7	21°48'24"	85°08'31"

Proposed protective measures

It has been planned to make retaining wall, garland drain, settling pond etc at strategic point by which water can be channelized through the proposed protective measures and ultimately allowed to flow within the nalas flowing within the lease areas. The details of protective measures are furnished below:

Retaining wall, garland drain, settling pond and Coir Matting

Year	Location	Retaining wall (m)	Garland drain (m)	Settling Tank/ Pond(nos)	Coir matting/ Grass Patching (m2)
2022-23	Dump – 8	270	300	1	–
2023-24	Dump - 4	-	-	-	7000
Total		**270**	**300**	1	7000

Plantation during 2021-22

Item	Location / Block	Plantation	No of saplings
Safety Zone area	308245/2410973-308500/2411113	1 Ha	2000 nos
Plantation during 2022-23			
Safety Zone area	307820/2411068-307937/2411191	1 Ha	2000 nos
Plantation during 2022-23			
Safety Zone area	308118/2412241-308284/2412198	1 Ha	2000 nos
Plantation during 2022-23			
Dump-4	308721/2411094-308765/2411201	1 Ha	2000 nos
G Total		4 Ha	8000 nos

Mineral Rejects/ Sub-grade ore:

Rate of yearly generation of sub-grade mineral with reference to threshold values and proposals for stacking during the remaining 5 years of plan period:

Sub-grade/Mineral Reject Stack:

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Disposal of Mineral rejects of manganese ore

Manganese ore

Year	Mineral reject (m^3)	Utilization (m^3)		Location of Stacking	Dimension	
		Blending (70%)	Storage (30%)			
2020-21	2076	1453	623	308299/2411998-308321/2412010 to 308347/2411968-308325/411955	50m x 25m x 5m	505
2021-22	2075	1453	623			
2022-23	2734	1914	820			
2023-24	3692	2584	1108			
2024-25	6924	4847	2077			
G Total	**17501**	12251	5250			

Iron ore

Year	Mineral reject (m^3)	Utilization		Location of Stacking	Dimension	Top RL
		Blending (80%)	Storage (20%)			
2022-23	58340	46672	11668	308223/2411974-308293/2412000 to 308321/2411936-308250/2411912	75m x 70m x 10m	510
2023-24	70410	56328	14082			
2024-25	116668	93334	23334			
G Total	**245419**	**196335**	**49084**			

Note: The ROM will be dispatched outside for processing. Hence, the mineral reject generated during the plan period will be sent along with high grade ore.

Engineering details of retaining walls & Garland drains

The average rain fall has been considered as 1300mm/year. Since the proposed waste dumps are located in areas which is a steep slope, maximum flow of water in rainy season will endanger the retaining walls. Therefore, it has been proposed to construct masonry wall with weep holes along the toe of the proposed dump. However, the following precautionary measures shall be taken while designing the retaining walls and garland drains.

Retaining Walls

Retaining boulder wall (1.5 m high and 1.0 m width) of substantial strength shall be constructed all around the bottom periphery of waste dumps with locally available boulders mixed with sand and cement, to arrest any rolling down of the dump materials. Perforation shall be left at around 10 m intervals to allow for passage of water.

Garland drains

Garland drains of 1.5 m deep and 1.0 m wide shall be constructed all along the bottom periphery of waste dumps followed by the retaining wall to prevent any wash off or leaching of dump materials during heavy rains. Side walls and the base shall be pitched with locally available boulders. Joints shall be filled up with cement and sand mixture so that water cannot percolate.

Settling Tank

The garland drain shall be channelized to settling tank of 15m long, 10m width and 2.0m deep. Side walls and base shall be packed with locally available boulders mixed with cement and sand.

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CHAPTER-V

5.0 USE OF MINERAL AND MINERAL REJECTS

The following are to be furnished in the interest of mineral conservation.

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

The run-off mine (Lump)iron and manganese ore raised from the mine will be sent to outside the lease hold area for processing. After processing of the same at outside, the material will be sold different destination/plants. The Lessee will continue the supply of ores to the industries as the physical and chemical characteristics has been suitable as per their requirements. Regular chemical analysis of the ores will be made for checking the grade of dispatchable ores as per the buyers need. Requirement of Mn ore for end use in terms of physical and chemical specification are furnished below:

Manganese ore

PARAMETERS	STEEL PLANT	FERRO MANGANESE PLANT	SILICO MANGANESE PLANT	BATTERY INDUSTRY
Mn	18-32%	42-46%	32-38%	>46%
Fe	24-16%	8-10%	10-16%	1.5%
SiO2	13% Max	5%	12%Max	0.5%
Al2O3	7.5% Max	3.5%	05% Max	0.5%
P	0.18% Max	0.10% Max	0.15% Max	0.05%
Moisture	3% Max	4.5% Max	4.5 % Max	7% Max
Size	10-40mm	20-50mm	10-50 % Max	10-40mm

Iron ore

Sl. No.	Constituents	B/F Grade	S.M.S Grade	Sponge Grade
1.	Fe	62.5 - 65%	65% min	62% min
2.	SiO_2	—	3% max.	—
3.	Al_2O_3	—	---	—
4.	$SiO_2 + Al_2O_3$	6.5% max.	---	5% max.
5.	Al_2O_3 / SiO_2	1.5% max.	---	—
6.	P	0.05% max.	---	0.03% max.
7.	S	0.02% max.	---	---
8.	Cu	0.04% max.	---	2% max
9.	CaO + MgO	—	---	0.3% max.
10.	MnO	---	---	0.02% max.
11.	Moisture	5% max.	1.5% max.	

5.2Give brief requirement of intermediate industries involved in up-gradation of mineral before its end-use.

The ROM (both iron and Manganese ore) generated from the lease area will be sent out side for further processing.

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It is proposed to set up a beneficiation facility at a suitable location where further grading of the ore will be carried out . A Ferro Alloy plant will also be put up for further value addition. A crushing/sizing and mineral beneficiation facility will be put up for Iron Ore, which can be sold to Steel Plants.

5.3Give detail requirements for other industries, captive consumption, export, associated industrial use etc.

Lessee has no captive units for consumption of manganese ore. However, value addition will be due to up gradation of manganese ore in the M.L area by way of dry processing, manual breaking, sorting, sizing, screening and blending.

5.4 Indicate precise physical and chemical specification stipulated by buyers

The ore from the referred area meets all the specifications of the consumers. Manganese ore raised from the referred area meets all the specifications of the consumers. As far as size is concerned, size ranges are in two forms as 10-75mm as lumps, 0-10mm as fines. The Chemical specification of the manganese ore is represented as follows:

Manganese ore

Sl. No.	Constituents	Grade
1	Mn	30-34%
2	Fe	15-26%
3	SiO_2	5-13%
4	Al_2O_3	5-7.5%
5	P	0.10-0.20 %
6	Moisture	3% (max)

There has been no such instance for change in specification.

Iron ore

Sl. No.	Constituents	Monnet Ispat& Energy Ltd	Bhushan steel ltd	Maheswarilspat Ltd	MSP Metalliks Ltd
1.	Fe	62 - 64%	62.5% min	62-64%	62-63% min
2.	SiO_2	---	3% max.	---	---
3.	Al_2O_3	---	---	---	---
4.	$SiO_2 + Al_2O_3$	5% max.	---	5% max.	5% max.
5.	Al_2O_3 / SiO_2	--	---	--	---
6.	P	0.03% max.	0.03% max.	0.03% max.	0.03% max.
7.	MnO	---	---	---	0.02% max.
8	Size	5-18mm/fines	5-18mm/fines	5-18mm	5-18mm/fines

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

The ROM (both iron and Manganese ore) generated from the lease area will be sent out side for further processing.

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ORE PROCESSING

ROM (iron and manganese ore) to be generated from the lease will be sent outside the lease area for further processing. There is no proposal of mineral processing within the lease area. Hence, process flow sheet has not been furnished in this document.

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It is proposed to set up a beneficiation facility at a suitable location where further gradinig of the ore will be carried out . A Ferro Alloy plant will also be put up for further value addition. A crushing/sizing and mineral beneficiation facility will be put up for Iron Ore, which can be sold to Steel Plants.

5.3Give detail requirements for other industries, captive consumption, export, associated industrial use etc.

Lessee has no captive units for consumption of manganese ore. However, valuc addition will be clue to up gradation of manganese ore in the M.L area by way of dry processing, manual breaking, sorting, sizing, screening and blending.

5.4 Indicate precise physical and chemical specification stipulated by buyers

The ore from the referred area meets all the specifications of the consumers. Manganese ore raised from the referred area meets all the specifications of the consumers. As far as size is concerned, size ranges are in two forms as 10-75mm as lumps, 0-10mm as fines. The Chemical specification of the manganese ore is represented as follows:

Manganese ore

Sl. No.	Constituents	Grade
1	Mn	30-34%
2	Fe	15-26%
3	SiO_2	5-13%
4	Al_2O_3	5-7.5%
5	P	0.10-0.20 %
6	Moisture	3% (max)

There has been no such instance for change in specification.

Iron ore

Sl. No.	Constituents	Monnet Ispat& Energy Ltd	Bhushan steel ltd	Maheswarilspat Ltd	MSP Metalliks Ltd
1.	Fe	62 - 64%	62.5% min	62-64%	62-63% min
2.	SiO_2	—	3% max.	—	—
3.	Al_2O_3	—	—	—	—
4.	$SiO_2 + Al_2O_3$	5% max.	—	5% max.	5% max.
5.	Al_2O_3 / SiO_2	—	—	—	—
6.	P	0.03% max.	0.03% max.	0.03% max.	0.03% max.
7.	MnO	—	—	—	0.02% max.
8	Size	5-18mm/fines	5-18mm/fines	5-18mm	5-18mm/fines

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

The ROM (both iron and Manganese ore) generated from the lease area will be sent out side for further processing.

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CHAPTER-VI

6.0 PROCESSINGOFROMANDMINERALREJECT

As far as mineral conservation is concerned, up-gradation of ore is essentially required along with systematic development of the mine. Therefore, this chapter "Mineral Processing" is detailed to include the associated impurities, their removal process and the processing technique proposed in the M.L area

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

In general, the essential impurities in manganese ore are silica, alumina, sulphur and phosphorus which are in the form of SiO2, Al2O3, FeS2 or CaSO4 and Ca3 (PO4)2 respectively

In general, the essential impurities in Iron ore are silica, alumina, sulphur and phosphorus which are in the form of SiO_2, Al_2O_3, FeS_2 or CaSO4 and Ca3 (PO4)2 respectively. The Al2O3 / SiO2 ratio has an important role in the economics of Fe-ore smelting.

Product Quality and Grade Control of iron ore: Grade control will be managed throughout the mining sequence to meet the product specifications acceptable to the steel plant in terms of size distribution and content of key elements such as Fe, SiO_2 and Al_2O_3.

Product Quality and Grade Control: Grade control is managed throughout the mining sequence to meet the product specifications of the customers in terms of fines content and key elements such as Mn, Fe, SiO_2 and $Al2O_3$.

The following practices are planned to manage product quality & grade control-

Blast hole sampling : The proposed practice consists of creating composite blast hole samples which are analysed in the site laboratory to provide an estimate of the grade within the ROM; based on which the appropriate destination of the material is determined.

Grade control at processing yard: Based on the outcome of the blast hole results, the grade of the ROM will be ascertained. Thus, the grade of ROM will be controlled by blending high grade and low grade material before processing manually. High and low grade ROM delineated by the blast hole sampling process are proposed to be blended to have a grade of about 20-34% Mn which will consist of sorting, sizing, breaking manually. Regular assaying of the feed and final output product will be done to enable the site technical team to vary the blend accordingly to maintain the appropriate grade to meet the buyer's specifications.

6.2 Give a material balance chart with a flow sheet or schematic diagram of the processing procedure indicating feed, product, recovery, and its grade at each stage of processing.

After excavation, the ROM, will be sent to outside for the purpose of processing. After processing of ROM at outside the product will be sold to the market as per consumer's demand. Therefore, process flow sheet of iron and Manganese ore has not been furnished as processing will be done outside the lease area.

Explain the disposal method for tailings or reject from the processing plant.

There is no processing plant in the ML area. So the generation of tailings is nil and hence there is no necessity of its disposal.

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6.3Quantity and quality of tailings /reject proposed to be disposed, size and capacity of tailing pond, toxic effect of such tailings, if any, with process adopted to neutralize any such effect before their disposal and dealing of excess water from the tailings dam.

Not applicable as there is no processing plant within the MI area.

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

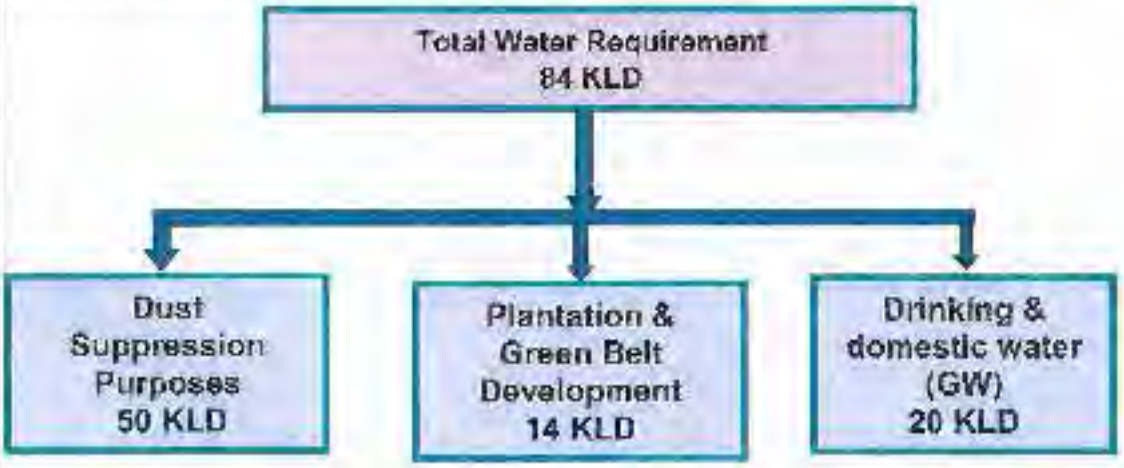
There will be no use of any chemicals. However water will be sprinkled for dust suppression at the processing area.

6.5 Specify quantity and type of chemicals to be stored on site / plant.

Not applicable

6.6 Indicate quantity (m^3 / day) of water required for mining and processing and sources of supply of water, disposal of water and extent of recycling. Water balance chart may be given.

Water consumption will be limited to 84 m^3 / day which consist of 20 m^3 / day for domestic, 64 m^3 / day for non-domestic purpose. Water for drinking / domestic use will be sourced from the boring point of Lessee while water for non-domestic use such as plantation, water sprinkling etc. will be sourced from water harvesting ponds and Bhutudansia.



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CHAPTER -VII

7.0 Others (Describe briefly the following)
7.1 Site services:

Existing Site Services: The lease area can be approached from Barbil through 35 km long well maintained metalled road (NH - 215) uptoKoira, 8 Km. metalled road (National Highway 215 connecting Rourkela and Koira) and a fair weather road of 10 Km which is the link between NH and lease area. Important towns like Barbil (Mining Town) & Rourkela (Steel City in Odisha State and Tata Nagar (Steel City) and Chaibasa (Regional Mine safety office) in Jharkhand State are well connected with Koira which is a P.S. area for the lease area.

Local market sits at Bhutuda on Sunday. However, fully fledged market facilities are available at two important Mining Towns, Tensa NAC (10 km) and Barbil Municipality area in Odisha State and Chaibasa (120 Km) in Jharkhand State. Steel cities located nearby are Rourkela and Tata Nagar.

Electricity is available in the M.L area. As the mine is operated in day shift only, there is no necessity of power for illumination at mines. However a 5KVA DG set is installed for the operation of W/B and site office at the mine.

For staff colony, office illumination and W/B. power requirement is about 40 KW. This 40 KW power is fed from Grid power of WESCO through 63 KVA, 11/0.415 KV substation as primary power & 30 KVA DG set as backup restricted power.

Drinking water is available from the nearby perennial nala and bore well which is supplied by the Lessee through pipe line for domestic use. Water for non-domestic purpose is taken from Bhutudanala and rain water harvesting pond through portable water tankers.

Postal, telephone and internet facility is available at Bhutuda and Telegraphic facility is available at Barsuan a mining town, 10 Km from the mining lease area. Electricity supplied through WESCO and Solar energy is utilized in the lease area for obtaining the telephonic facility.

Proposed site services: For day to day mine operation, following facilities are proposed to be provided in respect of various activities.

Type of Work	Facilities
Mine working	Repair, maintenance & purchase of Machineries/Vehicles/ Equipment/Accessories.
Safety Measures	Provision of helmets, gloves, spades, spectacles.
Protection of Environment	Water sprinkling arrangement for plantation and construction of retaining wall/check dam, development of garland drain, settling tank etc.
Welfare	Provision of rest shed, blasting shed, first aid facilities, wholesome drinking water & ambulance arrangement.

Medical examination of workers shall be carried out periodically, records shall be maintained properly and treatment shall be done accordingly by the specialized doctors.

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Temporary housing facilities will be provided to the laborers within the site with all necessary facilities such as fuel for cooking, mobile toilets, wholesome drinking water, medical/health care etc.

Occupational health surveillance programme of the workers shall be undertaken periodically to observe any contractions due to exposure of dust and take corrective measures.

7.2 Employment potential:

Total work force including Mining Engineer / Geologist appointed under rule MCDR, 2017 and Mines Manager appointed under MMR, 1961 in the mine is estimated to be 110 numbers. About 90% of labour strength will be considered for the local population of SC & ST categories.

Overburden, side burden and inter burden will be transported to the waste dumps and ROM manganese ore will be excavated mechanically and transported by dumper-shovel combination to processing yard for sorting, sizing, breaking, screening manually. Manganese ore will be dispatched through contract trucks after loading manually or by pay loader.

Management & Supervisory Personnel

Designation	Qualification	Personnel
Mines Manager	Degree in Mining with First class Mines Managers Certificate of Competency	1
Mining Engineer	Degree in mining engineering	1
Geologist	M. Sc in Geology	1
Surveyor	Surveyor's certificate of competency	1
Other administrative, clerical & supervising staff	---	6
Total	---	**10**

Workers (skilled / semi-skilled / un- skilled)

1	Skilled	17%	20
2	Semi-skilled	58%	70
3	Unskilled	25%	20
Total	---	100%	110

Total Manpower (category wise) :Considering the absenteeism of workers @10% break-up of total manpower will be as follows:

Sl. No.	Class of personnel	Numbers	Percentage (%)
1	Management/ Supervisory/ Clerical	10	3%
4	Skilled	88	29%
5	Semi-skilled	118	39%
6	Un-skilled	88	29%
Total	---	304	100%

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CHAPTER-VIII

8.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 OF MCDR'1988

8.1 Environment Base line information: Attach a note on the status of baseline information with regard to the following:

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

The Environmental Base line information from october-2005 to Nov-2005 (Post Monsoon 2005) has been collected by M/s Ecomen Laboratories Pvt Ltd, Lucknow. The data is confirming to the norms of MoEF&CC,GOI. Based on these data, EIA & EMP has been prepared and submitted before MoEF for grant of environment clearance for 0.040MTPA production of Mn ore and accordingly, MoEF has accorded approval for the said capacity. Further, environment monitoring is being regularly done and quarterly monitoring report is being submitted to SPCB and IBM. The detail discussion on the base line data are given below.

Land use pattern:

Out of total lease of 380.317Ha, an area of 124.469 hectares has already been utilized/ degraded due to mining and allied activities which is as follows:

Sl. No.	Type of land use	As at present (ha)
1	Area under excavation	27.207
2	Storage for Topsoil	0.00
3	Overburden dump	19.894
4	Mineral Storage	17.804
5	Infrastructure facilities (weigh bridge, work shop, office, etc.)	3.984
6	Road	11.00
7	Railways	0
8	Plantation	0
9	Tailing Pond	0
10	Effluent Treatment Plant	0.630
11	Mineral processing Plant/ Beneficiation plant/site services	0
12	Others (Green belt/plantation)	43.900
	Total	**124.469**

A brief about surface features existing within a periphery of 500m from the lease boundary as per the Rule 32 (5) (b) of MCDR'2017 supported by an Environment Plan in terms of the said rule.

Name of the existing features	Distance	Direction
BhutudaMn Mine, AXL exploration	300m	South east
Sarkunda Iron and Mn Mine of M/s Rungta Mines Ltd	Adjacent to the lease area	North and North East
Khandadhar Iron ore Mine of OMC	250m	South and south west
Village Randa	Adjacent to the lease	West
Village Bhutuda	100m	East
KuradhiNadi	450m	North

8.1.2Water regime, quality of air, ambient noise level, flora, climatic conditions

Kurarhinala with many perennial & seasonal streams and tributaries of the different order constitutes the main dendritic pattern of drainage system in the area. Two perennial nalas flow from the eastern part and one perennial nala locally known as Rajabasanala flow from the SW part of the lease area. These perennial nalas merge to form the Bhutudanala which flows towards north and finally drains into Kurarhinala in the north part outside ML area. Bhutudanala constitutes the nearest source of water for the M.L. area under consideration. Source of drinking water for the lease is the Bhutudanala and boring point near the new office premises and

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water from Bhutudanala is used for non-domestic purpose. Due to the absence of industry nearby, water pollution is negligible.

There is no industry within 5 km. radius of M.L area. Therefore, air pollution in the area is negligible.

The source of the noise in the core (M.L. area) and buffer (5km radius) zone is due to the movement of vehicles and the noise level is felt to be below 75 dB (A).

As discussed, out of the total lease area of 390.317 hectares, forest land includes 370.751 hectares of having 348.129 hectares protected reserved forest and 22.622 DLC forest. General character of the vegetation is dry deciduous type. The vegetation comprises trees, shrubs, herbs etc with species like Asan, Amla, Bahada, Chara,Dhaura, Harida, Dhaman, Jamun, Kendu, Kusum, Mango, Patul, Sal, Semul, Chhana, Atundi, Muturi&Siali etc. The forest is of open type with density 0.1.

The climate in the area is generally cold in winter between November and February and hot in summer between March and June. The monsoon sets in late June and continues up to the end of August. The mean minimum & mean maximum temperature shows the variation between 4.40 C to 47.60 C. Average annual rainfall is 1325mm. January, May & August are the coldest, hottest & rainiest month respectively.Predominant wind direction is South-West.

8.1.3 Human settlements

Office premises and hutting comes within lease area. People of the buffer zone are mostly engaged in mining, agriculture and forest produce. Socio-economic condition ten (10) villages selected within 5 km radius of the M.L area has been assessed as follows:

❖ **Population Distribution pattern**

Male to Female ratio is 1000:910. Area around the mine is dominated by the scheduled tribes. However, the population distribution pattern is as follows:

- No. of villages studied = 10
- Total population (as per Census of India, 2011) = 9,672
- Male = 5,063
- Female = 4,609
- SC = 681 (7%)
- ST = 6,683 (69%)

POPULATION DISTRIBUTION PATTERN (Source: Census of India, 2011)

Sl. No.	Name of the village	POPULATION			SC	ST
		Male	Female	Total		
1	Barsuan	1659	1454	3113	359	1613
2	Bhutuda	457	372	829	48	618
3	Baurkela	58	50	108	—	108
4	Budhabhuin	563	508	1071	53	1007
5	Damalu	292	338	630	20	536
6	Ladapani	113	107	220	—	219
7	Lasi	345	341	686	67	561
8	Randa	136	122	258	—	208
9	Ranta	402	328	730	56	591
10	Saskela	1038	989	2027	78	1222
—	**Total**	**5,063**	**4,609**	**9,672**	**681**	**6,683**

❖ **Literacy Level**

Total population and literates are 9,672 and 4,189 respectively. Overall literacy level is 43%. Highest & lowest level of literacy is observed at village Barsuan (59%) and village Ladapani (10%).

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LITERACY LEVEL (Source: Census of India, 2011)

sl. no.	Name of the village	Total population	Literacy			
			Male	female	total	
1	Barsuan	3113	1081	754	1835	
2	Bhutuda	829	185	75	260	31
3	Baurkela	108	22	11	33	31
4	Budhabhuin	1071	240	123	363	34
5	Damalu	630	183	155	338	54
6	Ladapani	220	12	9	21	10
7	Lasi	686	80	38	118	17
8	Randa	258	61	35	96	37
9	Rantha	730	67	17	84	12
10	Sasakela	2027	622	419	1041	51
—	Total	9,672	2,553	1,636	4,189	43

❖ **Status of Employment**

People of the area are mostly engaged in mining, forest produce and agriculture for their livelihood. The details of the status of employment are as follows:

- Main workers = 3,011 (31%)
- Marginal workers = 1,131 (12%)
- Total workers (Main + Marginal) = 4,142 (43%)
- Non-workers = 5,530 (57%)

OCCUPATIONAL STRUCTURE (Source: Census of India, 2011)

SL. NO.	NAME OF THE VILLAGE	TOTAL POPULATION	WORKING POPULATION			NON-WORKERS
			Main workers	Marginal workers	Total Workers	
1	Barsuan	3113	1073	88	1161	1952
2	Bhutuda	829	278	39	317	512
3	Baurkela	108	20	49	69	39
4	Budhabhuin	1071	232	277	509	562
5	Damalu	630	304	9	313	317
6	Ladapani	220	80	103	183	37
7	Lasi	686	7	249	256	430
8	Randa	258	90	11	101	157
9	Rantha	730	171	78	249	481
10	Sasakela	2027	756	228	984	1043
—	Total	9672	3011	1131	4142	5530

8.1.4 Public buildings, places of worship and monuments

The lease area (core zone) and the area within 5 km radius of the M.L area (Buffer Zone) does not have places of archaeological, historical, cultural, aesthetic and important residential as well as official buildings.

8.1.5 Indicate any sanctuary is located in the vicinity of leasehold

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

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

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

Sl. No.	Type of land use	As at present (ha)	As at the end of plan period (ha)	As at the end of Conceptual period (life of mine) (ha)
1	Area under excavation	27.207	32.107	112.39
2	Storage for Topsoil	0.00	0.05	1.05
3	Overburden dump	19.894	21.094	21.094
4	Mineral Storage	17.804	28.804	28.804
5	Infrastructure facilities (weigh bridge, work shop, office, etc.)	3.984	5.50	5.50
6	Road	11.00	12.20	12.20
7	Railways	0	0	0
8	Plantation	0	0	0
9	Tailing Pond	0	0	0
10	Effluent Treatment Plant	0.630	0.630	0.630
11	Mineral processing Plant/ Beneficiation plant/site services	0	0	0
12	Others (Green belt/plantation)	43.900	43.900	43.900
	Total	**124.469**	**144.285**	**202.486**

8.2.2 Air quality

Existing air quality Status:

The ambient air quality depends upon the emission sources, meteorological conditions and the background concentration of specific contaminants. The study of the baseline ambient air quality data in the area is an essential and primary requirement for assessing the impact on air quality due to the proposed activity and also to the potential environmental changes likely to occur when the project is in operation. With the above objective, the following parameters were analysed at the sampling locations established in the study area.

- Particulate Matter (PM10)
- Particulate Matter (PM2.5)
- Sulphur Dioxide
- Oxides of Nitrogen

Basis of study

Ambient Air quality has been assessed through a net-work of 04 ambient air quality stations. The following methodology has been considered for design of ambient air quality monitoring network in the area.

- Topography / terrain of study area.
- Populated areas within study area
- Residential /sensitive areas within study area
- Magnitude of surrounding industries
- Representation of regional background levels.
- Representation of cross sectional distribution in cown wind direction
- Pre-dominant wind direction and wind pattern

Ambient air quality Data:

The lessee is submitting quarterly monitoring report. Based on the quarterly report at four stations at core zone and one station at buffer zone has been considered for monitoring of Air. In the buffer zone study of air has been conducted in Bhutuda village. Similarly in the core zone study of air has been conducted near AMTC camp site, Processing yard, Excavation area and active dump-4 within the mines.

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Year	Monitoring station	Frequency	Parameters	Prescribed limit	Actual data
2015-16	1.AMTC CAMP SITE NEAR OLD OFFICE	Weekly Twice	PM(10 mg/m3)	100	
	2.PROCESSING YARD NEAR WEIGH BRIDGE		PM(2.5 mg/m3)	60	
	3.BHUTUDA VILLAGE		SO2 (mg/m3)	80	3.4
	4.EXCAVATION AREA (NANDAGIRA QUARRY NO.01)		Nox (mg/m3)	80	12.6
	5.ACTIVE DUMP YARD (DUMP – 4)		CO (mg/m3)	2	0.2
2016-17	1.AMTC CAMP SITE NEAR OLD OFFICE	Weekly Twice	PM(10 mg/m3)	100	50.58
	2.PROCESSING YARD NEAR WEIGH BRIDGE		PM(2.5 mg/m3)	60	25.00
	3.BHUTUDA VILLAGE		SO2 (mg/m3)	80	BDL
	4.EXCAVATION AREA (NANDAGIRA QUARRY NO.01)		Nox (mg/m3)	80	10.75
	5.ACTIVE DUMP YARD (DUMP – 4)		CO (mg/m3)	2	0.15
2017-18	1.AMTC CAMP SITE NEAR OLD OFFICE	Weekly Twice	PM(10 g/m3)	100	65
	2.PROCESSING YARD NEAR WEIGH BRIDGE		PM(2.5 mg/m3)	60	18
	3.BHUTUDA VILLAGE		SO2 (mg/m3)	80	7.7
	4.EXCAVATION AREA (NANDAGIRA QUARRY NO.01)		Nox (mg/m3)	80	9.5
	5.ACTIVE DUMP YARD (DUMP – 4)		CO (mg/m3)	2	0.28

The details of air quality data has been enclosed as **Annexure- XIX**

Mitigative Measures

Existing air environment in the mining area is of desired quality i.e., all parameters are within limit. The extended mining activity in the area might add little pollutants to the existing air environment. Control measures have to be considered and implemented. The following preventive measures shall be taken to control the air pollution at different sites present inside the lease area.

a. Regular water spraying on haul roads, waste dumps and maintaining approach roads, to suppress the dust.
b. The volume of dust rising from waste dump areas, quarry site, roads, etc. by action of wind shall be checked by planting grasses and broad leaf trees.
c. Ensuring transporting vehicles not to cross the stipulated speed. A strict instruction should also be given in the board it shall be displayed that no vehicle should run greater than a speed of 30 Km/hour.
d. Over loading on transport vehicles to be prevented in order to stop spillage.
e. Strengthening further the green belt plantation around ML area, quarry and over burden dump as well as crushing plant site.
f. Water spraying in the ore stack yard will be done to check air borne dust.
g. Exhaust fumes in the internal combustion engines used in excavators, ensuring vigorous maintenance and stringent overhaul schedules shall minimize dumpers, dozers and other machinery.
h. Wet drilling method shall be adopted.
i. Water injection system in drill and wearing of PPE by driller to be proposed to control air pollution and minimization of its effect.

Regular monitoring of air is being conducted quarterly to know the quality of air in core as well as buffer zone.

8.2.3 Water quality

Existing surface water body

The core zone is made up of four hilly blocks dissected by the natural streams at many places with varying slope. Two perennial nala flows from eastern part and one perennial nala locally known as Rajabasanala flow

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from the south western part of the lease area. These perennial nalas merge to form Bhuluda Nala which flow towards north and finally drains into Kurarhinala in the northern part outside ML area. Western part in buffer zone is drained by KhandadharNala and GagerNala which flow due east.

Measures taken for protection of surface water bodies

Surface Water

The surface run-off water of the lease area is being regulated in such a manner so as to cause minimum contamination and alteration of drainage system. There has been no adverse impact on the existing drainage system because of provision of retaining wall, garland drains at strategic location to guide water through check dams & settling ponds down to outside nala. The water management scheme suggested for the project is periodical cleaning of settling ponds, garland drains & check dam. The regular monitoring of surface run-off is/will be carried out by the authorized agency and record is/will be maintained regularly. The preventive measures have been proposed are as below:

a. Provision of Retaining wall, garland drain, settling pond etc.
b. Garland Drains/settling pond is being cleaned up periodically.
c. Strengthen of small stone/ rock barriers across the drains at intervals to check the water current and to arrest the solid particles.
d. All the water of mines has to pass into the settling tanks and after settling, the water shall be used for plantation & dust suppression.
e. Monitoring of surface water as per MoEF& CC guide line.

Quality of surface water bodies

The lessee has undertaken monitoring of water to know the water quality within the nala/streams. The details of summarised data are furnished below:

Particulars	Water Quality parameters observed				
	BhuludaNala Up stream	NandagiraNala Up stream	KhandadharNala Up stream	RajabasaNala Up stream	Rajabasa Nala down stream
pH value	6.81	6.75	6.7	6.69	6.78
Dissolved Solid (mg/ltr)	97	92	84	106	116
Oil & Grease (mg/ltr)	<1	<1	<1	<1	<1
Dissolved Oxygen (mg/ltr)	5.3	5.6	5.5	5.8	5.3
BOD (mg/ltr)	3	3	3	3	4

Corrective measures already taken to minimize pollution of surface water.

Retaining Wall: The Retaining Wall of length 3405m has been constructed at the toe of waste dump, sub-grade fines/mineral reject stock & surrounding R.F.

Garland Drain: The garland drain about length of 7599m has been constructed at the toe of waste dump & sub-grade fines stock & connected to the settling pond followed by check dam. The runoff will follow the siltation by the settling tank. The garland drain details as follows:

Check Dam: Check-dams have been constructed at the outlet of settling pond for arresting solid wash offs.

Settling Pond: Settling ponds have been made across the channel drains and garland drains to settle down solid wastes drained during surface run off. The details are given here under-

Plantation

Name of Dump	Location / Block	Gap plantation	No of saplings

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Dump-1	N-2412330-2412710 and E-307415-307648	1.50 Ha	300 nos
Dump-2	N-2412105-2412275 and E-3017240-307335	0.50 Ha	180 nos
Dump-4	N-2411200-2411380 and E-308700-308920	1.40 Ha	1480 nos.
Virgin area (Safety zone)	N-2412350-2412570 and E-308000-308080	0.50 Ha	800 nos
Total		**3.90 ha**	**1480 nos.**

Existing ground water bodies.

There are three bore well available within the lease area. Based on the hydrological study repon the level of ground water during pre-monsoon and post monsoon period is furnished below:

Pre-monsoon Water level: Pre-monsoon water level varies from 5.05 to 8.68 m below ground level. The minimum water level was recorded at Bhutuda village and max mum at Serkanda village. The average pre - monsoon water level is 7.07 meter below ground level.

Post-monsoon Water level: Post- monsoon water level varies from 2.85 meter below ground level to 5.76 meter below ground level. The average water level (post monsoon period) is 4.21 meter below ground level.

Fluctuation in water level: Pre and post monsoon water levels were considerec for evaluation of seasonal fluctuation in water level. Thus fluctuation in water level varies from 1.47 to 3.96. The average fluctuation is 2.86 meters.

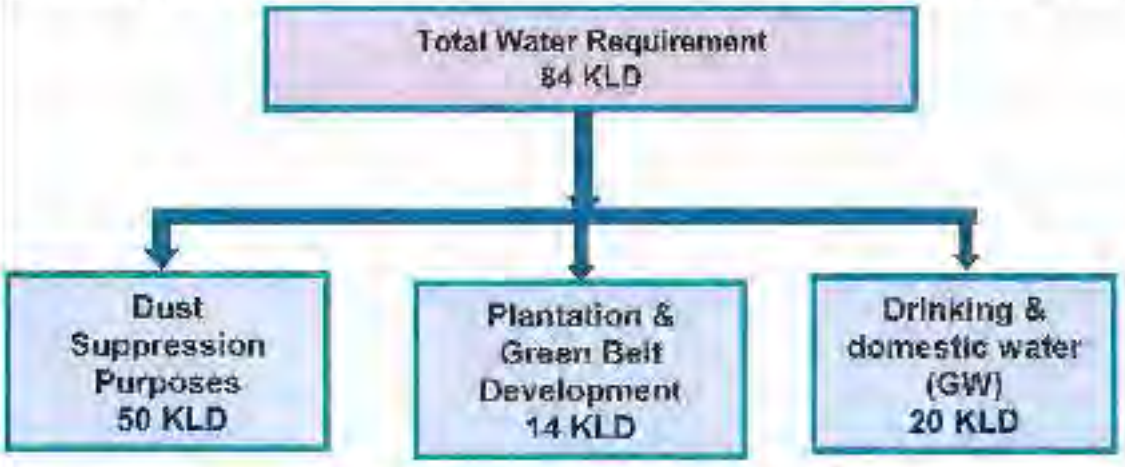
Ground water quality is potable and also suitable for all purposes. The annual rainwater to the tune of 0.1168 MCM can be recharged to the ground water which is 255%of the annual ground water withdrawal (28180m^3/year).

Measures taken for protection of ground water bodies

Ground water samples from different bore well/open wells of nearby villages will be analyzed for their pollutant levels which will help to decide the type of treatment needed.Ground water depth from surface are being measured in each of the 4 seasons starting from summer to winter and it was analyzed and observed that there is no adverse effect on GW level & quality in any of the case.

Consumption of water

Water consumption will be limited to 84m^3/ day which consist of 20 m^3/ day for domestic, 64m^3/ day for non-domestic purpose. Water for drinking / domestic use will be sourced from the boring point of Lessee while water for non-domestic use such as plantation, vehicle washing, water sprinkling etc will be sourced from Bhutudanala and during lean season from water harvesting pond.The water balance diagram is as follows:



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Impact on Ground Water: The downward movement of the toxic substances from the stack, dump and exposed quarry faces during seepage and percolation of ground water normally affects the ground water quality adversely in mining area. The water table in the area is comparatively at a greater depth which will not be touched during scheme period. Therefore, the chances of ground water pollution will be nil. Since Mn ore and associated rocks like laterite and shale will be handled in scheme period, generation of acidic substance is not expected to cause acid mine drainage. There is no issue of acid mine drainage at the mines. Only 20 cum/day of water is required for domestic use from ground water body. Hence, there is no adverse impact on ground water depletion.

Quality of Ground water bodies

Assessment of ground water quality from drinking water point of view. While comparing with drinking water standard (IS-10500,2012) it is found that all the ground water samples collected from different sources in the area are suitable for drinking water purposes. Hence water of the area is potable and good for health.

The summarized analysis result of ground water is furnished below.

SL No	DESCRIPTION	UNIT	Bore Well at AMTC Camp site	Tube Well at hutting area	Tube Well at at AMTC Camp
1	P^H	—	6.69	6.92	6.69
2	Iron as Fe	Mg/1	0.06	0.10	0.12
3	Total Dissolvec Solids 105°CTotal	Mg/1	137	198	92
4	Fluoride as F	Mg/1	0.27	0.39	0.32
5	Total Alkalinity as CaCO3	Mg/1	30	54	20
6	Manganese as Mn	Mg/1	0.03	0.03	0.03

8.2.4 Noise levels

Noise level is expected to increase marginally due to drilling, blasting, excavation, ore processing and transportation. Work zone noise levels & exposure to the operators will be less than 90dB(A) as they will be sitting either in closed cabins or will wear earplugs.

8.2.5 Vibration levels (due to blasting)

DTH drills of 85mm dia will be used for blast hole drilling and blasting. Holes will be up to 6m depth and with 85m dia drilling machine. Blasting of such blast holes in soft ore strata, which is not hard & compact, may not be objectionable in respect of vibration. As such, there are no human settlements nearby to be affected during blasting.

8.2.6 Water regime

The downward movement of the toxic substances from the stack, dump and exposed quarry faces during seepage and percolation of ground water normally affects the ground water quality adversely in mining area.

Water pollution is expected marginally due to only the suspended solids in the surface run-off water during rainy season. Ore as well as waste material does not contain any toxic elements and precipitated water passing through the quarry floor will not contaminate surface water. There is possibility of chocking of nala course due to flow of loose sediments.

Water consumption will be limited to 84m^3/ day which consist of 20 m^3/ day for domestic, 64m^3/ day for non-domestic purpose. Water for drinking / domestic use will be sourced from the boring point of Lessee while water for non-domestic use such as plantation, vehicle washing, water sprinkling etc. will be sourced from water harvesting ponds, manganese quarries.

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8.2.7 Acid mine drainage

Since mn ore and associated rocks like laterite and shale will be handled in scheme period, generation of acidic substance is not expected to cause acid mine drainage.

8.2.8 Surface subsidence

Opencast mining is proposed in the M.L area. Hence, question regarding surface subsidence does not arise.

8.2.9 Socio-economics

It is a fact that, this mn ore deposit is located in backward areas where the general living condition of the people is below poverty line. Agriculture has not been developed in the region to the extent it should have been. Therefore, ongoing mining operation will have a positive impact on the living condition of the local inhabitants.

As proposed in chapter 7.2, there will be direct engagement of 500 persons for mining activity. Indirect engagement may be two to three times. Purchase facilities, general awareness etc. will also be improved due to improvement in socio-economic condition of the local people by direct and indirect engagement.

8.2.10 Historical monuments etc.

There will be no impact on historical monuments as they are not found located within 5 km radius of the M.L. area.

8.3 Progressive reclamation Plan :

To mitigate the impacts and ameliorate the condition, describe year wise steps proposed for phased restoration, reclamation of lands already/to be degraded in respect of following items separately for 2 years period.

8.3.1Mined-Out Land: Describe the proposals to be implemented for reclamation and rehabilitation of mined-out land including the manner in which the actual site of the pit will be restored for future use. The proposals may be supported with yearly plans and sections depicting yearly progress in the activities for land restoration/ reclamation/ rehabilitation, afforestation etc. called "Reclamation Plan".

RECLAMATION / REHABILITATION

Existing:

Around 27.207 hectares of land has already been degraded due to mining activity. None of the area has been reclaimed till date.

Proposed:

During ensuing plan period 4.90ha additional area will be utilized for mining activities. Hence, at the end of 2024-25 total area under mining will be 32.107Ha.

Reclamation & rehabilitation measures during ensuing plan period.

Existing

About 0.042ha of area within quarry-3 has been back-filled till date by previous lessee.

During plan period

Year wise generation and utilization of waste

Year	Back-filling (cum)	Area of Back-filling (m2)	Avg Height (m)	RL(m)	Name of the quarry
2020-21	29821	4800	7	570	Quarry-3
2021-22	29915	4400	8	570	
Total	59736	**9200**			

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Details of back-filling

Year	Name of the block	Grid location of proposed back-filling	Waste to be generated (cum)	Waste to be back-filled	Area to be back-filled (ha)	Level of back-filling	Plantation
2020-21	Quarry-3	2412205-2412300N & 307594-307670	3313.4	29820.6	0.48	570m.RL	—
2021-22		2412135-2412225N & 307585-307663	3323.9	29915.1	0.44	570m.RL	Plantation over 0.92 Ha will be done to reclaim the back-filled area with 1500 nos of saplings.
Total					0.92		

Dump plantation:

The dump will be stabilized by means of plantation. As shown in the Reclamation plan after proper terracing, the dump over an area of 1.90 Ha will be reclaimed by means of gap filling plantation at dump-4. Plantation over the dump will be under taken from 2023-24 onwards.

8.3.1 Topsoil Management: The topsoil available at the site and its utilization may be described for the closure period of two years. No non-stabilized stacks of topsoil should be left at the expiry of lease period. (Either the generated topsoil should be utilized or the stacks should be stabilized and secured.)

Mineable area exposes manganiferrous shale, laterite and manganese ore. There is no topsoil in the mineable area. However, topsoil encountered incidentally during the course of mining will be scrapped off, transported and spread over the dead portion of the waste dump for concurrent rehabilitation.

8.3.2 The information on protective measures for reclamation and rehabilitation works year wise may be provided as per the following table.

Items	Details	2020-21(Proposals)		
		F	N.F	Total
	Proposed Afforestation Area (ha)	Nil	Nil	Nil
	Grid Reference(North/East)			
	No of saplings planted	Nil	Nil	Nil
	Any other method of rehabilitation(specify)			
	Grid Reference(North/East)			
	Cost including watch and care during the year	Nil	Nil	Nil
Management of worked out benches	Area available for rehabilitation (ha)	Nil	Nil	Nil
	Afforestation done (ha)	Nil	Nil	Nil
	No of saplings planted in the year	Nil	Nil	Nil
	Cumulative no of plants	Nil	Nil	Nil
	Any other method of rehabilitation (specify)	Nil	Nil	Nil
	Cost including watch and care during the year	Nil	Nil	Nil
Reclamation and Rehabilitation By backfilling	Void available for Backfilling (L x B x D)pit-wise/stope wise	0.42	Nil	0.42
	Void proposed for Backfilling by waste tailings (cum)	29821	Nil	29821
	Afforestation on the backfilled area	Nil	Nil	Nil
	Rehabilitation by making water Reservoir	Nil	Nil	Nil
	Any other means (specify)	Nil	Nil	Nil

BHABAGRAHI MOHAPATRA
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Rehabilitation of waste land within lease	Area available (ha)	—		
	Area rehabilitated	Nil	Nil	Nil
	Method of rehabilitation	Nil		
Others(specify)	Retaining wall	Nil	Nil	
	Garland drain	Nil	Nil	Nil
	Settling tank	Nil	Nil	Nil
	Environment Monitoring	To be continued as per MoEF Guide line		

Items	Details	Proposals					
		2021-22			2022- 23		
		F	N.F	Total	F	N.F	Total
Dump Management	Area available for rehabilitation(ha)	Nil	Nil	Nil	Nil	Nil	Nil
	Proposed Afforestation Area (ha)				Nil	Nil	Nil
	Grid Reference(North/East)				Nil	Nil	Nil
	No of seedlings planted	Nil	Nil	Nil	Nil	Nil	Nil
	Any other method of rehabilitation(specify)				Nil	Nil	Nil
	Grid Reference(North/East)				Nil	Nil	Nil
	Cost including watch and care during the year	Nil	Nil	Nil	Nil	Nil	Nil
Management of worked out benches	Area available for rehabilitation (ha)	Nil	Nil	Nil	Nil	Nil	Nil
	Afforestation done (ha)	Nil	Nil	Nil	Nil	Nil	Nil
	No of seedlings planted in the year	Nil	Nil	Nil	Nil	Nil	Nil
	Cumulative no of plants	Nil	Nil	Nil	Nil	Nil	Nil
	Any other method of rehabilitation (specify)	Nil	Nil	Nil	Nil	Nil	Nil
	Cost including watch and care during the year	Nil	Nil	Nil	Nil	Nil	Nil
Reclamation and Rehabilitation By backfilling	Void available for Backfilling (L x B x D)pit wise/stepe wise	0.55	Nil	0.55	Nil	Nil	Nil
	Void proposed for Backfilling by waste/ tailings (cum)	29915	Nil	29915	Nil	Nil	Nil
	Afforestation on the backfilled area	Nil	Nil	Nil	Nil	Nil	Nil
	Rehabilitation by making water Reservoir	Nil	Nil	Nil	Nil	Nil	Nil
	Any other means (specify)	Nil	Nil	Nil	Nil	Nil	Nil
Rehabilitation of waste land within lease	Area available (ha)	—			—	Nil	Nil
	Area rehabilitated	Nil	Nil	Nil	Nil		
	Method of rehabilitation	Nil	Nil	Nil	Nil	Nil	Nil
Others(specify)	Retaining wall	Nil	Nil	Nil	270m x 1m x1m	Nil	270m x 1m x1m
	Garland drain	Nil	Nil	Nil	300mx1m 1.5m	Nil	300mx1m 1.5m
	Settling tank	Nil	Nil	Nil	1 nos	Nil	1 nos
	Safety Zone Plantation	1 ha		1 Ha	1 ha		1 Ha
	Environment Monitoring	To be continued as per MoEF Guide line			To be continued as per MoEF Guide line		

Items	Details	Proposals					
		2023-24			2024- 25		
		F	N.F	Total	F	N.F	Total
Dump Management	Area available for rehabilitation(ha)	Nil	Nil	Nil	1 ha	Nil	1 ha
	Proposed Afforestation Area (ha)	Nil	Nil	Nil	Nil	Nil	Nil
	Grid Reference(North/East)	Nil	Nil	Nil	Nil	Nil	Nil
	No of saplings planted	Nil	Nil	Nil	2000	Nil	2000
	Any other method of rehabilitation(specify)	Nil	Nil	Nil	Nil	Nil	Nil

BHARAGRAM CHHATRA
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	Grid Reference(North/East)	Nil	Nil	Nil	Nil	Nil	Nil
	Cost including watch and care during the year	Nil	Nil	Nil	Nil	Nil	Nil
Management of worked out benches	Area available for rehabilitation (ha)	Nil	Nil	Nil	Nil	Nil	Nil
	Afforestation done (ha)	Nil	Nil	Nil	Nil	Nil	Nil
	No of saplings planted in the year	Nil	Nil	Nil	Nil	Nil	Nil
	Cumulative no of plants	Nil	Nil	Nil	Nil	Nil	Nil
	Any other method of rehabilitation (specify)	Nil	Nil	Nil	Nil	Nil	Nil
	Cost including watch and care during the year	Nil	Nil	Nil	Nil	Nil	Nil
Reclamation and Rehabilitation By backfilling	Void available for Backfilling (L x B x D)cft-wise/stope wise	Nil	Nil	Nil	Nil	Nil	Nil
	Void proposed for Backfilling by waste/ tailings (cum)	Nil	Nil	Nil	Nil	Nil	Nil
	Afforestation on the backfilled area	Nil	Nil	Nil	Nil	Nil	Nil
	Rehabilitation by making water Reservoir	Nil	Nil	Nil	Nil	Nil	Nil
	Any other means (specify)	Nil	Nil	Nil	Nil	Nil	Nil
Rehabilitation of waste land within lease	Area available (ha)	—			—	Nil	Nil
	Area rehabilitated	Nil	Nil	Nil	Nil		
	Method of rehabilitation	Nil	Nil	Nil	Nil		
Others(specify)	Retaining wall	Nil	Nil	Nil	Nil	Nil	Nil
	Garland drain	Nil	Nil	Nil	Nil	Nil	Nil
	Settling tank	Nil	Nil	Nil	Nil	Nil	Nil
	Safety Zone Plantation	1 ha		1 Ha.			
	Environment Monitoring	To be carried as per MoEF Guideline			To be continued as per MoEF Guideline		

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

No tailing dam is involved due to installation of filter press which is a fully automatic process, which produces a cake for easy handling and transport, the system is ideal for convenient disposal of tailings.

Toxic effect of the tailings: Nil

Dealing of excess water from the tailings dam: not required.

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

Acidmine drainage is not expected (ref. Para-11.2.7) and mitigative measures is not necessitated.

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

The information on protective measures for reclamation and rehabilitation works year wise may be provided as per the following table

8.3.6Summary of yearwise proposal

The information on protective measures for reclamation and rehabilitation works year wise may be provided as per the following table:

8.4 Disaster Management and Risk Assessment:

A disaster is a catastrophic situation whereby suddenly, people are plunged into helplessness and suffering and, as a result, need protection, clothing, shelter, medical and social care and other necessities of life.

Disasters can be divided into two main groups. In the first, disasters resulting from natural phenomena like earthquakes, volcanic eruptions, storm surges, cyclones, tropical storms, floods, avalanches, landslides, forest fires. The second group includes disastrous events occasioned by man, or by man's impact upon the environment. Examples are armed conflict, industrial accidents, radiation accidents, factory fires, explosions

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and escape of toxic gases or chemical substances, river pollution, mining or other structural collapse, air, sea, rail and road transport accidents and can reach catastrophic dimensions in terms of human loss. There can be no set criteria for assessing the gravity of a disaster in the abstract since this depends to a large extent on the physical, economic and social environment in which it occurs. What would be considered a major disaster in a developing country, ill-equipped to cope with the problems involved, may not mean more than a temporary emergency elsewhere. However, all disasters bring in their wake similar consequences that call for immediate action, whether at the local, national or international level, for the rescue and relief of the victims. This includes the search for the dead and injured, medical and social care, removal of the debris, the provision of temporary shelter for the homeless, food, clothing and medical supplies, and the rapid re-establishment of essential services.

Objectives of Disaster management Plan (DMP)

The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the Disaster Management Plan, it should be widely circulated and personnel training through rehearsals / drills.

The Disaster Management Plan should reflect the probable consequential severalties of the undesired event due to deteriorating conditions or through 'Knock on' effects. Further the management should be able to demonstrate that their assessment of the consequences uses good supporting evidence and is based on currently available and reliable information, incident data from internal and external sources and if necessary the reports of the outside agencies.

To tackle the consequences of a major emergency inside the mines or immediate vicinity of the mines, a Disaster Management Plan has to be formulated and this planned emergency document is called "Disaster Management Plan"

The objective of the Industrial Disaster Management Plan is to make use of the combined resources of the plant and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties;
- To Safeguard other people,
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Provide authoritative information to the news media;
- Secure the safe rehabilitation of affected area;
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the Emergency.

In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

Failure of slope in the pit:

In order to avoid risk due to open cast slope failure, slope stability estimation have been made for the existing quarries after determining various physical parameters of the ground mass like; uniaxial compressive strength, triaxial compressive strength, cohesion, angle of friction, specific gravity of the rock, water pressure etc.

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Besides, all the discontinuities have been plotted in stereo-plots (Net) which indicates that there is no chance of any planer failure or wedge failure. even than factor of safety has been determined against overall slope failure as well as against individual bench slope by circular failure, planer failure and wedge failure. Besides determining factor of safety, the slopes are monitored at regular intervals to check for any possible failure. The well-developed drainage system over the lease area ensures that storm water does not accumulate in the lease area and therefore hydrostatic pressure remains at a low level. For future working also similar measurement and inspection shall be carried out. The mine has been designed based on the above consideration with sufficient safety margin to eliminate any chance of slope failure in the pit.

Failure of slope of external dump:

The slopes of external dump have been initially planned at the angle of repose of the dump material. However, as the edges attend final position, the slopes will be terraced and proper vegetation will be laid which will cause lowering of slopes as well as binding of the soil, preventing any slope failure.

Fly rock fragment & vibration due to blasting operation:

Trial blasting has been carried out at the field empirical equation based on which the charge for delay shall be regulated to protect the nearby structures. All the precaution related to control of fly rocks (are / will be) taken during the blasting operations. Safety zone of 500 meters as per statutes is being maintained.

Surface fire:

Spillage of HSD and resultant fire constitutes a potential risk. The quantity of oil which can spill is not much more and can be easily controlled. Sufficient numbers of potable fire extinguishers have been provided at strategic location to take care of any eventually.

There are risks of fire at the electrical sub-station and transformers. Dry and foam type potable fire extinguisher are available at the electrical sub-station and control room. In case of any electrical fire, the personnel on duty shall shutdown the electrical fire and inform the shift-in-charge. Personnel trained in dealing with electrical fire will be summoned. The fire area will be cordoned off till the fire is fully extinguished and remain so until all wreckage and debris is cleared away. After effecting necessary repairs the power may be restored. The clearance for restoration of power shall be given only by the shift- in-charge.

As soon as any fire reported the shift-in-charge shall assume the function of disaster controller. In case of serious fire and depending on the gravity of the situation the Mines Manager may be summoned to assume charge. Personnel trained in dealing with fires will be summoned. Meanwhile the hospital will be informed to handle the casualties. The fire area will be cordoned off till the fire is fully extinguished and remain so until all wreckage and debris is cleared away.

Possible danger due to storage of explosive:

An explosive magazine exists in the mines. Adequate safety zone has been provided as per statutory requirement while locating the magazine. The magazine has been constructed as per plan approved by the department of explosive. The following precautionary safety measures have been considered in the design of the magazine:

a) All dry vegetation within a 15 meters radius to be cleared
b) Lightening arrester installed in the magazine roof
c) Safety zone around the magazine to be created

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d) In summer, the temperature inside the magazine is monitored to guard against spontaneous fire.

e) The manufacturing date of all explosives stored in the magazine is carefully recorded so that no explosive whose self-life has expired is kept in stock.

In case of any fire, who so over notices that the fire will sound the alarm and inform the shift-in-charge. The shift-in-charge will inform the security personnel and arrange to evacuate all personnel except those who are required for firefight, from the area. The fire brigade shall be summoned to deal with the emergency. Concern district official will be informed. The hospital will be informed to standby to handle the casualties.

Emergency plan:

1) On realizing anything serious that may happen anywhere in the mine immediate action to inform nearest mining official will be taken.
2) On being informed about the emergency it will be verified for the correctness of information and telephone in particular to the Manager and other mining officials of the mine and managers of adjoining mine.
3) On receiving information of emergency situation intimation will be sent to the consultative committee which is already formed. Shift in-charge will ensure that all the materials and transport system to deal with emergency situation is alerted.
4) First aid facilities will be readily available

Responsibility has been given to following officers of the mines for Emergency preparedness plan. The detail contact no. of the officers is as follows

Sl. No.	Designation	Address	Responsibility
1	Mines Manager	MahulsukhaMn Mine At/ PO- Koira Dist- Sundargarh	Disaster control sounding the alarm at danger / accident and information to the Lessee regarding the situation.
2	Assistant Manager	-do-	-do-
3	Foreman	-do-	Labour management & mob control. Information to the security personnel to evacuate all the persons from the area in case fire or any disaster except the fire brigade personnel.
4	Mate	-do-	-do-

8.5 Care and maintenance

❖ **During temporary discontinuance:**

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

Lease area is planned to operate for iron ore continuously over a period of 32 years till date. However, during the course of mining, there may be temporary discontinuance due to unforeseen causes such as:

- Court order
- Natural Calamities
- Statutory Requirements
- Any other unforeseen circumstances
- Accidents in the Mine
- Local issues

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Therefore, an emergence plan is necessary to re-open the mine which will include:

- Intimation to authorities concerned (IBM, DGMS, Directorate of Mines, Circle Mining Officer,) in the prescribed form for temporary discontinuance.
- Explanation to the local community regarding the cause of temporary discontinuance and possibility of re-opening of the mine in future.
- Listing and proper storing of machines / equipment / vehicles, assets and documents.
- Tightening of the security for proper watch and ward.
- Monitoring of status of discontinued mining operation in respect of bench height, width, individual bench slope angle, overall quarry slope angle, overhang, undercut, misfire, noise levels or any other parameters whose levels either in form of higher side or lower side is dangerous for further mine working.
- Preparation of plan & sections of discontinued mining operation.
- Projection of benches in plan & sections which is safe for further working.
- Formation of safe benches as per plan & sections.
- Management of misfire, fly rock movement, maintenance of machinery etc which is risk free and not dangerous for further working.
- Intimation to the concerned authorities for re-opening once the mine is risk free.

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8.6 Financial Assurance:

The financial assurance can be submitted in any encashable form preferably a Bank Guarantee from a Scheduled Bank as stated in Rule 27 of Mineral Conservation and Development Rules, 2017 for two years period expiring at the end of validity of the document.Table indicating the break-up of areas in the Mining Lease for calculation of Financial Assurance:

Sl. No	Head	Area put on use at start of plan (ha.)	Additional requirement during plan period (ha.)	Total (in ha.)	Area considered as fully reclaimed & rehabilitated (ha.)	Net area considered for calculation (in ha.)
1	Area under excavation	27.207	4.90	32.107	0	32.107
2	Storage for Topsoil	0.00	0.05	0.05	0	0.05
3	Overburden dump	19.894	1.20	21.094	0	21.094
4	Mineral Storage	17.804	11.00	28.804	0	28.804
5	Infrastructure facilities (weigh bridge, work shop, office, etc.)	3.984	1.516	5.50	0	5.50
6	Roads	11.00	1.2	12.20	0	12.20
7	Railways	0	0	0	0	0
8	Tailing Pond	0	0	0	0	0
9	Effluent Treatment Plant	0.630	0	0.630	0	0.630
10	Mineral Separation plant	0	0	0	0	0
11	Township area	0	0	0	0	0
12	Others (Green belt)	43.900	0	43.900	0	43.900
	Grand Total	**124.469 (A)**	**19.866 (B)**	**144.285 C=(A+B)**		**144.285 [E = (C-D)]**

As per Rule 27 of Mineral Conservation and Development Rules – 2017, the lessee will have to provide financial assurance of Rs.300000 per ha since it is an A-Category mine. Therefore, financial assurance estimated to be 144.285 x Rs.300000/- = Rs.43285500/- (Rupees four Crore thirty two lakhs eighty five thousand five hundred only) at the rate of Rs.300000/- per hectare. However, the provisions of 27(1) of MCDR Rule- 2017 shall not be applicable for a mining lease granted through the mining lease granted under the provisions of clause (c) of sub-section (2) of section 10A. (Financial Assurance is not required to be submitted by lease holder, where mining lease is granted through the auction or the mining lease granted under the provisions of clause (b) or clause (c) of sub-section (2) of section 10A, wherein the Mine Development and Production Agreement has been signed between the lessee and the State Government.)

अनुमोदित
APPROVED

[illegible]/2020

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

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8.7 Certificate and Undertaking

This is to certify that the Progressive Mine Closure Plan of Mahulsukha Iron and Mn ore block shall comply all statutory rules, regulations, orders made by the State or Central Government, Statutory organizations, Court etc. Wherever any specific permission is required, the lessee will approach the concerned authorities. The lessee also undertakes to the effect that all the measures proposed in this closure plan will be implemented in a time bound manner.

8.8Plans & Sections - This Progressive Mine Closure Plan is submitted as per the Rule 23 B (2) under MCDR 1988. Plans and sections for this plan have been referred to that of Mining Scheme, which is being suomitted simultaneously for approval

(S. K. Patnaik)

Director

BHABAGRAHI MOHAPATRA
QUALIFIED PERSON

PATNAIK MINERALS PVT. LTD.
CIN : U13209OR1989PTC002368

CONSENT LETTER/ UNDERTAKING/ CERTIFICATE FROM THE LESSEE

(01)The Mining Planin respect of Manulsukha Iron and ManganeseOre Blockover an area of 390.317Ha. of M/s Patnaik Minerals Pvt. Ltd.in village Randa, Rantha and Bhutuda under Bonai subdivision of Sundargarh district, Odisha Stateunder Rule 16(1) of MCR 2016 has been prepared by qualified person Shri BhabagrahiMohapatra, M Sc (Geology) having professional experiences of more than 20 years of working in the field of mining after obtaining the Degree as per Rule 15 of MCR, 2016.

This is to request the Regional Controller of Mines, Indian Bureau of Mines, Bhubaneswar to make any further correspondence regarding any correction of the Mining Planwith the said qualified person at his address below :-

Sri BhabagrahiMohapatra

At- BANEIKALA

Po-BANEIKALA

PS :Joda, Dist.-Keonjhar Odisha.

PIN : 758038

E mail : mohapatrab123@gmail.com

Mobile No : 9437139637

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

(02)It is certified that the CCOM Circular No-2/2010 will be implemented and complied with when an authorized agency is approved by the State Government.

Regd. Off : P.O : BONAIKELA, JODA, DIST - KEONJHAR - 758038, ODISHA
Tel : (06767) 272100, 272101 (Office), Fax : (06767) 273807, Email : pmpl 123@rediffmail.com

(03) It is certified that the Progressive Mine Closure Planin respect of Mahulsukha Iron and ManganeseOre Blockover an area of 390.317Ha. of M/s Patnaik Minerals Pvt. Ltd.in village Randa, Rantha and Bhuluda under Bonai subdivision of Sundargarh district, Odisha State, complies with all statutory rules, Regulations, Orders made by the Central or State Government, Statutory organization, Court etc which have been taken into consideration and wherever any specific permission is required the lessee will approach the concerned authorities.

The information furnished in the Progressive Mine Closure Planis true and correct to the best of my knowledge and records.

(04) "The provisions of Mines Act, Rules and Regulations made there under have been observed in the preparation of the Mining Planover an area of 390.317Ha. in village Randa, Rantha and Bhuluda under Bonai subdivision of Sundargarh district, Odisha State, belonging to Mahulsukha Iron and ManganeseOreBlock, and where specific permissions are required, the applicant will approach the D.G.M.S. Further, standards prescribed by D.G.M.S. in respect of miners' health will be strictly implemented"

(05) We do hereby undertake to complete the exploration within Mahulsukha Iron and ManganeseOre Blockover an area of 390.317Ha, of M/s Patnaik Minerals Pvt. Ltd,as proposed in the Mining Plan in time bound manner.

Thanking You.

For **Patnaik Minerals Pvt. Ltd.**

(S. K. Patnaik)

Director

PATNAIK MINERALS PVT. LTD.

CIN : U13209OR1989PTC002368

CERTIFICATE

The provisions of the Mineral Conservation and Development Rules 2017 have been observed in the preparation of the Mining Plan for Mahulsukha Iron and Manganese Ore Blockover an area of 390.317Ha, of M/s Patnaik Minerals Pvt. Ltd, in village Randa, Rantha and Bhutuda under Bonai subdivision of Sundargarh district, Odisha State and Whenever specific permissions are required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

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

Place: Joda
Date: 21/09/2020

(Bhabagrahi Mohapatra)
Qualified Person

B. MOHAPATRA
GENERAL MANAGER (P & C)
M/S. PATNAIK MINERALS PVT. LTD.

Regd. Off : P.O. : BONAIKELA, JODA, DIST - KEONJHAR - 758038, ODISHA
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