DOM COPY

REVIEW OF THE MINING PLAN

(Submitted Under Rule 17(2) of MCR, 2016)

WITH

PROGRESSIVE MINE CLOSURE PLAN

(Submitted Under Rule 23 of MCDR, 2017)

In respect of

JURURI IRON & MANGANESE MINE OVER 66.368 HA IN VILLAGE JURURI, TAHASIL - BARBIL OF M S TARINI MINERALS PVT LTD. AT KEONJHAR DISTRICT, ODISHA

PROPOSAL FOR

THE FINANCIAL YEAR: 2020-21 to 2024-25

PROPOSAL WILL BE IMPLEMENTED FROM DATE OF APPROVAL

CATEGORY OF MINE
"A" FULLY MECHANISED

FOREST AREA: 66.368HA, NON FOREST: NIL •
EARLIER DIVERTED AREA: 15.068HA

DATE OF EXECUTION : 06.02.1990
DATE OF EXPIRY : 05.02. 2010
DATE OF RML APPLICATION: 22.11.2008

As per Section 8A (6) of the MMDRA Act 2015, the lease is deemed to be extended up to a period ending on the 05.02.2040.

Mines office	Registered office
Jururi Iron and Manganese Mine	A 6 Commercial Estate, Civil township
At : Po Jururi P S Bamebari Keonjhar	Dist Sundargarh Odisha
Odisha Pin-758034	Pin-769 004
Phone : 06767272304 06767272230	Ph fax-0661-2400139,
Email: drp@altradegroup.com	Email: drp@altradegroup.com

Prepared By

SRI A. GURUBALASUBRAMANIAM, B. E. IN MINING
(QUALIFIED PERSON)
UNCHABALI, BAMEBARI JODA, KEONJHAR, ODISHA
EMAIL ID : ags@altradegroup.com
MOB: 9437062184

Approved vide letter no:-
RMP/A/05-ORI/BHW/2020-21
dated 03.07.2020

CONTENTS

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

LIST OF ANNEXURE

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

LIST OF PLATES

SL NO	PLATE NO.	PARTICULARS	SCALE
1	PLATE NO-I	KEY PLAN	1:50,000
2	PLATE NO-II(A)	AUTHENTICATED LEASE PLAN	1:4000
3	PLATE NO-II(B)	DGPS MAP	1:5000
4	PLATE NO-III	SURFACE PLAN.	1:2,000
5	PLATE NO-IV	SURFACE GEOLOGICAL PLAN	1:2,000
6	PLATE NO-V	GEOLOGICAL SECTIONS	1:2,000
7	PLATE NO-VA	UNFC PLAN	1:2,000
8	PLATE NO-VI	DEVELOPMENT PLAN & SECTION (2020-21 TO 2024-25)	1:2,000
9	PLATE NO-VII	ENVIRONMENT PLAN	1:5,000
10	PLATE NO-VIII	RECLAMATION PLAN	1:2,000
11	PLATE NO-IX	MINE DRAINAGE PLAN	1:2,000
12	PLATE NO-X	CONCEPTUAL PLAN	1:2,000
13	PLATE NO-XI	CONCEPTUAL SECTIONS	1:2,000
14	PLATE NO-XII	FINANCIAL ASSURANCE PLAN	1:2000

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

INTRODUCTORY NOTE

History of the Lease

Mining lease area over 66.368 Ha, in village Juruni of Keonjhar district in Orissa was granted in favor of Sri Niranjan Patnaik for exploitation of Iron & Manganese ore. The lease was executed on 06.02.1990 for a period of 20 years. Copy of the lessee deed is enclosed as **(Annexure-1).** Again the lease was transferred in the name of M/s Tarini Minerals Pvt. Ltd on 15.10.1995. The copy of the transfer deed is enclosed as **(Annexure-2).** The validity of the lease was up-to 05.02.2010. Accordingly, the lessee had filed the renewal application on 22.11.2008 within stipulated time provision under Rule 24A MCR 1960 for a period of 20 years to the State Govt. The copy of the renewal application and receiving copy in Form-J and Form-D are enclosed as **(Annexure-3).** More over the renewal of mining lease is no more in the existence of the MMDR Amendment Act 2015. As per Section 8A (6) of the MMDRA Act 2015, the lease is deemed to have been extended up to a period ending on the 5th February, 2040.

Present Status of the Mines Lease

a. The validity of the lease has not been extended under the provision of 8A (6) of MMDR Amendment Act 2015. The mining Lease over 66.368 Ha of M/s. Tarini Minerals Pvt. Ltd. which have been declared lapsed by the State Government vide letter No 4003/SM dated 02.05.2015 by Steel & Mines Department as per u/s 4A (4) of MMDR Act, 1957 read with provision of u/r 28(1) of MCR, 1960. (The copy of the lapse order is attached as **Annexure - 3A)**. However, the lessee filed a W.P (C) No 510/215 & W.P.(C) no 510 of 2015 against the lapsing order and the status are as under on 12.01.2015 the MMDR Act was amended and as per the provision of Section 8 A (6) of amended Act, the lease is valid till 2040.

b. The Lessee filed a writ vide WPC 995 of 2015 before Hon'ble Orissa High Court seeking direction to the State to drop the lapsing proceeding initiated by it and to declare the lease as extended till 2040 as per amended Act. In the aforesaid Hon'ble Court order dated 26.02.2019 directed that in view of the decision of the Hon'ble Supreme Court in the case of Common Cause v. Union of India and others, reported in (2016) 11 SCC 455, the order dated 02.05.2015 is required to be quashed and set aside and we do so. The matter is remitted back to the authority with a direction that the petitioners will appear before the authority on 25.03.2019 and the authority after giving opportunity of hearing the parties concerned will decide the same by a reasoned order within a period of four months from the date of appearance of the petitioners. **(Annexure-3B)**

c. In view of the order of the Hon'ble High Court of Orissa and the Revisional Authority, the lease is subsisting as on date. As the State Government did not put bar on processing of diversion proposal as the statutory clearances/approval like Mining Plan, Forest Clearance & Environment clearance are pre-requisite and mandatory for extension of

APPROVED
31/01/2020
क्षेत्रीय खनि नियंत्रक
REGIONAL CONTROLLER OF MINES
भारतीय खान ब्यूरो
INDIN BUREAU OF MINES
भुवनेश्वर/ BHUBANESWAR

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

lease period a mines and even after obtaining the aforesaid approvals granting the extension of lease period is subject to fulfillment of term & condition of the lease and sole discretion of the State Government.

d. Further, Director of Mines, Govt. of Odisha, vide their letter no MIV(X) 57/2008-4984/DM dated 28.06.2019 has made a communication to Regional Controller of Mines, Bhubaneswar to consider the Mining Plan subject to on the final decision of the Govt. on the issue of lapsing of the lease and with a condition that the approval if accorded will not warrant any entitlement of the lessee to avail the benefit of extension of the lease validity as under Section 8A(6) of MMDR Amendment Act 2015. The copy of the letter is attached as **Annexure-3C**

e. Accordingly, the Review of the mining Plan under Rule 17(2) of MCR 2016 was approved vide letter No MS/FM/11-ORI/BHU/2019-20dated 20.09.2019.

f. Further, the lessee has filed a Revision Application before the Revisional Authority, Ministry of Mines, Govt of India under section 30 of MMDR Act, 1957 read with Rule 35 of the MCR, 2016 against the lapsing order passed by the State Government. The said Revision Application is registered as R.A. 22(01)/2020/RC-1. **Annexure-3D**

g. An Application under Rule 20(7) of the Minerals (Other Than Atomic & Hydrocarbons Energy Minerals) Concession Rules, 2016 seeking Revival of the mining lease has been submitted in State Government for consideration **Annexure-3E**

h. As per the provision of Section 8 A (6) of MMDR Amended Act, 2015, the lease is deemed to be extended till 2040.

Statutory Clearances

➢ **Mining Plan/Scheme of Mining:**

As the lease was to be expired on 05.02.2010, the lessee prepared the mining plan under Rule 24A of MCR 1960. However, the validity of the scheme of Mining approved on 27.05.2005 was upto31.03.2009. Therefore, the lessee prepared the Scheme of mining under Rule 12 (2) of MCDR 1988 for one year (2009-10 – up to 05.02.2010) till the date on which the mining lease expires and The Mining plan under Rule 24 A of MCR 1960 for next 5 years (2010-11 to 2014-15). The same was approved by Controller of Mines (CZ) of Indian Bureau of Mines, Govt. of India, vide letter no 314(3)/2009/MCCM (CZ)/MP-07, dated 10.08.2009. Copy of approval letter is enclosed as **(Annexure –4).**

The Modification in the Mining Plan for the period 2011-12 to 2014-15 was approved vide letter number 314(3)/2011-MCCM(CZ)/MP-24, dated 27.12.2011. The Review of the Mining Plan for the financial year 2015-20 was approved vide letter No dated MS/FM/11-ORI/BHU/2019-20 dated 20.09.2019. **(Annexure – 4).** Since the validity of the review of the Mining plan is going to expired on 31.03.2020 the lessee is now submitting the Next Review of the Mining plan under Rule 17(2) of MCR 2016.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

➢ **Status of forest diversion:**

The Lessee had obtained approval under section-2 of the Forest (Conservation) Act, 1980 over an area of 15.068 Ha of forest land out of the total lease area of 66.368 Ha, from the Ministry of Environment & Forests, Government of India, vide their letter No.8-22/91-FC dt.07.02.1992 which was co-terminus with the validity of the mining lease. **(Refer Annexure-5).** Further as per the circular/guideline of MoEF & CC, Govt. of India vide letter No. 11-51/2015-FC, dated. 01.04.2015, it is clearly mentioned that the validity of approvals accorded under Section-2 of the FC Act shall be extended and shall be deemed to have been extended up to a period co-terminus with the period of mining lease. So as per this guideline the same forest clearance over 15.068 Ha is valid till the expiry of lease i.e., up to 5th February 2040. (**Refer Annexure – 6**). Besides this, the lessee has submitted the application for diversion of forest land over 66.368 ha for mining and allied activities including already diverted area over 15.068 ha. The copy of the application is enclosed as **(Annexure No-7).** The application is under active consideration by the State Govt.

➢ **Environmental clearance:**

As far as environment clearance is concerned, EIA/EMP report was prepared on the basis of the TOR issued by MoEF vide letter No. J-11015/28/2007-IA.II (M), dated 18th January 2010 and Public hearing for this project was held on 18th July 2012. Further, as per the MoEF & CC, GoI, Gazette notification dated 14th August 2018 ≤ 100 ha of mining lease area in respect of non-coal mine lease is comes under category "B". So our proposal has been transferred from MoEF & CC to SEIAA.

So, TOR has been issued by the SEIAA vide letter no. 1084/SEAC-174 dt. 14.12.2018 for the enhancement of iron ore production of 4.27 lakh TPA Iron ore along with existing crushing unit of Primary Crusher (40 TPH) and 2 x 12 TPH Secondary crusher over mining lease area of 66.368 Ha. **(Annexure-8A). The final EIA/EMP is submitted before the authority and** the Lessee has presented the expansion proposal before the SEAC, SEIAA for final approval, which is recommended by the SEAC for grant of the Environmental Clearance. under active consideration for approval **(Annexure-8B).**

Other Information

1. Other Leases of the Lessee

Besides this mining Lease, the lessee is having another mining lease in its name in the state of Odisha. The details of mining lease are as given below:

Sl No	Name of the Mining Lease	Area (ha)	Location			Name of the mineral / ore
			Village	District	State	
1	Deojhar Iron Ore Mines	34.365	Thakurani R.F	Keonjhar	Odisha	Iron

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

1.0 GENERAL

(a) Name and Address of the Lessee - M/s Tarini Minerals pvt Ltd

Mines office	Registered office
Jururi Iron and Manganese Mine At : Po Jururi P.S Bamebari Dist Keonjhar State : Odisha Pin-758034 Phone : 06767272304 Email: drp@altradegroup.com	A/6, Commercial Estate, civil town ship Dist : Sundargarh State: Odisha Pin-769 004 Ph-0661-2400139, Email: drp@altradegroup.com

Copy of ID proof and address proof is enclosed as **Annexure – 18.**

Rule 45 registrations No: IBM/5262/2011

b) Status of the Lessee/Applicant

The lessee is a private ltd company carrying out business in mining and trading of minerals particularly Iron and Manganese ore. The Name & Address of directors are given below:

Name	Designation	Address with Telephone No	Date of Appointment
Sri Dipti Ranjan Patnaik	Managing Director	X-5,Civil Township, Rourkela,769004,Odisha, Ph-0661-2400139 drp@altradegroup.com, miom.drp@gmail.com	1.01.1992
Sri Devajyoti Patnaik	Director	N-2/29,NAYAPALLI, Bhubaneswar-751015,Odisha, Ph-9937090909 Email-id: devjyoti.patnaik@gmail.com	1.01.1992

As Sri Dipti Ranjan Patnaik is the Managing Director, he is the signatory authority in all relevant document related to Jururi Mines. The copy of the Resolution of the Board of Directors is enclosed as **Annexure - 9**. The Memorandum and Article of Association is enclosed as **Annexure-10.**

(c)	Minerals which is included in the prospecting license	Not Applicable
(d)	Minerals which is included in the lease deed	Iron and Manganese ore
(e)	Minerals which is applicant intend to mine	Iron ore

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

(f) Name of the Recognized person under Rule 22C of MCR 1960 or a person employed under clause (c) of Sub Rule (1) of Rule 42 of MCDR, 2017 (Applicable) for Review of the Mining Plan.

As per the Rule 15 of MCR'2016, the qualified person who have prepared the Review of the Mining Plan is furnished below.

Name	**A. Gurubalasubramaniam**
Address	At: Unchabali, Po: Bamebari, Joda, Dist Keonjhar, Odisha, Pin-758034 Mob No:9437062184 ags@altradegroup.com
Registration No	Not Applicable
Date of Registration	Not Applicable
Valid up to	Not Applicable

Self-certified copies of working experience in supervisory capacity in the field of Mining along with certificates in support of educational qualifications required as per the Rule 15 (b) of MCR' 2016 is attached as **Annexure 11.**

2.0 LOCATION AND ACCESSIBILITY

(a)	**Lease Details(Existing Mines)**			
	Name of the Mine	Jururi Iron and Manganese Mines		
	Latitude and longitude of any boundary point			
	Latitude	21°56'25.83" to 21056'55.46"N		
	Longitude	85° 24'35.20" to 85°25'07.89"E.		
	Date of Grant of Lease	01.03.1978		
	Date of execution of Lease	06.02.1990		
	Period/Expiry date	The lease was executed for a period of 20 years up to 05.02.2010. Application for Renewal of Mining Lease was made by the Lessee on 22.11.2008 for a period of 20 years. However, as per the MMDR (Amendment) Act 2015, the validity of the lease period is deemed to be extended up to 05.02.2040.		
	Name of the Lease holder	M/s Tarini Minerals pvt Ltd		
	Postal Address	A-6,Civil Township, Rourkela,769004,Odisha,		
	Telephone No	Ph-0661-2400139		
	Email id	drp@altradegroup.com, miom.drp@gmail.com		
	Mobile No	9937090909		
(b)	Details of Applied Lease area with location map (fresh area/ mine)	The M.L area over 66.368 hectares falls in forest land near Jururi village Tehsil- Barbil, Sub-division- Champua, District Keonjhar, Odisha.		
Forest (Specify)		**Area, Ha)**	**Non- Forest (Specify)**	**Area (Ha)**
Reserve Forest		Nil	Waste Land	Nil
Protected Forest		Nil	Grazing Land	Nil
Village Forest		Nil	Agriculture Land	Nil
Others (DLC Forest)		66.368	Others (Specify)	Nil

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Total	**66.368**	**Total**	**Nil**
Total lease area:	66.368 hectares		
District & State :	Keonjhar & Odisha		
Taluka :	Barbil		
Village	Jururi		
Whether the area falls under Coastal Regulation Zone(CRZ)	No		
If yes, details thereof :	Not Applicable		
Existence of public road/railway line, if any nearby and approximate distance	The leasehold of Jururi Iron Ore Mine over 66.368Ha is well connected with Road and Railways. The detail communication facilities are as follows: **Communication:** a) **Road link** The ML area is approachable from Joda. The mine is adjacent to Joda - Bamebari road. Joda is around 14km from the lease area. b) **Rail link** The lease area is well connected with rail network. Jururi Railway station is adjacent to the mines. Banspani Railway Station is about 4km from the lease area. c) **Air link** Bhubaneswar airport (320 km away) is the nearest airport from the area. There is an airstrip/ helipad near Bhadrasai, Barbil which is around 32km from the lease area.		
Topo sheet No. with latitude & longitude of all corner boundary point/ pillar	Latitude : 21°56'25.83" to 21056'55.46"N Longitude: 85° 24'35.20" to 85°25'07.89"E. Ref: Toposheet No 73G/5,(F45N5) Details of latitude and longitude of all corner boundary point/pillar is furnished below:		

For compliance of CCoM's circular No. 2/2010 dated 06.04.2010 of IBM DGPS survey has been undertaken by ORSAC for delineation of boundary pillar. However the same has not been authenticated till date. An undertaking for submission of Geo-referenced cadastral maps certified by ORSAC has been enclosed. The details of co-ordinates of the pillars as per DGPS survey are as follows:

Sl. No.	Pillar No.	Longitude	Latitude	Northing	Easting
1	A	85°24'57.90118"	21°56'25.83413"	2427087.1711	336423.5939
2	B	85°24'58.39668"	21°56'27.35614"	2427133.8327	336438.2945
3	C	85°25'01.22010"	21°56'32.41484"	2427288.5733	336520.9114
4	D	85°25'04.27588"	21°56'38.30941"	2427468.9521	336610.4589
5	E	85°25'07.04393"	21°56'43.46387"	2427626.6548	336691.5143
6	F	85°25'07.89550"	21°56'47.30859"	2427744.6448	336717.1668
7	G	85°25'07.39563"	21°56'51.86103"	2427884.8004	336704.2695
8	H	85°25'07.41122"	21°56'55.46881"	2427995.7509	336705.8616
9	H1	85°25'05.46630"	21°56'55.31199"	2427991.5039	336650.0108

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

10	H2	85°24'59.53312"	21°56'55.19994"	2427989.8158	336479.7481
11	H3	85°24'55.39835"	21°56'55.04964"	2427986.4196	336361.0708
12	H4	85°24'51.94708"	21°56'54.90552"	2427983.0115	336262.0054
13	I	85°24'45.83826"	21°56'54.67300"	2427977.6748	336086.6647
14	J	85°24'43.20772"	21°56'51.02568"	2427866.2852	336010.0301
15	K	85°24'40.79215"	21°56'51.31783"	2427875.9884	335940.8181
16	K1	85°24'40.20349"	21°56'48.45007"	2427787.9670	335923.0146
17	K2	85°24'39.31325"	21°56'44.00553"	2427651.5423	335896.0554
18	K3	85°24'38.62014"	21°56'41.33361"	2427569.5749	335875.3170
19	K4	85°24'37.79422"	21°56'37.04562"	2427437.9457	335850.2525
20	K5	85°24'36.79396"	21°56'32.89668"	2427310.6449	335820.2299
21	K5-1	85°24'35.81786"	21°56'28.62309"	2427179.5033	335790.8604
22	L	85°24'35.20406"	21°56'25.85422"	2427094.5308	335772.3657
23	L1	85°24'38.34393"	21°56'25.86401"	2427093.8976	335862.4593
24	L2	85°24'44.90593"	21°56'25.85709"	2427091.7340	336050.7366
25	L3	85°24'49.82325"	21°56'25.84604"	2427089.9337	336191.8227
26	L3-1	85°24'51.65622"	21°56'25.85429"	2427089.6434	336244.4176

c) 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

The details of approved Mining Plan/Scheme of Mining in chronological order are as summarized below:

Document approved	Under Rule	Period	Approval
Scheme of Mining and Mining Plan for Renewal	12 of MCDR' 1988 & 24A of MCR 1960	(2009-10 up to 05.02.2010) & (2010-11 to 2014-15)	Approved vide letter No 314(3) /2009/MCCM (CZ)/MP-07, dated 10.08.2009 **(Annexure –4).**
Modification in the Approved Mining Plan	Rule-10 of MCDR 1988	2011-12 to 2014-15	Approved vide letter No 314(3)/ 2011-MCCM(CZ)/MP-24,dated 27.12.2011
Review of the Mining Plan	Rule-17(2) of MCR 2016	2015-16 to 2019-20	Approved vide letter No dated MS/FM/11-ORI/BHU/2019-20 dated 20.09.2019

3.2 Details of Last Modifications if any

Modifications to the last approved scheme of mining along with modifications to the approved mining plan was approved under Rule 10 of MCDR 1988 by IBM vide letter No 314(3)/2011-MCCM(CZ)/MP-24 dated 27 Dec 2011. The modification of Scheme of Mining was done due to the following reason:

A team of task force from IBM issued a violation vide letter no ORI/IRON/KJR/MCDR-33 BBS dated 01.09.2010. Accordingly, the lessee submitted the reply vide letter no DION-TEMPL/IBM/2010-21 dated 23.09.2010. However, Being not satisfied with the compliances to the violation cum show cause Notice given by M/s Tarini Minerals (P) Ltd., Regional Controller of Mines, Indian Bureau of Mines issued an Order of Suspension of Mining Operation vide Letter No ORI/IRON & MN/KJR/MCDR-33/BBS dated 12.11.2010. For the revocation of suspension order,

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

the lessee made the Modification of approved Scheme of Mining under Rule 10 of MCDR 1988 which was duly approved by IBM vide letter No 314(3)/2011-MCCM(CZ)/MP-24 dated 27 Dec 2011.

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

3.3.1 Exploration:

Year	Commitment	Compliance	Remarks
2015-16	Nil	NIL	Due to lapse of the lease the Mining plan could not be approved. Hence there was no proposal during this period.
2016-17	Nil	NIL	
2017-18	Nil		
2018-19	Nil		
2019-20	50	NIL	Due to temporary suspension of the mining operation due to lapse of the mining lease mining operation has not been started & hence, exploration could not be undertaken.

3.3.2 Waste Generation

Year	Commitment	Compliance	Remarks
2015-16	Nil	NIL	Due to lapse of the lease the Mining plan could not be approved. Hence there was no proposal during this period.
2016-17	Nil	NIL	
2017-18	Nil		
2018-19	Nil		
2019-20	6412	NIL	Due to temporary suspension of the mining operation due to lapse of the mining lease mining operation has not been started & hence, waste generation was not achieved.

As per the proposal total waste generation during the plan period was 6412 Cu.m. It was proposed to use this waste for road maintenance.

3.3.3 Production

Year	Commitment	Complian	Remarks
2015-16	Nil	NIL	Due to lapse of the lease the Mining plan could not be approved. Hence there was no proposal during this period.
2016-17	Nil	NIL	
2017-18	Nil		
2018-19	Nil		
2019-20	359084.096 **(Saleable ore)** 48091.62 (Mineral Reject)	NIL	Due to temporary suspension of the mining operation due to lapse of the mining lease mining operation has not been started & hence, production could not be done.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

3.3.4 Afforestation Programme

Year	Commitment	Complian	Remarks
2015-16	Nil	NIL	
2016-17	Nil	NIL	Due to lapse of the lease the Mining plan could not be approved. Hence there was no proposal during this period.
2017-18	Nil		
2018-19	Nil		
2019-20	4400 nos of saplings were proposed to be planted over 2.75 Ha along safety zone and safety zone of Railway Siding	NIL	Due to temporary suspension of the mining operation due to lapse of the mining lease mining operation has not been started & hence, plantation could not be undertaken.

Reclamation & Rehabilitation:

Not proposed.

3.3.5 Blasting

Commitment

For blasting purpose, explosives of desired quality are used as blasting agent in blast holes. Blasting operations are being carried out to dislodge the harder formations, both in overburden as well as in the ore zone. Preventive measures like marking of danger zone, arrangement of warning signals were suggested.

Compliance

Not done

3.4 Status of compliance of violations pointed by IBM.

3.4.1 Review of the violation pointed out after inspection made under MCDR, 1988 during last 5 years.

A team of Task force headed by Shri A. Nandi, Dy. Controller of Mines under Rule 13(2) of Mineral Conservation and Development Rules, 1988 visited the Jururi Iron & Manganese Mines (66.368 Ha) of M/s Tarini Minerals (P) Ltd in Keonjhar District, Orissa State visited the site on 10.08.2010. Shri M. K. Somani, Senior Mining Geologist, Shri P. K. Behera Chief Surveyor DGM, Govt. of Orissa and Sri M. Mahanta Mines Manager of the Jururi Iron & Manganese Mines also accompanied in the team. Basing on their report Sri M. K. Somani Senior Mining Geologist of IBM Bhubaneswar issued a violation cum show cause Notice addressing the Nominated Owner of M/s Tarini minerals (P) Ltd vide letter No ORI/IRO/KJR/MCDR-33 BBS dated 01.09.2010. M/s Tarini Minerals (P) Ltd., replied to the violations vide their Letter No DIOM-TMPL/IBM/2010-21 dated 23.09.2010. Being not satisfied with the compliances to the violation cum show cause Notice given by M/s Tarini Minerals (P) Ltd., Regional Controller of Mines, Indian Bureau of Mines issued an Order of Suspension of Mining Operation vide Letter No ORI/IRON & MN/KJR/MCDR-33/BBS dated 12.11.2010.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

RULE	Violation	Reply
13(1)	An Order of Suspension of Mining Operation was issued vide Letter No ORI/IRON & MN/KJR/MCDR-33/BBS dated 12.11.2010.	For compliance of the violation modifications to the last approved scheme of mining along with modifications to the approved mining plan was approved by IBM vide letter No 314(3)/2011-MCCM(CZ)/MP-24 dated 27 Dec 2011.

Copy of MCDR Violation is attached as Annexure-12

3.4.2 Review of the compliance position of conditions and stipulations imposed, if any, while approving the Mining Plan / Mining Scheme:

Conditions in the approval letter of Scheme of Mining vide letter No 314 (3) / 2011 / MCCM / (CZ) / MP-24 dated 27.12.2011.	Compliance of specific condition
Point(iii) It is further clarified that this approval of modification in the approved mining plan is subject to the provision of forest (Conservation) Act 1980, Forest Conservation Rule 1981 and other relevant statutes, orders and guidelines as may be applicable to the lease area from time to time.	Compliance: The lessee has submitted the application for diversion of forest land over 66.368 ha for mining and allied activities. The copy of the application is enclosed as (Annexure No-7).The application is under active consideration by the State Govt.
Point(xiii) A copy of environment Impact Assessment Environment management plan (EIA-EMP) as approved by MOEF (Ministry of Environment & Forest) shall be submitted to IBM immediately after approve of MOEF.	Compliance: TOR has been issued by the SEIAA vide letter no. 1084/SEAC-174 dt. 14.12.2018 for the enhancement of iron ore production of 4.27 lakh TPA Iron ore along with crushing & screening plant over mining lease area of 66.368 Ha. The copy of the TOR is enclosed as **(Annexure-8).**
Point (xvi) Yearly report as required under Rule 23E(2) of MCDR'88 setting forth the extent of protection and rehabilitation works carried out as envisaged in the approved progressive mine closure plan and if there is any deviations, reason there of shall be submitted before 1st July of every year.	Compliance: The lessee is submitting yearly report as required under Rule 23E (2) of MCDR'88 before 1st July of every year. However the PMCP work has not been carried out due non-operation of the Mines.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

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

Order of Suspension of Mining Operation vides Letter No ORI/IRON & MN/KJR/MCDR-33/BBS dated 12.11.2010 was issued by IBM. Revocation of the order of suspension was done vide letter no ORI/IRON & Mn/KJR/MCDR-33/BBS Dated 12.11.2010. However, revocation order was issued vide letter No ORI/IRON & MN/KJR/MCDR-33/BBS Dated 01.02.2012. (**Ref Annexure - 13**)

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

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

PART-A
CHAPTER-1.0

1.0 GEOLOGY AND EXPLORATION

a) Briefly describe the Topography, Drainage pattern, Vegetation, Climate, Rainfall data of the area applied/Mining Lease Area

Topography

The area exhibits an undulated topography with a maximum elevation of 620 meters and minimum elevation of 530 meters above MSL.

Drainage pattern

As far as drainage pattern is concerned, dendritic pattern can be observed regionally in the lease area and its surrounding area. There is no perennial water body within the M.L area. A small seasonal nalah flows from west to east.

Vegetation

Within the virgin land Sal is the most important species found within the lease area. In associates of Sal (*Shoroa robusta*), naturally grown plant species like *Shorea Robusta*, *Maduca Indica*, *Diospyros melanoxylon*, *Schleichera oleosa*, *Zyzipus marutiana*, *Cassia*, Adina, etc., are commonly observed. The details of vegetation within the lease area are given below:

Local Name	Botanical Name	Family Name
TREES		
Asan	*Terminalia tomentosa*	Combretaceae
Bel	*Aegle marmelos*	Rutaceae
Char	*Buchnania lanzan*	Anacardiaceae
Dhaura	*Anogeissus latifolia*	Combretaceae
Jamun	*Syzygium cuminii*	Myrtaceae
Kasi	*Bridelia retusa*	Euphorbiaceae
Kendu	*Diospyrus melanoxylon*	Ebenaceae
Mahul	*Madhuca indica*	Sapotaceae
Sal	*Shorea robusta*	Dipterocarpaceae
Piasal	*Pterocarpus marsupium*	Papilionaceae
Bara	*Ficus Benghalensis*	Moraceae
Dhatki	*Woodfordia Fruticosa*	Lythraceae
Dhaman	*Grewia tilaefolia*	Tiliaceae
Mundi	*Mitragyna parviflora*	Rubiaceae
Sisso	*Delbergia sisso*	Papillionaceae
Sunari	*Cassia fistula*	Casalpiniaceae
Bahada	*Terminalia belerica*	Combretaceae
Barakoli	*Zizyphus maurtiiana*	Rhamnaceae
Kusum	*Schleichera oleosa*	Sapindaceae
Haldu	*Adina cordifolia*	Rubiaceae

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

GRASSES		
Khara grass	*Imperata cylindrica*	Gramineae
SHRUBS / HERBS		
Anantamula	*Hemidesmus indicus*	Asclepidaceae
Dhatki	*Woodfordia fruticosa*	Lythraceae
CLIMBERS		
Atundi	*Combretum decandrum*	Combretaceae
Bichhuati	*Tragia plukenetii*	Euphorbiaceae

CLIMATE

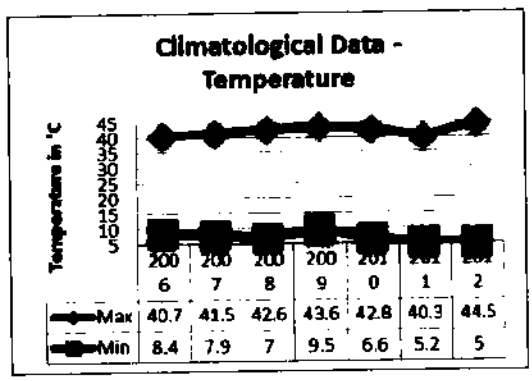
The climate of the study area in general is hot and humid. Annual maximum temperature is 42.3°C which shoots up to 44.5°C also. Summer is the hottest season. The average precipitation in the monsoon and non-monsoon season is 993 mm & 275.9 mm respectively. Maximum rainfall of 1871.6mm was recorded during 2011. Very often the bay depressions and cyclones cross over this area affecting weather and causing wide spread rains.

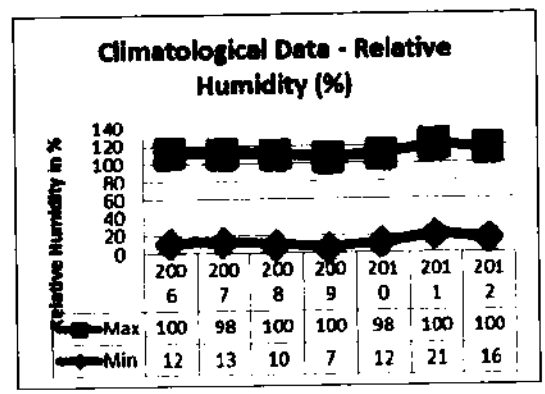
CLIMATOLOGICAL SHEET OF IMD

METEOROLOGICAL DATA

Station: Keonjhar

Year	Temperature in degree Celsius		Relative Humidity (%)		Wind Direction		Wind Speed in kmph		Rainfall in millimeters
	Max	Min	0830hrs	1730hrs	0830hrs	1730hrs	0830hrs (MAX)	1730hrs (MIN)	
2006	40.7	8.4	100	12	WSW	WSW	24	0	1648.0
2007	41.5	7.9	98	13	SW	WSW	14	0	1685.6
2008	42.6	7	100	10	SW	SW	24	0	1643.7
2009	43.6	9.5	100	7	SW	SW	12	0	1304.5
2010	42.8	6.6	98	12	NW	SW	10	0	1254.2
2011	40.3	5.2	100	21	SW, NW	SW	10	0	1871.6
2012	44.5	5	100	16	SW, NW	SW	8	0	1115.6





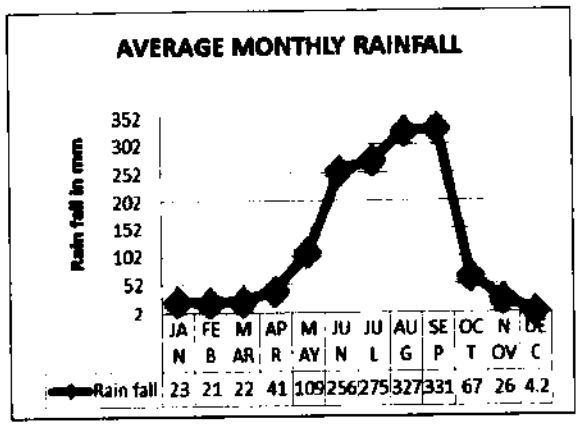
A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

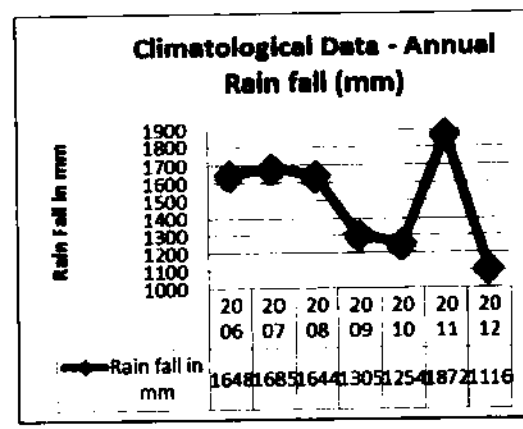
Rainfall Data

From the table it is seen that maximum rainfall occurs during the month of June, July, August and September. Maximum monthly rainfall of 677.5 mm was observed during September 2011.

ANNUAL RAINFALL DATA (KEONJHAR DISTRICT)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2006	0	0	19	50.1	173.9	199.3	287.1	568.2	247	67.4	36	0	1648
2007	2	94.1	20.6	32.8	110.4	242.9	404.6	355.9	316.5	28.5	77.3	0	1685.6
2008	62.5	11.9	12.7	35.2	98.2	605.1	175.6	193.8	429.1	4.6	15	0	1643.7
2009	0	0	2.8	0.5	133.1	103.5	386	333.4	195.2	123.2	26.8	0	1304.5
2010	1.3	1.3	71	0.4	122.1	114.4	289.2	233.1	238.1	125.2	28.6	29.5	1254.2
2011	0	32.8	31.3	121.2	117.6	359.9	157.5	318.7	677.5	55.1	0	0	1871.6
2012	94.7	7.8	0	46.3	9.5	169.7	225	283.6	212.7	66.3	0	0	1115.6
Average	22.9	21.1	22.5	40.9	109.3	256.4	275.0	326.7	330.9	67.2	26.2	4.2	1503.3





b) Brief description of regional Geology with reference to location of the lease/applied area.

The area represents a part of the eastern limb of U-shaped Iron ore Geosyncline of Jharkhand and Odisha. This synclinorium is made of rocks of the iron ore Group of pre-cambrian age comprises of lower shale horizon middle banded iron formation and upper shale horizon. The regional stratigraphy is summarized below:

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Regional Stratigraphy:

The Precambrian rocks of this region comprising of basic lava, tuff, banded iron formation, 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 he named as ` the Kolhan Group''. The type area of the Kolhan Group lies to the north of Noamundi in Bihar.

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 the Bonai-Keonjhar belt.

The stratigraphy suggested by Murthy and Acharya (1975) is as under:

Kolhan Group		Sandstone, Conglomerate-Breccia
——————————Unconformity——————————		
Koira Group	Mixed facies formation	Basic lava, tuffs and tuffites of volcanic facies.
		Iron, manganese, lenses of iron formation, chert, small dolomite patches of chemical facies.
		Minor lenses of sandy and silty shale of clastic facies.
	Banded shale formation	Banded shale member
		Black shale member
		Black shale chert member
	Banded iron formation	Finely banded jaspilite member
		Coarsely banded jaspilite member
	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-basics and meta-sedimentary rocks.

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

i) Shape and size of the mineral/ore deposit:

The lessee has drilled 33 nos of boreholes within the iron ore zone. But all the bore holes have been closed at shallow depth. None of the bore holes have gone up to the end of the mineralization. Based on the existing exploration data the shape and size of the iron ore deposit is **530m x 420m x 40m.** No boreholes have been drilled within manganese ore zone. Manganese ore occurs as pocket. However, the existing manganese quarry has given valuable information about the shape and size of the ore body. Based on the observation from the quarry manganese and manganese ore deposit is **125m x 120m x 15m.**

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

ii) Disposition of various litho-units indicating structural features if any etc.

The area under reference around Jururi village represents the central part of the eastern limb of U-shaped synclinorium. The litho units comprises of banded iron ore formation occurring as banded hematite shale associated with massive iron ore deposit and the upper purple to variegated shales with manganese and float iron ore. The disposition of different litho units have been shown in the geological plan. These litho units have developed various structural features such as bedding planes, axial planes, joints and faults. The general trend of bedding planes noted in different litho units exihbits a general NNE-SSW trend dipping due east and south east. Both iron and manganese observed to be structurally control and mostly confined to synformal and antiformal zones of various litho units. Based on the study and the bore hole undertaken the stratigraphy of the area will be as follows:

Precambrian Iron Formation	Soil and Alluvium
	Laterite and Float Iron ore Upper shale – purple to variegated shale with manganese ore. Banded Iron ore Formation with banded hematite jasper, Banded Hematite Shale and iron ore

The massive banded iron ore deposits are mostly confined to the hill top along the south central part of the area whereas the adjacent eastern valley, exposing upper shale formation contains manganese ore deposit. The strike of the litho units are in the NE-SW direction. The dip of the litho units is varying from 28^0- 44^0 due south East. The float iron ore bodies are mostly located northern part of the top quarry. Float ore are associated with laterite.

(d) Name of the prospecting/exploration agency

(i) Name	(ii) Address	(iii) Email Id	(iv) Contact No
M/s Thriveni Exploration Agency Pvt Ltd	At-Unchabali, Bamebari, Joda -758034	Orissa@ thriveni.com	9937091660
In house drilling	A/6, Commercial Estate, Civil town Ship Dist : Sundargarh State: Odisha Pin-769 004	Email: drp@altradegroup.com	Ph-0661-2400139,

(e) Details of prospecting / exploration already carried out

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

Due to earlier mining operation, three numbers of iron quarry namely Old quarry, Top quarry, middle quarry and one manganese quarry have been developed. The floors of the quarries are maintained at RL 580.1m, 560.3m, 544.75m, and 540m respectively. These quarries give detail information about the ore body configuration and quality of ore. The details of the existing dimensions of the pit are given below:

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Name of the Quarry	Existing dimension in meter					
	Length	Width	Top RL	Bottom RL	Height	No of Benches
Top Quarry	250.00	90.00	605.00	562.00	43.00	9
Middle Quarry	210.00	55.00	564.00	540.00	24.00	7
Old Quarry	189.00	75.00	593.60	579.00	14.60	5
Manganese Quarry	75.00	52.00	557.00	543.50	13.50	5

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

As per the approved mining plan the lessee has already drilled 18 no of bore holes and 15 no of DTH within the lease area. The highest and lowest depths of the ore body from the drilled boreholes are 5m and 45m respectively. From the bore hole it has been confirmed that the ore zone is extended up-to a depth of 515 mRL, however the depth of the ore zone is vary from section to section depending upon the bore hole drilled. Considering this information estimation of iron ore resource has been made.

Year	*Sl.No*	*Bore Hole ID*	*Easting*	*Northing*	*Nature of BH*	*Collar RL (m)*	*Depth (m)*	*Mineralised /Non mineralised*	*Inclination*
2006-07	1	BH-1	336437	2427479	Core	558	25	*Mineralised*	Vertical (90°)
	2	BH-2	336320	2427537	Core	575	30	*Mineralised*	Vertical (90°)
	3	BH-3	336286	2427321	Core	565	25	*Mineralised*	Vertical (90°)
	4	BH-4	336401	2427550	Core	548	31	*Mineralised*	Vertical (90°)
	5	BH-5	336429	2427711	Core	549	15	*Mineralised*	Vertical (90°)
	6	BH-6	336427	2427854	Core	566	25	*Mineralised*	Vertical (90°)
	7	BH-7	336332	2427688	Core	574	26	*Mineralised*	Vertical (90°)
	8	BH-8	336348	2427799	Core	576	15	*Mineralised*	Vertical (90°)
	9	BH-9	336327	2427948	Core	583	32	*Mineralised*	Vertical (90°)
	10	BH-10	336192	2427871	Core	608	24	*Mineralised*	Vertical (90°)
2007-08	11	BH-11	336237	2427937	Core	605	16	*Mineralised*	Vertical (90°)
	12	BH-12	336247	2427975	Core	605	15	*Mineralised*	Vertical (90°)
	13	BH-13	336152	2427968	Core	617	12	*Mineralised*	Vertical (90°)
	14	BH-14	336101	2427965	Core	623	14	*Mineralised*	Vertical (90°)
	15	BH-15	336249	2427250	Core	554	10	*Mineralised*	Vertical (90°)
	16	BH-16	336113	2427847	Core	606	21	*Mineralised*	Vertical (90°)
	17	BH-17	336067	2427913	Core	615	25	*Mineralised*	Vertical (90°)
	18	BH-18	336130	2427911	Core	615	17	*Mineralised*	Vertical (90°)
	19	DTH-1	336039	2427224	DTH	531	24	Non-Mineralised	Vertical (90°)
	20	DTH-2	336024	2427323	DTH	526	48	Non-Mineralised	Vertical (90°)
	21	DTH-3	336008	2427422	DTH	528	40	*Mineralised*	Vertical (90°)
	22	DTH-4	335977	2427619	DTH	550	20	*Mineralised*	Vertical (90°)
	23	DTH-5	335962	2427718	DTH	572	18	*Mineralised*	Vertical (90°)
	24	DTH-6	336060	2427733	DTH	575	18	*Mineralised*	Vertical (90°)
	25	DTH-7	336146	2427836	DTH	606	24	*Mineralised*	Vertical (90°)
	26	DTH-8	336252	2427723	DTH	586	30	*Mineralised*	Vertical (90°)
	27	DTH-9	336370	2427723	DTH	554	40	*Mineralised*	Vertical (90°)
	28	DTH-10	336187	2427664	DTH	595	18	*Mineralised*	Vertical (90°)
	29	DTH-11	336270	2427620	DTH	585	48	*Mineralised*	Vertical (90°)
	30	DTH-12	336379	2427634	DTH	558	33	*Mineralised*	Vertical (90°)
	31	DTH-13	336293	2427471	DTH	565	30	*Mineralised*	Vertical (90°)
	32	DTH-14	336286	2427521	DTH	559	45	*Mineralised*	
	33	DTH-15	336375	2427532	DTH	556	30	*Mineralised*	

Copy of form-J and K with Litho log is attached as **Annexure-14**

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Summarized statement of total exploration carried out till date

Year	Type of bore holes	Total no of bore holes	Total meterage
2006-07	Core	10	248m
2007-08	Core /DTH	8 nos core type 15 nos DTH type	130m 483m
Total		**18 core type and 15 DTH**	**861m**

Details of potentially Mineralized area explored

Potentially mineralized area and its extent Coordinate in WGS 84
2427400N to 2427900N and 336550E to 335900E

Potentially Mineralized Area Explored			Proposal of exploration to explore remaining potentially mineralized area have been given with justification.
Forest	Non-forest	Remaining Area to be explored	
33 nos of Bore hole in 15.42Ha	Nil	66.368	The drilled bore holes have not carried out systematically with proper grid interval. Out of 33 bore holes 15 bore holes are DTH type. The bore holes are not drilled up to end of the mineralization. Therefore, it is envisaged to explore the entire area with core drilling up to end of the mineralization.

(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.

During 2006-07 to 2007-08, the samples of bore holes were analysed from M/s Geomin Consultants pvt Ltd. However, recently surface samples from quarries and have been analysed from NABL accredited Lab. Both iron and Manganese ore samples have been analyzed from the Lab in terms of Fe and Mn% respectively. The analysis report is enclosed as **Annexure- 15.** The details of Analysis of samples are furnished below:

Name of the Mineral	Samples analysed in NABL Accredited Lab	Samples analysed at Geomin Lab (Non – NABL Accredited Lab)	Total nos of samples analysed
Iron	**99 Nos**	**132 Nos**	**234 Nos**
Manganese	**4**	**0**	**4**

(i) Expenditure Incurred in various prospecting operation.

Total 18 core type and 15 DTH type holes were drilled within the lease area. The DTH type drilling were carried out by wagon drill machine of Lessee. The core type holes were drilled by M/s Thriveni Earth Movers pvt Ltd. The total cost involved for the exploration of Core type holes were Rs 7,56,000.00. The copy of the work order is enclo4ed as **Annexure -16.**

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

(f) The surface plan of the lease area may be prepared on a scale of 1 : 1000 or 1 : 2000 with contour interval of maximum 10m depending upon the topography and size of the area duly marked by grid lines showing all features indicated under Rule 28(1)(a) of MCDR 2017.

A surface plan of the lease area has been prepared on a scale of 1:2000 with a contour interval of 5m. **(Ref Plate No- III)**

(g) For preparation of geological plan, surface plan prepared on a scale of 1: 1000 or 1: 2000 scale specified under para 1.0 (f) of Part A of the format may be taken as the base plan. The details of exploration already carried out along with supporting data for existence of mineral, locations proposed exploration, various litho units along with structural features, mineralized/ore zone with grade variation if any may be marked on the geological plan along with other features indicated under Rule 32 of MCDR 2017.

A detail surface geological mapping carried out within the ML area. Further, the existing boreholes and quarries within the lease area have given valuable information about the geology of the area. Accordingly, the geological map on a scale of 1:2000 has been prepared with all the litho units and structural information. **(Ref Plate-IV)**

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

Considering the geological plan, eight 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. **(Ref Plate No-V)**

(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 as in table below:

It is proposed that exploration in the lease area shall be carried out as per the rule 27 (3) and CCOM circular no. 3/2010 vide letter no. M-11012/1/2009-CCOM Nagpur, dated, 14/07/2010 by putting 56 Numbers of boreholes during the plan period (2020-21) at a grid interval of 100m x 100m to cover the entire area. This will commence after obtaining Forest clearance and resumption of mining operation. It is proposed to drill up to a depth of average 70 m or up to the bottom of mineralization. The total meterage of drilling will be approximately 3710m. The meterage will vary based on the results of bore holes. The detail of proposed exploration programme during this plan period is given in Table below and location of these boreholes is shown in Geological Plan (Plate No– IV).

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

SL NO	YEAR	BH NO	NORTHING	EASTING	COLLAR RL	CORE/RC/DTH	METERAGE	INCLINATION	FOTEST/NF/DIVERTED FOREST	SURFACE RIGHT/NON SURFACE RIGHT	PURPOSE OF BH
1	2020-21	PBH-1	2427899	336099	615	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	TO KNOW THE LATERAL AND DEPTH WARD CONTINUITY OF ORE BODY
2		PBH-2	2427899	336199	607	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
3		PBH-3	2427899	336299	587	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
4		PBH-4	2427899	336399	575	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
5		PBH-5	2427899	336499	558	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
6		PBH-6	2427899	336599	545	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
7		PBH-7	2427799	335999	591	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
8		PBH-8	2427799	336099	595	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
9		PBH-9	2427799	336199	601	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
10		PBH-10	2427799	336299	585	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
11		PBH-11	2427799	336399	572	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
12		PBH-12	2427799	336499	561	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
13		PBH-13	2427799	336599	545	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
14		PBH-14	2427799	336000	560	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
15		PBH-15	2427700	336099	575	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
16		PBH-16	2427699	336199	587	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
17		PBH-17	2427699	336299	583	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
18		PBH-18	2427699	336399	550	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
19		PBH-19	2427699	336499	553	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
20		PBH-20	2427622	336000	544	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
21		PBH-21	2427611	336099	576	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
22		PBH-22	2427600	336199	596	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
23		PBH-23	2427599	336299	582	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
24		PBH-24	2427599	336399	553	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
25		PBH-25	2427599	336499	554	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
26		PBH-26	2427499	335999	534	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
27		PBH-27	2427499	336099	545	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
28		PBH-28	2427499	336199	586	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
29		PBH-29	2427499	336299	582	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
30		PBH-30	2427499	336399	549	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
31		PBH-31	2427499	336499	550	CORE	70	VERTICAL	DIVERTED FOREST	SURFACE RIGHT	
32		PBH-32	2427399	336599	550	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
33		PBH-33	2427399	335999	526	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
34		PBH-34	2427399	336099	537	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
35		PBH-35	2427399	336199	571	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
36		PBH-36	2427399	336299	571	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
37		PBH-37	2427399	336399	557	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
38		PBH-38	2427399	336499	548	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
39		PBH-39	2427299	336599	542	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
40		PBH-40	2427299	335999	532	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
41		PBH-41	2427299	336099	527	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
42		PBH-42	2427299	336199	550	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
43		PBH-43	2427299	336299	557	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
44		PBH-44	2427299	336399	546	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
45		PBH-45	2427199	336499	548	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
46		PBH-46	2427199	335999	534	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
47		PBH-47	2427199	336099	515	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
48		PBH-48	2427199	336199	540	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
49		PBH-49	2427008	336135	545	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
50		PBH-50	2426994	336206	549	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
51		PBH-51	2426994	336206	534	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
52		PBH-52	2426962	336126	547	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
53		PBH-53	2426961	336177	541	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
54		PBH-54	2427302	336334	550	CORE	70	VERTICAL	FOREST	SURFACE RIGHT	
55		PBH-55	2427254	336354	555	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	
56		PBH-56	2427254	336354	552	CORE	70	VERTICAL	FOREST	NON-SURFACE RIGHT	

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Cumulative number of proposed BH in forest area, non-forest area, diverted forest area, Surface right area and non -surface right area

Total No of Bore holes	Forest Area	Non forest area	Diverted Forest Area	Surface Right area	Non surface Right area
56	56	0	18	17	39

(j) Reserve and Resources as per UNFC with respect to threshold value notified by IBM may be furnished in a tabular form:

(1) Category wise Reserves estimated in the Modification in the Approved Mining Plan with grade.

The geological resources and mineable reserve of Iron and Manganese ore as on 01.04.2019 under different categories of UNFC classification as per the approved Modification in the mining plan are tabulated below.

Total Resource	Category	Code	Iron Ore		Manganese ore	
			Quantity (MT)	Grade	Quantity (MT)	Grade
(A) Reserves	Proved	111		45 % Fe & above	–	10 % Mn. & above
	Probable	121	9673228		53532.5	
		122	920432.5			
Subtotal (A)			**10593660.5**		**53532.5**	
(B) Remaining Resources	Feasibility Mineral resources	211	–	45 % Fe & above	–	10 % Mn. & above
	Pre-Feasibility Mineral resources	221	132207		Nil	
		222	–		Nil	
	Measured Mineral Resources	331	Nil		Nil	
	Indicated Mineral Resources	332	Nil		Nil	
	Inferred Mineral Resources	333	1573530		Nil	
	Reconnaissance Mineral Resources	334	Nil		Nil	
Subtotal (A)			**1705737**		**Nil**	
Grand Total			**12299397.5**		**53532.5**	

(2) Depletion of Reserves

During 2015-16 to 2019-20 there was no production of Iron and manganese ore. Therefore the depletion of reserve has been considered as Nil.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

(3) Residual Resource/Reserve

Total Resource	Category	Code	Iron Ore		Manganese ore	
			Quantity (MT)	Grade	Quantity (MT)	Grade
(A) Reserves	Proved	111		45 % Fe & above	–	10% Mn. & above
	Probable	121	9673228		53532.5	
		122	920432.5			
Subtotal (A)			**10693660.5**		**53532.5**	

(B) Remaining Resources	Feasibility Mineral resources	211	–	45 % Fe & above	–	10 % Mn. & above
	Pre-Feasibility Mineral resources	221	132207		Nil	
		222	–		Nil	
	Measured Mineral Resources	331	Nil		Nil	
	Indicated Mineral Resources	332	Nil		Nil	
	Inferred Mineral Resources	333	1573530		Nil	
	Reconnaissance Mineral Resources	334	Nil		Nil	
Sub total (A)			**1705737**		**Nil**	
Grand Total			**12299397.5**		**53532.5**	

Basis of Resource estimation

Estimation of resources and reserve of iron ore of the area have been made based on quarry exposures and exploration carried out in the area. There exists three Iron quarries namely Old quarry, Top quarry, middle quarry and one manganese quarry are within the ML area and the floor of the quarry is 580.1m,560.3m,544.75m,540m respectively. These quarries give detail information about the ore body configuration and quality of ore. Further, as per the approved mining plan the lessee has already drilled 18 no of bore holes and 15 no of DTH within the lease area. The highest and lowest depths of the ore body from the drilled boreholes are 5m and 45m respectively. From the borehole it has been confirmed that the ore zone is extended up-to a depth of 515 MRL, however the depth of the ore zone is vary from section to section depending upon the bore hole drilled. Considering this information estimation of iron ore resource has been made.

Parameters considered for Resource Estimation

- As per guidelines of IBM threshold value of iron ore is considered as 45% Fe and calculation of reserves is done under different range of Fe% i.e. 45 to 55% Fe and 55 % Fe above. Similarly for Manganese ore threshold value is considered as 10% Mn

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

and calculation of reserves is done under different range of Mn% i.e. 10 to 20% Mn and 20% Mn above.

- While above 55% Fe ore is termed as saleable iron ore, below that up to 45% Fe is termed as Mineral Reject. Ore containing less than 45% Fe is considered as mineral waste. Similarly for Manganese ore, above 20% Mn ore is termed as saleable ore, below that up to 10% Mn is termed as Mineral Reject.
- Considering the above factors the updated grade – wise reserves calculation in the ML area for iron and manganese ore has been carried out.
- Considering the geological plan, nine 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. A total of 8 nos of sections have been drawn, and the interval of cross sections are at 100m distance. However, 6 numbers sections have been considered for resource estimation.
- The recovery factor for saleable iron ore has been considered at 80% and Mineral Reject is 15%. For Manganese ore the recovery factor of saleable ore has been considered at 15% and mineral reject has been considered at 10%. A recovery factor study for iron ore and manganese ore has been carried out from NABL accredited lab. The copy of the recovery factor study is attached as **Annexure-17**
- The tonnage factor for saleable iron ore and saleable Mn ore has been considered as 3.5 MT/m3 and 2.5T/m3 respectively.
- The tonnage factor for Mineral Reject of iron ore and Mn ore has been considered as 2.5 MT/m3 and 2.0MT/cum.
- Measured mineral resources zone is the part of already explored area (G1). Further, the existing quarry along with drilled boreholes within the ML area is considered for estimation of mineral reserve under G1 category. A lateral influence of 50m has been taken in the both side of borehole matching with the depth for estimation of mineral reserve under G1 category.
- Indicated resource (G2) has been considered two measured zones i.e. within the co-ordinate of 242680N to 242850N along the section 242700N and 242800N.
- Remaining part of has been considered as unexplored area.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

(4) Additional Reserves Established Category wise (with basis and parameters considered :

As no exploration has been carried out during last review period, no additional reserves for Iron and Manganese have been established for this Review period.

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

Method of Resource Estimation

Resource/Reserve assessment has been made by cross sectional area method. Cross sectional area measured in sections are multiplied with the respective length of influence of each section giving the volume. As the volume so calculated is combination of saleable ore, mineral reject and intercalated waste, a recovery factor has been applied to get the volume of each saleable ore, mineral reject and waste. The volume (cum) so calculated for saleable ore and mineral reject ore is then converted into tonnage under different category. A symbolic representation may be outlined to calculate the reserve as below:

G = CLRT

Where G = Geological reserve in metric tons
C = Cross sectional area in square meters
L = Length of influence in meters
R = Recovery Factor
T = Tonnage Conversion factor

Category of Resources

Measured Resource (331)

A 'Measured Mineral Resource is that part a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content has been estimated with a high level of confidence is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and/or grade continuity.

For Iron ore, the mineralized zone has been demarcated based on the surface exposures as well as existing quarry and exploration carried out in the area. Laterally 50m influence from the borehole drilled and in vertically up-to the end of the mineralized zone from the drilled borehole has been taken for estimation of resources. The thickness of the ore body is variable from section to section. Thus, geological axis has been considered under G1 category.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

For Manganese ore only G1 category resource has been considered considering the bore hole intersection and existing quarry.

Indicated Resource (332)

The bore holes drilled at 200m x 200m grid interval have been considered under Indicated resource (G2). The areas have been earmarked within two measured zones i.e within the co-ordinate of 242680N to 242850N along the section 242700N and 242800N.

Inferred Resources (333)

An 'inferred Mineral Resource ' is that part of a Mineral Resource for which has no detail information about the tonnage, densities, shape, physical characteristics, grade and mineral content has been obtained. The remaining part where only drilling carried out with single bore holes and no influence can be taken as per MEMC Rule 2015, inferred resource has been considered in that case.

The mineral resources so estimated for in situ and float ore separately. The up to date Geological resource and Mineable reserve in different categories for entire area as on 01.04.2020 will be as follows:

Gist of Mineral resources
Iron ore

Ore Type	Category of Resources	Saleable Ore (+55% Fe) (MT)	Mineral Reject (45 to -55 Fe %) (MT)	Total Quantity (+45% Fe) (MT)	Grade
In-situ Ore	Measured	8440992	1130490	9571482	+45% Fe
	Indicated	811720	108712.5	920432.5	
	Inferred	1387680	185850	1573530	
	Total	**10640392**	**1425053**	**12065445**	
Float Ore	Measured	190894.90	43059.00	233953.90	
	Total	**190894.900**	**43059.000**	**233953.900**	
Grand Total		**10831286.9**	**1468112**	**12299399**	

Section wise estimation of Geological Resources of the entire area is as follows;
In-situ Iron Ore Resource (G1)

Sl. No	Cross Section	Cross Section Area (Sq.m)	Length of Influence (m)	Volume of Ore Zone (Cum)	Saleable ore (Tones)	Mineral Reject (Tones)	Total Ore (Tones)	Volume of waste (cum)
	a	b	c	d=b X c	e=dX80%X3.5	f=dX15%X2.5	g=e + f	h=dx0.05
1	2427900	3874	60	232440	650832	87165	737997	11622
2	2427800	4000	100	400000	1120000	150000	1270000	20000
3	2427700	8903	100	890300	2492840	333862.5	2826702.5	44515
4	2427600	8390	100	839000	2349200	314625	2663825	41950
5	2427500	6377	100	637700	1785560	239137.5	2024697.5	31885
6	2427400	152	100	15200	42560	5700	48260	760
7	2427300	0	100	0	0	0	0	0
Total				**3014640**	**8440992**	**1130490**	**9571482**	**150732**

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Indicated Resource (G2)

Sl.No	Cross Section	Cross Section Area (Sq.m)	Length of Influence (m)	Volume of Ore Zone (cum)	Saleable ore (Tones)	Mineral Reject (Tones)	Total Ore (Tones)	Volume of waste(cum)
	a	b	c	d=b X c	e=dX80%X3.5	f=dX15%X2.5	g=e + f	h=dx0.05
1	2427900	0	60	0	0	0	0	0
2	2427800	2578	100	257800	721840	96675	818515	12890
3	2427700	321	100	32100	89880	12037.5	101917.5	1605
4	2427600	0	100	0	0	0	0	0
5	2427500	0	100	0	0	0	0	0
6	2427400	0	100	0	0	0	0	0
7	2427300	0	100	0	0	0	0	0
Total				289900	811720	108712.5	920432.5	14495

Inferred Resource (G3)

Sl.No	Cross Section	Cross Section Area (Sq.m)	Length of Influence (m)	Volume of Ore Zone (CuM)	Saleable ore (Tones)	Mineral Reject (Tones)	Total Ore (Tones)	Volume of waste (cum)
	a	b	C	d=b X c	e=dX80%X3.5	f=dX15%X2.5	g=e + f	h=dx0.05
1	2427900	0	60	0	0	0	0	0
2	2427800	2578	100	257800	721840	96675	818515	12890
3	2427700	321	100	32100	89880	12037.5	101917.5	1605
4	2427600	0	100	0	0	0	0	0
5	2427500	0	100	0	0	0	0	0
6	2427400	1500	100	150000	420000	56250	476250	7500
7	2427300	557	100	55700	155960	20887.5	176847.5	2785
Total				***495600***	***1387680***	***185850***	***1573530***	***24780***

Float Iron Ore

Measured Resources (331)

Sl. No	Area (Sq.m)	Thickness (m)	Volume of Ore Zone (Cu.M)	Saleable ore (Tones)	Sub Grade (Tones)
	a	B	c=a X b	d=cX38%X3.5	e=cX12%X2.5
1	28706	5	143530.00	190894.90	43059.00

Manganese ore

Ore Type	Category of Resources	Saleable Ore (+20% Mn)	Mineral Reject (10 to -20 Mn %)	Total Quantity (+10% Mn)	Grade
		(MT)	(MT)	(MT)	
Mn ore	Measured(331)	34912.5	18620	53532.5	+10% Mn
Grand Total		34912.5	18620	53532.5	

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Section wise estimation of Geological Resources of the entire area is as follows;

Sl. No	Cross Section	Cross Section Area (Sq.m)	Length of Influence (m)	Volume of Ore Zone (Cu.M)	Saleable ore (Tones)	Mineral Reject (Tones)	Total Ore (Tones)	waste in cum
	a	b	c	d=b X c	e=dX15%X2.5	f=dX10%X2.0	g=e + f	h=dx75%
1	2427900	0	60	0	0	0	0	0
2	2427800	0	100	0	0	0	0	0
3	2427700	0	100	0	0	0	0	0
4	2427600	0	100	0	0	0	0	0
5	2427500	665	140	93100	34912.5	18620	53532.5	69825
6	2427400	0	100	0	0	0	0	0
7	2427300	0	100	0	0	0	0	0
Total				***93100***	***34912.5***	***18620***	***53532.5***	**69825**

Mineable Reserve

Mineral reserve is that part of reserve which can be calculated based on taking ultimate pit slope of the working leaving 7.5m from the lease boundary. While assessing the mineral reserves of the deposit measured and indicated categories of mineral resources have been considered and accordingly the mineral reserves are calculated assuming loss due to pit slope and its proximity with the lease boundary.

The ore blocked under 331 category has been considered as the resource under 221 category and the remaining reserve are under the 121 category as per UNFC. There will be no blockage of indicated ore as well as manganese ore.

During mining operation certain resources have been blocked under UPL, lease boundary safety zone, blocked area within bench slope. The iron ore in these blocked areas are non-mineable. Although feasibility study has been carried out and the quantity is established, because of the above mentioned blockages the quantity falls under F-2 category. By considering these blockages, due to above mention various factors, the mineable resource has been estimated. The mineable reserve so estimated for in situ and float ore separately. The up to date Mineable reserve in different categories for entire area as on 01.04.2020 will be as follows:

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Gist of Mineable Reserve

Iron ore

Ore Type	Category of Reserve	Saleable Ore (+55% Fe) (MT)	Mineral Reject (45 to - 55 Fe %) (MT)	Total Quantity (+45% Fe) (MT)	Grade
In-situ Ore	Probable (121)	8324400	1114875	9439275	+45% Fe
	Probable (122)	811720	108712.5	920432.5	
	Total	9136120	1223588	10359708	
Float	Probable (121)	190894.90	43059.00	233953.90	
	Total	**190894.900**	**43059.000**	**233953.900**	
Grand Total		**9327014.9**	**1266647**	**10593662**	

Section wise estimation of Geological Resources of the entire area is as follows;

In-situ Iron Ore Reserve

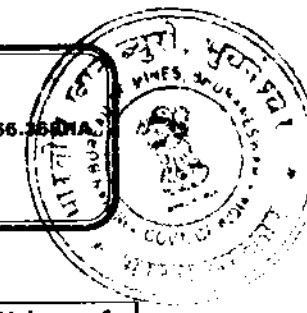
Probable Reserve(121)

Sl.No	Cross Section	Cross Section Area (Sq.m)	Length of Influence (m)	Volume of Ore Zone (Cu.M)	Saleable ore (Tones)	Mineral Reject (Tones)	Total Ore (Tones)	Volume of waste(cum)
	a	b	c	d=b X c	e=dX80%X3.5	f=dX15%X2.5	g=e + f	h=d*0.05
1	2427900	3480	60	208800	584640	78300	662940	10440
2	2427800	4000	100	400000	1120000	150000	1270000	20000
3	2427700	8723	100	872300	2442440	327112.5	2769552.5	43615
4	2427600	8390	100	839000	2349200	314625	2663825	41950
5	2427500	6377	100	637700	1785560	239137.5	2024697.5	31885
6	2427400	152	100	15200	42560	5700	48260	760
7	2427300	0	100	0	0	0	0	0
Total				***2973000***	***8324400***	***1114875***	***9439275***	**148650**

Probable Reserve(122)

Sl.No	Cross Section	Cross Section Area (Sq.m)	Length of Influence (m)	Volume of Ore Zone (Cu.M)	Saleable ore (Tones)	Mineral Reject (Tones)	Total Ore (Tones)	Volume of waste(cum)
	a	b	c	d=b X c	e=dX80%X3.5	f=dX15%X2.5	g=e + f	h=d*0.05
1	2427900	0	60	0	0	0	0	0
2	2427800	2578	100	257800	721840	96675	818515	12890
3	2427700	321	100	32100	89880	12037.5	101917.5	1605
4	2427600	0	100	0	0	0	0	0
5	2427500	0	100	0	0	0	0	0
6	2427400	0	100	0	0	0	0	0
7	2427300	0	100	0	0	0	0	0
Total				***289900***	***811720***	***108712.5***	***920432.5***	**14495**

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON



Float Iron Ore

Probable Reserve (121)

Sl.No	Area (Sq.m)	Thickness (m)	Volume of Ore Zone (Cu.M)	Saleable ore (Tones)	Sub Grade (Tones)	Total Ore (Tones)	Volume of waste(cum)
	a	b	c=a X b	d=cX38%X3.5	e=cX12%X2.5	g=d + f	h=cx50%
1	28706	5	143530.00	190894.90	43059.00	233953.90	71765

Gist of Feasibility & Pre-Feasibility Resources as on 01.04.2019

Ore Type	Category of Resources	Saleable Ore (+55% Fe)	Mineral Rejects (45 to 55 Fe %)	Total Quantity (+45% Fe)	Grade
		(MT)	(MT)	(MT)	
In-situ Ore	Pre-Feasibility Resource (221)	116592	15615	132207	**+45% Fe**
Total		**116592**	**15615**	**132207**	

The section wise calculation details are as follows:

Feasibility Resource (221)

Sl.No	Cross Section	Cross Section Area (Sq.m)	Length of Influence (m)	Volume of Ore Zone (Cu.M)	Saleable ore (Tones)	Mineral Reject (Tones)	Total Ore (Tones)	Volume of waste(cum)
	a	b	c	d=b X c	e=dX80%X3.5	f=dX15%X2.5	g=e + f	h=d*0.05
1	2427900	394	60	23640	66192	8865	75057	1182
2	2427800	0	100	0	0	0	0	0
3	2427700	180	100	18000	50400	6750	57150	900
4	2427600	0	100	0	0	0	0	0
5	2427500	0	100	0	0	0	0	0
6	2427400	0	100	0	0	0	0	0
7	2427300	0	100	0	0	0	0	0
Total				***41640***	***116592***	***15615***	***132207***	**2082**

MANGANESE ORE

Gist of Mineable Reserve

Ore Type	Category of Reserve	Saleable Ore (+20% Mn)	Mineral Reject (10 to - 20 Mn %)	Total Quantity (+10% Fe)	Grade
		(MT)	(MT)	(MT)	
Mn Ore	Probable (121)	34912.5	18620	53532.5	+10% Mn
Total		**34912.5**	**18620**	**53532.5**	

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

The section wise calculation details are as follows:

Sl.No	Cross Section	Cross Section Area (Sq.m)	Length of Influence (m)	Volume of Ore Zone (Cu.M)	Saleable ore (Tones)	Mineral Reject (Tones)	Total Ore (Tones)	waste in cum
	a	b	c	d=b X c	e=dX15%X2.5	f=dX10%X2.0	g=e + f	h=dx75%
1	2427900	0	60	0	0	0	0	0
2	2427800	0	100	0	0	0	0	0
3	2427700	0	100	0	0	0	0	0
4	2427600	0	100	0	0	0	0	0
5	2427500	665	140	93100	34912.5	18620	53532.5	69825
6	2427400	0	100	0	0	0	0	0
7	2427300	0	100	0	0	0	0	0
Total				***93100***	***34912.5***	***18620***	***53532.5***	**69825**

(K) 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	Iron ore Resources in tonne	Grade	Manganese ore resources in tonne	Grade
G1-Detail Exploration	9805435.9	+45%Fe	53532.5	10%Mn
G2-General Exploration	920432.5		-	
G3-Prospecting	1573530		-	
G4- Reconnaissance	-		-	
Total	12299398.4		**53532.5**	

Summary of lease area explored as per UNFC norms

Item of information	Lease area explored as per UNFC norms (in Ha) as on dt. 18.01. 2018 *Total Lease area* = A+B+C+D+E					Remarks/Comments including reasons for not carrying out the exploration as per UNFC norms.
	G1 Level	G2 Level	G3 Level	Explored and found non-mineralized with level of exploration (Remarks)	Unexplored lease area	
	A	B	C	D	E	
Area as per level of exploration	18.00	1.24	3.90	1.58	41.648	Due to delay in obtaining forest clearance and part Forest clearance, the exploration work could not be undertaken.
No. of BH Drilled	17	50m influence from G1	2	2	–	
No. of BH considered for Resource Estimation.	17	50m influence from G1	2	2	–	
Meterage Drilled	724	50m influence from G1	65	72	–	
Grid Interval	100 x 100	50m influence from G1	–	–	–	
Scale of Mapping	1:2000	1:2000	1:2000	1:2000	1:2000	

Note: All the bore holes have not reached at its ultimate limit. Therefore, it has been planned to explore the entire area by putting 56 Nos of bore holes.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Resources and Reserves within the lease have been arrived after applying results feasibility/pre-feasibility study and economic evaluation of deposit based on various factors such as:

Mining Method

On account of exposures of iron ore and its limited depth of occurrence, opencast Fully Mechanized method of mining will be adopted on three shift basis with the deployment of pneumatic drills, associated compressors, dumpers, excavators and other auxiliary equipment for development, production, processing, protection of environment and safety. The height of the bench will be 6m and the width will be 9m or more than the bench height. The deposit will be exploited in the manner as has been proposed in the scheme of mining. Wagon drill and Pneumatic Drill will be used for drill hole for blasting. Hydraulic excavator of 2.1 Cu.m and 0.9 Cu.m bucket capacity for excavation, truck of capacity 10 and 20 tons will be used for transport of ore and overburden.

Recovery factor:

Recovery factor has been considered based on the experience of mining operation and as per the approved Scheme of Mining. The recovery factor for saleable iron ore has been considered at 80% and Mineral Reject is 15%. Similarly, for manganese ore recovery factor for saleable ore is considered at 15% and that of mineral reject is considered at 10%. A details recovery factor study has been undertaken from NABL accredited lab to know the recovery of iron and Manganese ore.

Tonnage Factor

The tonnage factor for saleable iron ore has been considered as 3.5 MT/m3.The tonnage factor for mineral reject has been considered as 2.5 MT/m3.Similarly, for manganese ore tonnage factor for saleable ore is considered at 2.5MT/cum and that of Mineral reject is 2.0MT/cum.

Cutoff grade

As per guidelines of IBM threshold value of iron ore is considered as 45% Fe. While above 55 % Fe ore is termed as saleable iron ore, below that up to 45% Fe is termed as sub grade iron ore. Ore containing less than 45% Fe is considered as mineral waste. For manganese ore, cut off grade has been considered at 20%Mn and threshold value is considered as 10%Mn.

Ultimate pit depth proposed.

The maximum depth up to which the quarry can be developed economically is considered as the ultimate or conceptual extent of the quarry. Based on the present geological information, exploration data and mine ability of ore the ultimate pit limit has been marked. The depth of ultimate pit limit has been shown up to the probable limit in the iron ore zone. The bottom most RL has been proposed is given below:

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Ultimate size of Pits (m)		Ultimate Co-ordinates		Top RLs (m)	Bottom RLs (m)
Average length	Average width	Northing	Easting		
560	390	2427383 to 2427987	335920 to 336545	614.00	515.00

Mineral/ ore blocked dues to benches:

During mining operation certain resources have been blocked under UPL, lease boundary safety zone, and blocked area within bench slope. The ore in these blocked areas are non-mineable. Although feasibility study has been carried out and the quantity is established, because of the above mentioned blockages the quantity falls under F-2 category. By considering these blockages, due to above mention various factors, the mineable resource has been estimated.

Resource, Reserve & Grade as per United Nations Framework Classification as on 1.03.2020

Total Resource	**Category**	**Code**	**Iron Ore**		**Manganese ore**	
			Quantity (MT)	**Grade**	**Quantity (MT)**	**Grade**
(A) Reserves	Proved	111		45 % Fe & above	–	10 % Mn. & above
	Probable	121	9673228		53532.5	
		122	920432.5			
Subtotal (A)			**10593660.5**		**53532.5**	
(B) Remaining Resources	Feasibility Mineral resources	211	–	45 % Fe & above		10 % Mn. & above
	Pre-Feasibility Mineral resources	221	132207		Nil	
		222	–		Nil	
	Measured Mineral Resources	331	Nil		Nil	
	Indicated Mineral Resources	332	Nil		Nil	
	Inferred Mineral Resources	333	1573530		Nil	
	Reconnaissance Mineral Resources	334	Nil		Nil	
Subtotal (A)			**1705737**		**Nil**	
Grand Total			**12299397.5**		**53532.5**	

Copy of Feasibility Report is attached as **Annexure – 19.**

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

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

reserve/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)	**F2 (Pre-Feasibility Study)**	**G1(Detailed exploration)**	
The explored part of the area has been considered under G1 category. However, the reserve estimated under this category is coming under exceptional economic or conditional Economic category. Therefore, mineable reserve from the measured resource has been kept under E1 Axis.	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. The mining plan/Scheme of mining is approved. Land use pattern is detailed. Reclamation & rehabilitation proposal has been shown. However, due to lapse of the mining lease by the state govt vide letter No 4003/SM dated 02.05.2015 by Steel & Mines Department as per u/s 4A (4) of MMDR Act, 1957 read with provision of u/r 28(1) of MCR, 1960 and due to non-availability of Forest Clearance and Environment clearances the reserve has been considered under F2 axis.	Geological mapping has been done on 1:2000 scales. 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. Total 18 nos. of boreholes and 15 no of DTH holes were drilled till date within the lease area in G1 zone. Further, the existing quarry within the ML area is considered for estimation of mineral reserve under G1 category. A lateral influence of 50m has been taken on the both side of borehole and existing quarry for estimation of mineral reserve under G1 category.	121

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

E1 (Economic)	F2 (Pre-Feasibility Study)	G2(General exploration)	
The explored part of the area has been considered under G1 category. However, the reserve estimated under this category is coming under exceptional economic or conditional Economic category. Therefore, mineable reserve from the measured resource has been kept under E1 Axis.	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. The mining plan/Scheme of mining is approved. Land use pattern is detailed. Reclamation & rehabilitation proposal has been shown. However, due to lapse of the mining lease by the state govt vide letter No 4003/SM dated 02.05.2015 by Steel & Mines Department as per u/s 4A (4) of MMDR Act, 1957 read with provision of u/r 28(1) of MCR, 1960 and due to non-availability of Forest Clearance and Environment clearances the reserve has been considered under F2 axis.	Part of the area between Measured category where confidence level is high has been considered under indicated category.(G2)	122
E2(Intrinsically Economic)	**F2 (Pre-feasibility study)**	**G1 (Detailed exploration)**	**Code**
The blocked ore of 331 category within entire area due to blockage under safety zone of ML boundary, road cannot be mined out.	Geological information has been detailed. Part of the ML area has been explored in detail through bore hole and existing quarry. The level of exploration in this part is low in comparison to G1 category. Therefore, the	Geological mapping has been done on 1:2000 scales. Geological plan has been prepared showing the detailed topographical -cum-geological details including	221

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Hence, the reserve of this category has been kept under the E2 category of UNFC norms.	reserve estimated under this category has been coded as G2. The mining plan/Scheme of mining is approved. Environment Clearance is obtained for 0.864MTPA capacity. Land use pattern is detailed. Reclamation & rehabilitation proposal has been shown. However, due to lapse of the mining lease by the state govt vide letter No 4003/SM dated 02.05.2015 by Steel & Mines Department as per u/s 4A (4) of MMDR Act, 1957 read with provision of u/r 28(1) of MCR, 1960 and due to non-availability of Forest Clearance and Environment clearances the reserve has been considered under F2 axis.	surface features, extent of deposit, location of borehole etc. Geological sections have been prepared based on the bore hole data and mine development. Total 8 nos. of boreholes and 14 no of DTH holes were drilled till date within the lease area in G1 zone. Further, the existing quarry within the ML area is considered for estimation of mineral reserve under G1 category. A lateral influence of 50m has been taken on the both side of borehole and existing quarry for estimation of mineral reserve under G1 category	
E3 (Economic)	**F3 (Inferred study)**	**G3 (Prospecting)**	
The unexplored part of the ML area has been considered under G3category. Resource estimation has been made based only by geological interpretation. Exact grade of estimation of the	Definite identification of the ore body geometry has not been determined till date. Estimation for manpower deployment has not made in the Mining Plan/Scheme of Mining. Economics of the resources has to be known.	This category of mineral resource has been marked within the unexplored part of the entire area. Bore hole have been proposed at unexplored part of the lease area. These boreholes will be	333

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

resource has not been ascertained. Feasibility study has not been undertaken. Hence, the resources have been considered under E3 category.	Statutory obligations are to be given due attention during the mining of this possible resources. Feasibility study has not been undertaken. Hence, the resources have been considered under F3 category.	drilled up to end of the mineralization. Sampling and sample analysis will be done of each bore holes to convert the resource under G1 category.	

Reporting of Mineral Resources As per the format prescribed in Part IV- A of Minerals (Evidence of Mineral Content) Rule 2015

Sl. No.	Contents	Explanation
1	Title & Ownership	(iv) Contact No: M/s Thriveni Exploration Agency Pvt Ltd — At-Unchabali, Bamebari, Joda -758034 — Orissa@ thriveni.com — 9937091660 In house DTH drilling — At : Po Jururi P.S Bamebari Dist Keonjhar State : Odisha Pin-758034 — Email: drp@attradegroup.com — Phone : 06767272304
2	Details of the area	**Name of the Mine** :Jururi Iron Iron and Mn Mines (66.368 Ha) **Name of the lessee** : M/s Tarini Minerals pvt Ltd Village: Jururi District : Keonjhar
3	Infrastructure & Environment	The leasehold of Jururi Iron Ore Mine over 66.368Ha is well connected with Road and Railways. The detail communication facilities are as follows: **Communication:** a) **Road link** The ML area is approachable from Joda. The mine is adjacent to Joda - Bamebari road. Joda is around 14km from the lease area. b) **Rail link** The lease area is well connected with rail network. Jururi Railway station is adjacent to the mines. Banspani Railway Station is about 4km from the lease area. c) **Air link** Bhubaneswar airport (320 km away) is the nearest airport from the area. There is an airstrip/ helipad near Bhadrasai, Barbil which is around 32km from the lease area. **Host population**: The major surrounding villages are Jururi, Banspani, Jaribahal, Khuntpani etc. The population of villages are

Name of the village	Total Population
Jururi	2515
Jalahari	3021

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

		Bandhuaberha: 476 Palsa: 1714 Guruda: 1108 Kakarpani: 543 Jaganathpur: 897 Bholberha: 556 **Historical sites** :Nil **Forests**: 66.368Ha **Sanctuaries, national park :** Nil within 10 km radius **Environmental settings of the area.** Detail environment setting has been explained in Ch – VIII.
4	Previous Exploration	Explained in page no 18&19 of Chapter-I
5	Geology	Explained in Chapter-I
6	Aerial/ground geophysical/ geochemical data	Not done, However, detail exploration has been carried out by DTH/Core drilling.
7	Technological investigation	Details have been explained in chapter-I
8	Location of data Points.	The lease area has been surveyed by using Total Station and DGPS on a scale of 1: 5000 scale. During the survey the location of DTH/bore hole points were marked based on the topography and accessibility of drill machine.
9	Sampling Technique	During drilling cut samples of cores and chips of DTH were taken and analyzed to know the quality of ore in terms of Fe.
10	Drilling Technique & drill sampling employed	The lessee has already undertaken exploration in the form of 33 nos of bore hole till date. A total of 861 Meterage of drilling has been undertaken to assess the resource/reserve. The details of year wise meterage of drilling are furnished below:

Year	Type of bore holes	Total no of bore holes	Total meterage
2006-07	Core	10	248m
2007-08	Core /DTH	8 nos core type 15 nos DTH type	130m 483m
Total		**18 core type and 15 DTH**	**861m**

Drilling and sampling has not been carried out systematically and scientifically. The bore holes/DTH drilled was not gone upto end of the mineralization and has been excavated out. Hence, 56 bore holes at 100m x 100m grid interval has been envisaged within entire lease area.

11	Sub-sampling	After resumption of mining operation it has been envisaged to make meter

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

	techniques and sample preparation	wise sampling of each bore holes. Then samples will be sent for analysis at NABL lab. For cross checking purpose duplicate samples will be analysed at different lab. Analysis will be carried out for Fe,Sio2 and Al2O3.
12	Quality of assay data and laboratory tests	Earlier before 2008 there was no specification to analyse the samples at NABL accredited lab. Hence, lessee made the sample analysis at M/s Geomin lab to know the quality of ore. However, a detail drilling, sampling, and analysis will be carried out once mining operation is started.
13	Quality of assay data and laboratory tests	Not done.
14	Bulk Density	Bulk density has been considered based on the earlier mining experience within the lease area. Once the mining operation is started a detail study of bulk density will be undertaken.
15	Resource estimation techniques	Details of resource estimation is explained in Chapter-I (Geology and Reserve)
16	Further work	Total 56 nos of bore holes have been proposed to be carried out during ensuing plan period. It will be done after resumption of mining operation. The core of the bore holes will be analysed meter wise to know the quality of ore.
17	Annexures/enclosure to the report	Ref Annexure
18	Any other information	The mining operation has been temporary closed since 2010. Therefore, systematic exploration with analysis has not been carried out. After resumption of mining operation detail exploration at 100m x 100m grid interval will be carried out.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

CHAPTER-2

2.0 MINING

(A) OPENCAST MINING

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

Existing Method of Mining

The mining lease is not in operation since 2010. The mining Lease over 66.368 Ha of M/s. Tarini Minerals Pvt. Ltd. which have been declared lapsed by the State Government vide letter No 4003/SM dated 02.05.2015 by Steel & Mines Department as per u/s 4A (4) of MMDR Act, 1957 read with provision of u/r 28(1) of MCR, 1960. The lessee does not have the required statutory permissions to operate the mine. To start the mining operation the lessee has to obtain Environment Clearance, approved Mining Plan, consent to operate. However, during the time of operation, the mine was developed by mechanized (A-FM) means. Open cast mining method with drilling and blasting and shovel - dumper combination was adopted for the production of iron ore. Height and width of the benches were kept at 6m and 9m respectively. However, the salient points of existing method of mining are furnished below:

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

Sl. no	Salient features	Description
1)	Method of Mining	Fully Mechanized (FM)
2)	Max production at the time of operation	248000MT, 2272MT
3)	Type of ore	Iron ore, Lateritic iron ore etc
4)	Means of raising	Drilling, blasting, excavation, processing etc.
5)	Bench height	6m,
6)	Bench width	10m
7)	Stripping ratio (t/m3) (Ore: OB)	- 1: 0.19
8)	Over all slope	37.5^{0}
9)	Transportation ore to the stacking yard	Through dumper & tippers
10)	Nature of overburden	Generally soft and consists of shales, and Laterites
11)	Blasting proposal	Deep hole blasting is carried on to dislodge the boulders.
12)	Mineral beneficiation	Through 200TPH Screen and crushing unit.
13)	Output per man shift	10t to 20t

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Existing pit

There are 3 iron ore quarry and one manganese quarry and two no of dumps has been developed by means of mining within the lease area. The details of the existing dimensions of the pit are given below:

Sl no	Quarry name	Location	Length (m)	Width (m)	Area (m2)	No of benches	Top RL	Bottom RL	Remark
1	Top Quarry	Central part of the ML area	250	90.00	22500	9	605.0	560.0	Iron
2	Middle Quarry		210	5.00	1050	7	564.0	544.75	Iron
3	Old Quarry	Northern part of ML Area	189	75.00	14175	5	593.6	551.0	Iron
4	Manganese Quarry	Eastern part	75	52.00	3900	5	557.0	543.5	Mn

Existing Dumps

Name of the dump	Location (Grid)	Length(m)	Width (m)	Area occupied	Total volume(m3)	Grade
Dump – 1 (Mineral Reject dump)	2427380 to 2427750N and 336090 to 336225E	380	81	30969	839800	48.66%Fe
Dump - 2	2427850 to 2427950N and 336360 to 336477E	119	65	7735	38675	39.62%Fe
Dump - 3	2427744 to 2427816 and 336405 to 336495E	75	68	5100	25500	41.37%Fe
Dump - 4	2427739 to 2427845 and 336495 to 336550E	95	49	4655	23275	40.11%Fe

All these dumps has been analyzed by NABL Accredited lab. Based on the results of analysis dump-1 is mineral reject dump. Other three dumps are waste dumps. The copy of the sample analysis result is attached as **Annexure –15.** Part of the dumps which are situated within UPL will be re-located out side the UPL at earmarked place. The shifting work will be done during conceptual period. (Ref conceptual plan).

After shifting of these waste dumps it has been planned to make dumping within 336400E to 336550E and 2427750N to 2428000N. There will be provision of retaining wall, garland drain, and settling pond for this dumping. However, all these protective measures will be constructed during conceptual period before dumping is taken place.

Similarly, the part of the mineral reject dump situated within UPL will be shifted out side the UPL and stored at earmarked locations adjacent to the proposed mineral reject stack.

Salient features of Proposed Method of Mining:

There will be no change in the method of mining proposed in the earlier approved modified mining plan period. Opencast Fully mechanized method will be adopted during ensuing scheme period. The height of the bench will be 6m and the width will be 9m or more than the bench

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

height. The deposit will be exploited in the manner as has been proposed in the scheme of mining. Wagon drill and Pneumatic Drill will be used for drill hole for blasting. Hydraulic excavator of 2.1 Cu.m and 0.9 Cu.m bucket capacity for excavation, truck of capacity 10 and 20 tons will be used for transport of ore and waste. During this year the over burden generation will be nil. Waste will be generated as intercalations. The Top quarry has been planned to be developed and the top RL and bottom RL will be 602.60m and 575.00m respectively. Total five nos of benches will be developed within ore zone to achieve the targeted production.

The details of operating system of the mines will be as follows:

- **Drilling & Blasting**

Loosening of rock mass was done by drilling & blasting. For this purpose wagon drill of 100mm dia is being used with burden and spacing of 3.0m and 3.5m respectively. Rock breaker will be used for breaking the boulder size material.

The area contains lateritic ore which requires drilling & blasting. As the strata is hard, ore and O.B. benches will be made and maintained at 6.0m height and width more than the height of bench. Separate benches for O.B. and ore shall be maintained wherever possible. The hard, ore body will be drilled by LM 100mm drill machine and then blasted. It is proposed that about 50% of the ore zone will require drilling and blasting.

- **Excavation and loading**

Heavy Earth moving Machinery has been deployed, within the mines to produce required production of ore and its transportation. For excavation and loading 2.1 Cu.m capacities excavator is being used within the mine site.

- **Pit Road Layout**

The layout of roads for haulage of ore/ waste will be developed complying with the statutory regulations stipulated in the Metalliferrous Mines Regulations, 1961. The main haul roads shall generally be of 9m width, the width of 10-20 ton dumper envisaged for haulage of material being about 6m. Road gradient shall generally be maintained at 1 in 16, except in cases of ramps, where gradient of up to 1 in 12 may have to be provided, due to space constraints.

- **Transportation: (For Ore & Waste):**

Transportation of ore is carried out by the 10-20t capacity dumper. The, total production of ore shall be directly transported to the stock yard for sorting & sizing. For this, dumpers of 20 tones shall be used. Also, overburden and intercalated waste generated from the manganese section shall be directly transported to the dump yard earmarked for the purpose.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

- **Working Schedule**

After allowing for 52 Sundays and 3 National holidays and 4 major holidays, the available working days in a year workout to be 306. However, the effective working days have been kept as 300 days.

- **Man power detail**

The lessee has employed 84 numbers of manpower under this project for smooth functioning of mining operation.

PROPOSED METHOD OF MINING (YEARLY DEVELOPMENT PLAN PROPOSED DURING 2020-21 TO 2024-25)

1st Year Development (2020-21):

During this year, the existing Top pit quarry will be developed towards northward direction to achieve the targeted production of iron ore. It has been planned to produce 420000 MT of ROM ore during this year. As the old dumps are situated within the ultimate pit limit it has been planned to shift the old dumps outside the UPL. This shifting of old dump will be carried out during conceptual period, subject to forest clearance and resumption of Mining operation. The details of bench geometry and quarry development will be as follows:

Particulars		Description
Bench Geometry	Height	6 m
	Width	9 m
	Bench slope angle	85°
Quarry Development	Name of the existing quarry to be developed	Top Quarry
	Name of the section along which development will be done	N 2427600
	Direction of advancement	South to North
	Top RL	602.60
	Bottom RL	575.00
	Overall quarry slope angle	31°
	Production of saleable ore(MT)	370394
	Production of Mineral Reject(MT)	49606
	Generation of waste	13228MT or 6614 Cu.m
	Production of ROM (MT)	420000
	Stripping Ratio	1:0.015
	No of benches in OB and ore	5 nos in ore and nil in OB
	No of quarries to be developed	One(Top quarry)

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Section wise and RL wise Estimation during the year 2020-21

Cross Section	RL	C/ S Area (Sq. m)	Influence (m)	Volume of Ore Zone (Cu. m)	Saleable ore (MT)	Mineral Reject (MT)	Intercalated Waste (MT)	Qty. of ROM (MT)
	A	B	C	d=b X c	e=dX80%X3.5	f=dX15%X2.5	g=dX5%X 2.0	h=e+f
N2427600	599	36.625	70	2563	7178	961	256.	8140
	593	140	80	11200	31360	4200	1120	35560
	587	180	100	18000	50400	6750	1800	57150
	581	280	110	30800	86240	11550	3080	97790
	575	581	120	69720	195216	26145	6972	221361
Total				**132283**	**370394**	**49606**	**13228**	**420000**

Development during 2nd year (2021-2022)

During this year, the existing benches of Top pit quarry will be developed towards northward direction and further depth-ward direction of the 1st year developed benches of the to achieve the targeted production of iron ore. It has been planned to produce 419735 MT of ROM ore during this year. The details of bench geometry and quarry development will be as follows:

Particulars		Description
Bench Geometry	Height	6 m
	Width	9 m
	Bench slope angle	85^0
Quarry development	Name of the existing quarry to be developed	Top Quarry
	Name of the section along which development will be done	N 2427600
	Direction of advancement	South to North & depth-ward
	Top RL	599
	Bottom RL	593
	Overall quarry slope angle	31^0
	Production of saleable ore(MT)	370160
	Production of Mineral Reject (MT)	49575
	Generation of waste	13220 MT or 6610 Cu.m
	Production of ROM (MT)	419735
	Stripping Ratio	1:0.015

Section wise and RL wise Estimation of 2nd Year Production

Cross Section	RL	Cross Section Area (Sq. m)	Influence (m)	Volume of Ore Zone (Cu. m)	Saleable ore (Tones)	Mineral Reject (Tones)	Intercalated Waste (Tones)	Qty. of ROM (Tones)
	a	b	c	d=b X c	e= d X 80% X3.5	f=dX15%X2.5	g=dX5%X2	h=e+f
N2427600	599	772	100	77200	216160	28950	7720	245110
	593	550	100	55000	154000	20625	5500	174625

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Total	132200	370160	49575	13220	419735

Development during 3rd year (2022-2023)

During the year 2022-23, it has been proposed to develop the existing benches of Top Pit further towards southward and depth-ward direction up-to 557 m.RL to achieve the targeted production of iron ore. It has been planned to produce 419417.5MT of ROM ore during this year. The details of bench geometry and quarry development will be as follows:

Particulars		Description
Bench Geometry	Height	6 m
	Width	9 m
	Bench slope angle	85^0
Quarry development	Name of the existing quarry to be developed	Top Quarry
	Name of the section along which development will be done	N 2427600, N 2427500
	Direction of advancement	Towards South-ward & depth-ward
	Top RL	575
	Bottom RL	557
	Overall quarry slope angle	31^0
	Production of saleable ore(MT)	369880
	Production of sub grade ore(MT)	49537.5
	Generation of waste	13210MT or 6605 Cu.m
	Production of ROM (MT)	419417.5
	Stripping Ratio	1:0.015

Section wise and RL wise Estimation of 3rd Year Production

Cross Section	RL	Cross Section Area (Sq. m)	Influence (m)	Volume of Ore Zone (Cu. m)	Saleable ore (Tones)	Mineral Reject (Tones)	Intercalated Waste (Tones)	Qty. of ROM
	a	b	c	d=b X c	e = d X 80% x 3.5	f= d X15% x 2.5	g = d X 5% x 2	h= e+f
N2427600	557	800	100	80000	224000	30000	8000	254000
N2427500	575	45	100	4500	12600	1687.5	450	14287.5
	569	55	100	5500	15400	2062.5	550	17462.5
	563	89	100	8900	24920	3337.5	890	28257.5
	557	332	100	33200	92960	12450	3320	105410
Total				**132100**	**369880**	**49537.5**	**13210**	**419417.5**

Development during 4th year (2023-2024)

During the year 2023-24, it has been proposed to further develop the existing benches of Top Pit towards both eastward and westward direction to achieve the targeted production of iron

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

ore. It has been planned to produce 299826.250 MT of ROM ore during this year. The details of bench geometry and quarry development will be as follows:

Particulars		Description
Bench Geometry	Height	6 m
	Width	9 m
	Bench slope angle	850
Quarry development	Name of the existing quarry to be developed	Top Quarry
	Name of the section along which development will be done	N 2427600, N 2427500
	Direction of advancement	Towards east-ward & west-ward
	Top RL	593
	Bottom RL	557
	Overall quarry slope angle	310
	Production of saleable ore(MT)	370272
	Production of sub grade ore(MT)	49590
	Generation of waste	13224MT or 6612 Cu.m
	Production of ROM (MT)	419862
	Stripping Ratio	1:0.015

Section wise and RL wise Estimation of 4th Year Production

Cross Section	RL	Cross Section Area (Sq. m)	Influence (m)	Volume of Ore Zone (Cu. m)	Saleable ore (Tones)	Mineral Reject (Tones)	Intercalated Waste (Tones)	Qty. of ROM (Tones)
	a	b	c	d=b X c	e=dX80% X 3.5	f=dX15% X2.5	g=dX5% X2.0	h= e+f
N2427600	593	140	110	15400	43120	5775	1540	48895
	587	200	100	20000	56000	7500	2000	63500
	581	210	100	21000	58800	7875	2100	66675
N2427500	581	48	80	3840	10752	1440	384	12192
	569	110	150	16500	46200	6187.5	1650	52387.5
	563	160	150	24000	67200	9000	2400	76200
	557	210	150	31500	88200	11812.5	3150	100012.5
Total				**132240**	**370272**	**49590**	**13224**	**419862**

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Development during 5th year (2024-2025)

During this year, the existing benches of Top pit quarry will be developed towards depth-ward direction up-to 551 m.RL to achieve the targeted production of iron ore. It has been planned to produce 299996.550 MT of ROM ore during this year. The details of bench geometry and quarry development will be as follows:

Particulars		Description
Bench Geometry	Height	6 m
	Width	9 m
	Bench slope angle	85^0
Quarry development	Name of the existing quarry to be developed	Top Quarry
	Name of the section along which development will be done	N 2427500, N 2427600
	Direction of advancement	Towards east-ward & west-ward
	Top RL	593
	Bottom RL	557
	Overall quarry slope angle	31^0
	Production of saleable ore(MT)	370160
	Production of Mineral Reject(MT)	49575
	Generation of waste(MT)	13220 MT or 6610 Cu.m
	Production of ROM (MT)	419735
	Stripping Ratio	1:0.015

Section wise and RL wise Estimation of 5th Year Production

Cross Section	RL	Cross Section Area (Sq. m)	Length Influence (m)	Volume of Ore Zone (Cu. m)	Saleable ore (Tones)	Mineral Reject (Tones)	Intercalated Waste (Tones)	Qty. of ROM (Tones)
	a	b	c	d=b X c	e=dX80%X3.5	f=dX15%X2.5	g=dX5%X2.0	h= e+f
N2427600	575	208	100	20800	58240	7800	2080	66040
	569	150	90	13500	37800	5062.5	1350	42862.5
	563	180	80	14400	40320	5400	1440	45720
	557	180	70	12600	35280	4725	1260	40005
	551	420	60	25200	70560	9450	2520	80010
N2427500	575	90	120	10800	30240	4050	1080	34290
	569	90	130	11700	32760	4387.5	1170	37147.5
	563	80	140	11200	31360	4200	1120	35560
	557	80	150	12000	33600	4500	1200	38100
Total				**132200**	**370160**	**49575**	**13220**	**419735**

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

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

I. In-situ Tentative Excavation

Year	Pit no.	Total tentative Excavation (Cum)	Top Soil (Cu m)	Inter Burden (Cum)	ROM (Cu m)			Mineral reject	ROM Waste / Ratio (cum/cum)
					Ore (Cum)*	Mineral reject (Cum)	ROM (cum)		
1	2	3	4	5	6	7		8	9
2020-21	Top quarry	128446	Nil	6614	102595	19236.4	121832	Nil	1: 0.054
2021-22		132200	Nil	6610	105760	19830	125590	Nil	1: 0.053
2022-23		132100	Nil	6605	105680	19815	125495	Nil	1: 0.053
2023-24		132240	Nil	6612	105792	19836	125628	Nil	1: 0.053
2024-25		132200	Nil	6610	105760	19830	125590	Nil	1:0.053
Total		**657186**		**33051**	**525587**	**98547.4**	**624135**		

Note: 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.

At present in this document, the tonnage factor and recovery factor has been considered as per exploration input from the drilled bore-hole data and time series data as below:

Tentative tonnage and recovery factor

(a)Based on the earlier experience of mining operation, the recovery of marketable ore and their sub-grade & inter-burden material is given below:

Mineral	Marketable percentage of ROM	Sub-grade percentage of ROM	Inter-burden/ Intercalated Waste percentage of ROM
Iron ore	80% (+55% Fe)	15% (+45% Fe to 55% Mn)	5% < 45Fe

(b) Tonnage factor for iron ore considered – 1.0 Cum = 3.5 MT for saleable and 1.0 cum = 2.5 MT for S/G mineral. The tonnage factor of intercalated waste from manganese ore zone 1Cu.m = 2.0 MT. Thus, tentative tonnage proposed to be produced per year is arrived as below:

I. In situ Tentative Excavation (MT)

YEAR	ROM(MT)			Intercalated waste (MT)	Total Excavation (MT)
	Saleable ore	Mineral Reject	ROM(MT)		
2020-21	359084	48091	420000	13228	433228
2021-22	370160	49575	419735	13220	432955
2022-23	369880	49537.5	419418	13210	432628
2023-24	370272	49590	419862	13224	433086
2024-25	370160	49575	419735	13220	432955
Total	**1850866**	**247884**	**2098750**	**66102**	**2164852**

अनुमोदित
APPROVED

II. **Dump re-handling**

During ensuing Scheme period, there is no proposal of dump re-handling.

07/12/20

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

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

ANY CHANGE IN PROPOSED METHOD OF MINING AND DEPLOYMENT OF MACHINERY.

There will be no change in the method of mining proposed in the earlier approved modified mining plan period. The height of the bench will be 6m and the width will be 9m or more than the bench height. The deposit will be exploited in the manner as has been proposed in the scheme of mining. Wagon drill and Pneumatic Drill will be used for drill hole for blasting. Hydraulic excavator of 2.1 Cu.m and 0.9 Cu.m bucket capacity for excavation, truck of capacity 10 and 20 tons will be used for transport of ore and overburden.

Extent of Mechanization:

Drilling & Blasting

Wagon drill required to be deployed in the proposed Scheme Period

Specification of blast hole drill	:	85 mm
Diameter of blast hole drill	:	7.5 Cum/min
Pressure supplied up to	:	7.5 kg f/ sq.cm.
Drilling parameters		
Dia. of blast hole (D)	:	75 mm
Height of the bench	:	6 m
Additional drilling required (sub grade)	:	0.6 m
Length of the hole (H + A)	:	6.6 m
Burden (B)	:	4.4 m
Spacing (S)	:	5.5 m
Volume of earth to be broken/loosen per hole	:	B x S x H= 4.4 x 5.5 x 6.6 = 159.72 say 160 Cu.m
Meterage of drilling per drill (wagon drill) for primary blasting in ore zone		
Total volume of material	:	128244.00 Cum
Total volume required to be blasted (50%)	:	64122.00 Cum
Number of holes to be drilled	:	64122 ÷160 = 400.76
Number of holes to be drilled per day of 300 days in a year	:	400.76 ÷ 300 = 1.33
Total Meterage of drilling per day (Length of blast hole = 6.6m)	:	1.33 x 6.6 = 8.81 say 9
Requirement of drill		
Speed of the wagon drill	:	6m/hr
Effective drilling hr / one shift (8 hrs shift of which effective working hrs = 5 hrs shift)	:	5 hrs
Meterage of drilling to be effected day	:	9 x 5 = 45 m
Number of drills required	:	45 ÷ 30 = 1.5 or say 2 no

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Requirement of Air Compressor

Number of Wagon drills will be in Operation	:	1 Number
Dia. of each Wagon drill	:	85 mm
One 85 mm dia wagon drill requires compressed Air	:	7.5 Cum/Min
So,1 Wagon drill shall require air compressor	:	7.5 Cum/Min
Compressor unit Required	:	= 1 no

Requirement of Excavators during the Scheme Period

Specification of Excavators		
Bucket Capacity (C1)	:	2.1 Cum
Bucket Fill Factor (F)	:	0.7
Time Cycle pass at 900 Swing (T1)	:	28 sec
Swell Factor (S)	:	0.6
Production efficiency factor (e)	:	0.7
Job Management factor	:	0.9
Time Scheduling		
Working days per Year	:	300 days
Number of working shifts per day	:	1 shift
Working hour per shift	:	8 hrs
Effective working hour per shift	:	6 hrs
Seconds in hour	:	3600 sec
Output /0.9 Cum shovel/annum	:	(Cl x F x S x e x f x 3600 x 6 x 300] T1 = [2.1 x 0.7 x 0.6 x 0.7 x 0.9 x3600 x 6 x 300] ÷ 28 = 128595.60 Cum
Number of Excavators Required		
Maximum excavation	:	128244cum
Total excavation by one 2.1Cu.m capacity shovel per annum	:	128595.60 Cum
To excavate 128244.00 Cum	:	1 No
Shovel required as stand by	:	1 numbers of 2.1 Cu.m capacity
Total requirement of shovel	:	2 numbers

Transportation

The crusher is located within 2 km of the mine faces to which sub grade materials and salable grade materials shall go for crushing to required size as specified by the buyers and then will come their respective stack yard. The distance has been considered as 2 km as the lead distance for hauling of materials from the mine face to the crusher. Accordingly calculation for tipper/dumper requirement is furnished.

Loading Time		
Capacity of the dumper	:	20 tones
Rate of production of 2.1 Cum shovel per day	:	128244Cum ÷ 300 = 427.48 Cum or 1282 MT.
Number of passes required for one dumper attached to 2.1 Cum shovel	:	Dumper capacity ÷ Cl x F x S x Tonnage factor =20÷ (2.1 x 0.7x 2.6)= 5.23 or 6 passes

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Hauling time for crusher plant	:	Average hauls length to be covered by the loaded dumper (2 km) + Average speed of the dumper (20 km per hr. (Loaded + empty) = 6 min
Return time	:	6 min
Dumper cycle time (ore to crusher site) = Loading time + hauling time + unloading time + return time + spotting time and waiting time	:	5+6+5+6+3 = 25 Min
Working time per dumper per day	:	8 hrs
Number of trips per dumper per day	:	(6 x 60) + 25 = 14.4 say 14 trips
Tonnage per day per dumper	:	20 x 14 = 280
Dumper requirement (attached to 2.1 Cum shovel)	:	1282 + 280 = 4.57 say 5 nos
One 2.1 Cum shovels shall require	:	5 nos
Stand by to overcome break down	:	1 no
Total dumper requirement	:	6 nos

List of Machinery

Sl No	Machinery	Capacity	Existing (Nos)	Additional Requirement	Capacity
1	Compressor	(7.5 Cum Min)	1	Nil	
2	Drill	(85 mm dia)	1	1	
3	Excavator shovel	0.9 Cum	5	1	2.1 Cum
4	Dumper/Tipper	10 Ton	--	6	20 Ton
5	Water tanker	(10 KL)	1		
6	Crushing & Screening Unit			1+1	150 TPH Screen, 150 TPH Crusher
7	Jack hammers/ Drilling rods			As Required	
8	Dozer		1	Nil	

Blasting

Blasting of the rock to break it into smaller sized material is one of the key operations in any mining activity. For this purpose, explosives of desired quality are used as blasting agent in blast holes. In the present mining operation in the lease area, blasting operations are being carried out to dislodge the harder formations, both in overburden as well as in the ore zone.

Maximum Excavation in a year	:	128244.00 Cum
Percentage of excavation through blasting(50% of total Excavation)	:	64122.00 Cum
Monthly rate of excavation	:	5343.5 Cum
Power factor of the explosive	:	6.0
Explosive consumption per month	:	890 Kg
Number of holes required per month	:	710 No
Explosive consumption per year	:	10680 Kg

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Explosive Magazine

A 5 tonne capacity magazine is available in the lessee's mines in the area. An explosive van of 5tonne capacity that exists in the lease area shall be used for transportation of blasting materials. However, as the Mines has been closed since a long period, at present there is no permission valid for the Explosive magazine. After resumption of the mining operation, permission will be obtained from DGMS to use the Explosive magazine.

Type of Explosives to be used

Non cap sensitive slurry explosive of 83 mm dia like Powder gel2, Nitro gel etc. are used as column charge while OCG, Nitro boost etc. are used as booster charge for 100mm dia holes in both the quarries in dry season and in wet season combination of OCG and GN 1 is also used. For short hole blasting 25mm dia cartridges of Nitroglycerine based explosive like SG 60 is used. ANFO is used to blast the waste rocks.

Blasting Procedure

High explosives will be loaded by deck charging. The stemming length will be one third of the depth of the blast hole. The ratio of base charge & column charge will be kept at 0.2:1. The explosive column is blasted in a 'V' type blasting pattern initiated by OD/ NONEL/ safety fuse/Detonating cord.

Hydraulic operated rock breakers fitted with hydraulic excavators are deployed for breaking of oversize boulders generated from the deep hole (large diameter) blasting. Therefore, secondary blasting is not necessitated.

Ground Vibration & Fly rock Problems & Precautions:

The following precautionary measures will be adopted for controlling fly rock movement & ground vibration. Blasting pattern will be properly designed to reduce ground vibrations/ fly rock. Controlled blasting technique/muffle blasting will be adopted by varying burden, spacing and charge/hole depending upon the hardness of the formations. Loose materials will be removed from the bench floors and bench slopes before blasting.

a) Stemming length and stemming material will be optimum i.e. 1/3 of hole length and will be suitably chosen.
b) Safe ratio (stemming length to burden of hole) shall be kept at more than 0.6.
c) Stemming material will be compacted properly before blasting.

Ground Vibration & Fly rock Problems & Precautions:

- Blasting will be carried out by a person with Blaster's Certificate of Competency issued by DGMS, Dhanbad.
- Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

- Portable blasting shelters will be provided near the blasting site.
- Blasting will be preferably done during 5.00 PM to 6.00 PM depending on seasonal variation of break hours or the end of the day in order to ensure that no person or animals are within the blasting danger zone.
- Misfires will be handled carefully as per stipulated procedures.
- Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.
- Precautionary measures as stipulated under MMR, 1961 shall be strictly followed.

Safety Aspect

The major risks associated with the project are as follows:

1. Disaster due to Slope failure.
2. Disaster due to failure of waste dump.
3. Disaster due to surface fire.
4. Dangers due to storage of Magazine.
5. Accident due to Machineries (transportation, excavation etc.)
6. Disaster due to blasting.

The safety measures will be undertaken as per the DGMS Rule and guide line.

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

Separate Year wise development plan has been attached. (Ref plate No—VIA-VIF)

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

There will be no change in the method of mining proposed in the earlier approved modified mining plan period. Opencast Fully mechanized method will be adopted during ensuing scheme period. The height of the bench will be 6m and the width will be 9m or more than the bench height. The deposit will be exploited in the manner as has been proposed in the scheme of mining. Wagon drill and Pneumatic Drill will be used for drill hole for blasting. Hydraulic excavator of 2.1 Cu.m and 0.9 Cu.m bucket capacity for excavation, truck of capacity 10 and 20 tons will be used for transport of ore and overburden.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

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.

• Layout of Mine Workings

It has been proposed to develop the top pit to obtain a production of 420000MT iron ore per annum. At the end of the scheme period the layout of the top and middle pit will be as follows:

Particulars		Description
Bench Geometry	Height	6 m
	Width	9 m
	Bench slope angle	850
Quarry development	Name of the existing quarry to be developed	Top Quarry
	Name of the section along which development will be done	N 2427500, N 2427600
	Direction of advancement	Towards east-ward & west-ward
	Dimension (Length x width)	290 x 225
	Top RL	593
	Bottom RL	557
	Overall quarry slope angle	31^0

• Pit Road Layout

The layout of roads for haulage of ore/ waste will be developed complying with the statutory regulations stipulated in the Metalliferrous Mines Regulations, 1961. The main haul roads shall generally be of 9m width, the width of 10-20 ton dumper envisaged for haulage of material being about 3m. Road gradient shall generally be maintained at 1 in 16, except in cases of ramps, where gradient of up to 1 in 12 may have to be provided, due to space constraints.

Sites for disposal of overburden/waste along with ground preparation prior to disposal of waste reject etc.

The waste materials generated from the mine working comprises laterite, shale, clay materials in form of intercalated waste having -45% Fe occurring within the ore zone. A total of 5% waste will be generated in the form of intercalated waste out of the volume of ore zone. During the plan period about 33051cum of waste is likely to be generated.

There exists a waste dump near eastern side of the Old quarry .During scheme period this dump will be extended further 27 m in the NE direction. The dump is situated over non-mineralized area as far surface geology is concerned. However to prove the barrenness a bore hole has been proposed over the proposed dump area. The mineral rejects generated will be disposed within the quarry floor.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

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

Life of the mine

The total mineral reserve of iron ore is estimated to be 10593660.5MT

- Proposed production during the plan period is 2098750 MT
- Remaining reserve within the lease area will be 10593660.5–2098750 MT
  = 8494910
- Considering the production of iron ore @ 420000MT per annum, life of the mine will be 8494910 /420000 = 20.22 years say 21 years.
- Therefore, the life of the mines is 26 years which includes 5 years of planned period and 21 years of conceptual period. However, the life of the mine may vary after the exploration of entire area.

However, it has been proposed to drill around 56 numbers of holes at a grid interval of 100m X 100m during plan period. Therefore the life of mines may change depending upon outcomes of proposed exploratory drill holes, cut-off grade, method of working and market demand.

The Ultimate Extent and Size of the Pit

As described in chapter-III, there are 3 numbers of Iron ore pits/quarries and one manganese pit/quarry within the ML area. During conceptual period all the pits will be merged and worked as single quarry. The ultimate size of the pit and its ultimate co-ordinates, top & bottom RLs with depth of working are tabulated as below:

Ultimate size of Pits (m)		Ultimate Co-ordinates		Top RLs (m)	Bottom RLs (m)
Average length	Average width	Northing	Easting		
560	390	2427383 to 2427987	335920 to 336545	614.00	515.00

In case after the drill holes as proposed to be completed during the proposed scheme period encounter ore at depth, limitations of quarry boundary as well as quarry floor shall undergo change including reserves and life of the mines.

Ultimate capacity of dump:

Considering, the production target of 420000 TPA the life of the mine is 40 years. However, based on the earlier mining practices and the Annul Return submitted to IBM, it has been observed that the recovery percentage of iron ore from the ROM is 100%. However from the safe side the recovery percentage of saleable, Mineral reject and intercalated waste are considered as 80%, 15% and 5% respectively. As the old dumps are situated within the

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

ultimate pit limit it has been planned to shift the old dumps outside the UPL. This shifting of old dump will be carried out during 2025-26, subject to forest clearance and resumption of Mining operation.

Dumping during plan period:

The waste materials generated from the mine working comprises laterite, shale, clay materials in form of intercalated waste having -45% Fe occurring within the ore zone. A total of 5% waste will be generated in the form of intercalated waste out of the volume of ore zone. During the scheme period about 66102 MT or 33051Cu. m of waste is likely to be generated. The year wise waste generation will be as follows:

YEAR	Intercalated waste (MT)	Intercalated waste (cum)
2020-21	13228	6614
2021-22	13220	6610
2022-23	13210	6605
2023-24	13224	6612
2024-25	13220	6610
Total	**66102**	**33051**

The details of utilization of waste during the plan period are as follows;

Year	Volume (Cu.m)	Utilisation of waste
2020-21	6614	The total waste will be utilised for construction and maintenance of road
2021-22	6610	The waste will be occupied over an area 1526 m2 with an average height of 3 m up-to 564 MRL from surface level
2022-23	6605	The waste will be occupied over an area 1526 m2 with an average height of 3m up-to 567 MRL form second year dump position(564 MRL)
2023-24	6612	The waste will be occupied over an area 1526 m2 with an average height of 3 m up-to 570 MRL from third year dump position(567 MRL)
2024-25	6610	The waste will be occupied over an area 1526 m2 with an average height of 3 m up-to 573 MRL from fourth year dump position (570 MRL)

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Dumping during Conceptual period:

Total Mineable Resource (In-situ Iron ore zone) = 3687480.00 Cum
Total Excavation during Planned period = 121832 Cum
Remaining Resource for conceptual period = 3565648Cum
Waste generation during conceptual period = 3565648 Cum x 5%
=178282 Cum

Float Iron ore zone

Total volume of Float Iron ore zone = 143530.00 Cum
Waste generation @of 50% =143530.00 Cum x 50%
= 71765 Cum

Intermediate Waste to be excavated during Conceptual period = 299800.00 Cum

Total Waste generation beyond planned period = 178282 +71765.00+ 299800
= 549847 Cum

However, the waste dumps located within ultimate pit limit will be re-located outside of the UPL. This shifting of dump will be done during conceptual period, However, this shifting of dump is subject to forest clearance and resumption of mining operation.

Utilization of Waste:

The total waste i.e. 549847Cum will be utilized for backfilling at two different location which has been shown in the conceptual Plan . The details of backfilling will be as follows;

Location	Area (m2)	Avg. Thickness	Volume of waste to be back filled	Maximum height up to which back filling is
Back filled Area	21866	30	553028.20	Up-to RL 545m

Mineral Reject stack yard

During plan period:

Above 45 % Fe to -55% Fe iron ore, which do not have the market at present, is considered as mineral reject. The Mineral reject generation in the area is estimated in the proposed Mining plan period would be 247884 MT or 9153cum. The details of the generation of Mineral Reject is given below;

Year	Mineral Reject (MT)	Mineral Reject (cum)
2020-21	48091	19236.4
2021-22	49575	19830
2022-23	49537.5	19815
2023-24	49590	19836
2024-25	49575	19830
Total	**247884**	**99153.6**

These mineral reject shall be stacked separately in the floor of the quarry. However based on the marketability of ore the mineral reject will be blended with high grade to make it saleable grade and sold it various consuming agencies as far as practicable.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

During Conceptual period:

Total Mineable Resource (In-situ Iron ore zone) = 3687480.00 Cum

Total Excavation during Planned period = 121832 Cum

Remaining Resource for conceptual period = 3565648Cum

Generation of mineral reject during conceptual period = 3565648Cum x 15%
=534847 Cum

Float Iron ore zone

Total volume of Float Iron ore zone = 143530.00 Cum

Mineral reject generation @ of 40% =143530.00 Cum x 40%
= 57412.00 Cum

Total mineral reject beyond planned period = 534847 +57412.00
= 592259 Cum

In addition to above quantity, part of existing mineral reject stack within UPL will be shifted outside the UPL. About 61000cum of mineral reject will be re-handled and shifted to outside the UPL. These mineral reject will be stored adjacent to the proposed mineral reject which will be generated during plan period. The conceptual mineral reject to be generated will be stored temporarily at specified location by extension of proposed mineral reject stack towards south. However based on the marketability of ore the mineral reject will be blended with high grade to make it saleable grade and sold it various consuming agencies as far as practicable. At the end of the conceptual period, there will be no mineral reject stack within the lease area.

Conceptual Exploration

The total area will be explored within plan period. Therefore, no proposal of exploration has been envisaged during conceptual period.

Manpower:

The proposed production will be obtained by same manpower during conceptual period.

Machinery

For production during conceptual period same machineries/equipment will be deployed.

Afforestation

Afforestation plan period:

During plan period of 5 years, it has been planned to undertake plantation over 2.75 Ha in the safety zone and along the railway siding. The plantation would be carried out @ 1600nos per hectare. The year wise plantation within mining scheme period as follows:

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Year	Location	Area in Ha.	No of Saplings	Name of the Plants to be planted
2020-21	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	Consultation with forest authorities shall be planted. Artistida, onctarous, Cillianis, Agava mexicana, Euciliopsis binata, Eucalyptus,Sorea robusta
2021-22	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
2022-23	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
2023-24	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
2024-25	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
Total		**2.75**	**4400**	

Afforestation during conceptual period

During conceptual period it has been planned to do the plantation over the safety zone area of 1.717 Ha.

Type of species to be planted:

The scheme and selection of plant species will be mainly based on the local soil conditions and social accept abilities. The plant species which preferably will be nitrogen fixers, pollution abaters, fruit bearing shall be taken up for plantation. The species recommended are Diospyros melanoxylon (Kendu), Aegle marmelos (Bel) Gmelina arborea (Gambhari), Albizzia lebek (Siris), Mangifera indica (Mango). Madhuca indica (Mahul), Syzigium cumini (Jamu).

Environmental Aspects.

The afforestation programme and the reclamation proposal as a part of maintaining balance in the ecosystem. Disposal of waste has been planned with due regard to environmental implications. In order to avoid air pollution arising out of generation of dust, water spraying will be done on roads and other points where dust is likely to be generated. Dust due to blasting, however, will not be of any significance to cause set back to the air regime. The average wind speed of the area will be able to diffuse the dust quickly in the air and render it proper for inhalation.

Pollution of water regime will be caused by the run off rainwater from dumps mainly. This has been taken care of by planning a suitable settling pond in close vicinity of the dump. Similarly the ore may contaminate the ground water and surface water accumulated in the quarry floor. This contamination is expected to be so negligible that treatment of the same may not be

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

required. Though the mines will be worked mechanically there will be use of modern machinery. So the noise pollution will not be a problem at all. The workers in the close vicinity of sources of noise like machinery, diesel pumps compressors etc. will be provided with ear protective devices.

Degradation of land is unavoidable in a surface mining operation. This has been kept into a minimum level by planning more of depth-wise extension of the quarry. Lateral extension has been kept at bare minimum necessary level.

Protective measures around the waste and mineral reject dump

Plan period

Period	Retaining wall			Garland drain			Settling pond*(1 no)		
	L(m)	B(m)	H(m)	L(m)	B(m)	D(m)	L(m)	B(m)	D(m)
2020-21	220	1.0	2.0	230	1.0	1.5	10	10	2
Grid Location	2427580 to 2427700			2427570 to 2427700			2427700 and 336000		

Conceptual period

Period	Retaining wall			Garland drain			Settling pond*(1 no)		
	L(m)	B(m)	H(m)	L(m)	B(m)	D(m)	L(m)	B(m)	D(m)
Conceptual period	455	1.0	2.0	220	1.0	1.5	10	10	2
Grid location	2427900 to 2428000 (Around the waste dump)			2427900 to 2428000 (Around the waste dump)			Maintenance		
	2427370 to 2427580 (Around the mineral reject)			2427370 to 2427580 (Around the mineral reject)			Maintenance		

Land Degradation

An area of 28.626 hectares land is already degraded/ utilized for mining, dumping, office, road etc. excluding plantation/safety zone. During plan period 2.161Ha of land additionally required for mining and allied activities. A total area of 2.467 Ha safety zone will be maintained as green belt during entire life of the mine. The details of land use pattern will be as follows:

Sl. No	Pattern of Utilization	Area put on use at start of Plan period (Ha)	Total area at the end of Scheme period (Ha)	Total area at the end of Conceptual period (Ha)
1	Area under Mining /Quarrying	9.942	10.573	27.578
2	Waste Dump	2.480	2.830	2.632
3	Mineral storage/ Sub grade stack	2.900	3.90	5.900
4	Infrastructure	0.140	0.320	1.300
5	Roads	1.200	1.200	1.361
5	Railways	11.124	11.124	11.124
6	Tailing Pond	0.000	0.000	0.202
7	Mineral Separation Plant	0.800	0.800	0.800
8	Magazine	0.040	0.040	0.040

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

	Sub Total	**28.626**	**30.787**	**50.937**
09	Safety Zone	2.467	2.467	2.467
10	Others (Undisturbed)	35.275	33.114	12.964
	Total	**66.368**	**66.368**	**66.368**

Reclamation / Afforestation

Reclamation of Mined out land

Out of the total ML area of 66.368Ha the area of degradation under mining will be 28.656 hects. Considering the present exploration data and estimated mineable reserve within the ML area, it can be observed that, none of the quarries are going to be exhausted during ensuing scheme period. The ultimate quarry limit has been delineated considering the present exploration data.

The reclamation procedure will start after complete exhaust of minerals in the Pit area. Based on the present exploration data it can be observed that the Old quarry will be exhausted first during conceptual period. Therefore the reclamation will be started from the Old quarry by means of bench plantation.

During conceptual period it has been planned to reclaim the mined out land, both by means of back filling & plantation and bench plantation. Back- filling will be done at lower elevated area where as the dead benches in the hilly terrain where back filling cannot be possible will be reclaimed by means of plantation.

Out of the total mined out land of 28.656 hects an area of 2.856 Ha can be reclaimed by means of back filling and plantation and balance 25.80 Ha will be reclaimed by means of bench plantation.

Reclamation of dump

As on date, the dumping has been covered over an area of 2.48 Ha. During ensuing plan period, about 0.350ha area will be utilised for dumping. Waste will be utilised for road maintenance and dumping. As the dumping of one strip is over the second strip will be taken into use leaving a wide barren. The space left between different phases will be covered by top soil for growing plants in these areas. Moreover dump slopes will also be utilized for plantation in order to prevent damage to the dumps by the surface run-off (rain) water.

Reclamation of Mineral reject stack area:

The mineral reject stack will be temporary in nature. During conceptual period the material will be marketed by blending with high grade ore and the area over 5.90Ha will be covered under plantation

Reclamation of other areas

The other areas like ore stack yard, road, site services, Mineral reject stack etc will be reclaimed during conceptual period as under:

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Pattern of Utilization	Total area at the end of Conceptual period (Ha)	Method of Reclamation
Infrastructure	1.300	Plantation
Roads	1.361	
Railways	11.124	
Tailing Pond	0.202	
Mineral Separation Plant	0.800	
Magazine	0.070	

Post mining land use

The details of post mining land use will be as follows:

Post Mining Land Use Pattern of M.L. Area (Ha.)						
Sl. No.	Description	Land Use (Ha.)				
		Plantation	Water Body	Public Use	Undisturbed	Total
1	Mining	27.578	Nil	Nil	Nil	27.578
2	Dumping	2.632	Nil	Nil	Nil	2.632
3	Road & Infrastructure	Nil	Nil	2.661	Nil	2.661
4	Mineral Storage	5.900	Nil	Nil	Nil	5.90
5	Safety zone plantation	2.467	Nil	Nil	Nil	2.467
6	Railways	Nil	Nil	11.124	Nil	11.124
7	Tailing Pond	0.202	Nil	Nil	Nil	0.202
8	Magazine	0.040	Nil	Nil	Nil	0.040
9	Mineral Separation Plant	0.800	Nil	Nil	Nil	0.800
10	Others	Nil	Nil	Nil	12.964	12.964
	Total	**39.619**	**Nil**	**13.785**	12.964	**66.368**

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

CHAPTER-III

3.0 MINE DRAINAGE

a) Minimum and Maximum depth of water table based on observations from the nearby well

The area exhibits an undulated topography with a maximum elevation of 620 meters and minimum elevation of 530 meters above MSL. The nearby village is Jururi. The wells at village Jururi is indicating that the water level is encountering at RL 490m during summer and 495m during rainy season.

b) Indicate Maximum and Minimum depth of working.

It has been proposed to develop Top pit. At present the existing bottom RL of the pit is 562m. It has been planned to be developed up to 551m.RL. There will be no further depth ward development. Therefore, such depth of mining would not affect the ground water table. However, the existing and expected working depth of these quarries by the end of this plan period and Conceptual period is given below:

Table showing depth of quarries – Existing, at the end of plan period & at the end of conceptual period

NAME OF QUARRY	EXISTING DEPTH (m.RL)		AT THE END OF PLAN PERIOD (m.RL)		AT THE END OF CONCEPTUAL PERIOD (m.RL)	
	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM
Top pit	602.0	562.0	599.0	551.0	615.0	491.0

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

As stated above, the proposed working depth of quarries during the plan period excavation will not touch the water table. As such, question of encountered of water due to seepage does not arise.

However, during monsoon, accumulation of water in manganese pit takes place due to the rain drops falling over the quarry area. Maximum part of this water percolated in depth and thus the rest accumulated Water in the quarry (if any) shall be pumped out and utilized for plantation area/ dust suppression by engaging 10 HP Diesel operating pump. A seasonal nala is flowing within the south western part of the lease area. It has been planned to discharge the mine water within this seasonal nala.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

(d) Describe regional and local drainage pattern. Also indicate annual rainfall, catchment area and likely quantity of Rainwater to flow through the lease area, arrangement for arresting solid wash:

Regional Drainage Pattern

The area falls within the Baitarani river basin and watershed of the Kundra or Suna River.

The suna Nadi flows in the North and north western part of the lease area at a distance of 4.2km whereas the River Baitarani flows in the eastern part of the lease area at a distance of 2.2km. The Suna Nadi ultimately joins with the River Baitarani in the nort eastern part of the lease area.

The drainage pattern is dendritic generally but since the region is fracture controlled, trellis pattern is also observed. Network of small nalas joins Suna River. The Suna nala flows in a meandering pattern but are also lineament controlled. The drainage density is moderately high indicating more run-off than infiltration.

Annual Rainfall

The rain fall data has been obtained from IMD for the financial year 2009-2013. Based on the data the rain minimum Annual rainfall is 1115.6mm during 2010 and the maximum rain fall is 1871.6mm during 2013.

Catchment area and likely quantity of Rainwater to flow through the lease area:

The total area is 66.368Ha. However, the catchment area is coming around 25.44Ha or 254400sqm. An average rainfall of 1500mm has been taken into consideration for the calculation of run-off. The details of runoff per annum and the quantity of Rainwater to flow through the lease area are as follows:

- Run off co-efficient considered = 0.15
- Average annual rainfall = 1.5 m/yr
- Runoff = catchment area × Runoff coefficient × Annual rainfall
  = 254400 Sq. m × 0.15 × 1.5 m/ year = 57240 cu.m / yr

The area experiences high rainfall, the site will generate above volume of run offs during such rainy periods. The surface run off from the uncovered site would contain high concentration of suspended matter and eroded matter. This may result potential impact to surface water body.

Arrangement for arresting solid wash:

Surface run off pits and OB dump site if directly discharged into the river may cause siltation problem. It has been proposed to made surface drainage system around the mine to discharge the mine water outside the lease. The details of additional protective measures to be constructed around dump, subgrade stack and mine pit are mentioned below:

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Retaining wall of 780 m long all around the bottom periphery of waste dumps followed by garland drains of 295m shall be constructed during the plan period of 2020-21 to 2024-25. Water in the rainy season that will be percolated through the wastes in the waste dump shall be drained to the garland drain and the retaining wall shall help in arresting movement of waste materials along with water. The garland drains shall be canalized in such a way that the water flows to an area which will be on non-ore bearing and a wasteland. Regular cleaning of the drain shall be done for easy flow of water. Besides the garland drains and the retaining walls, a settling pond of 10 m x 10m x 2m size will be constructed at the end of garland drain, which will accumulate water. Alum shall be added here for settlement of suspended solids. After suspended solids are settled, the water shall be discharged outside the lease area. In the rainy season the water from the pits shall be pumped out to the garland drain at the top of the quarry so that entire water flows to outside the working area keeping the bottom of the pit in dry condition. The dimensions of the precautionary measures to be constructed and its design details will be as follows:

Plan period

Period	Retaining wall			Garland drain			Settling pond*(1 no)		
	L(m)	B(m)	H(m)	L(m)	B(m)	D(m)	L(m)	B(m)	D(m)
2020-21	220	1.0	2.0	230	1.0	1.5	10	10	2
2021-22	Maintenance			Maintenance			Maintenance		
2022-23	Maintenance			Maintenance			Maintenance		
2023-24	Maintenance			Maintenance			Maintenance		
2024-25	Maintenance			Maintenance			Maintenance		
Grid Location	2427580 to 2427700			2427570 to 2427700			2427700 and 336000		

Conceptual period

Period	Retaining wall			Garland drain			Settling pond*(1 no)		
	L(m)	B(m)	H(m)	L(m)	B(m)	D(m)	L(m)	B(m)	D(m)
Conceptual period	455	1.0	2.0	470	1.0	1.5	10	10	2
Grid location	2427900 to 2428000 (Around the waste dump)			2427900 to 2428000 (Around the waste dump)			N-2427985, E-336550 (Around the waste dump)		
	2427370 to 2427580 (Around the mineral reject)			2427370 to 2427580 (Around the mineral reject)			N-2427410, E-336040 (Around the mineral reject)		

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Afforestation plan period:

During scheme period of 5 years, it has been planned to undertake plantation over 2.75 Ha in the safety zone and along the railway siding. The plantation would be carried out @ 1600nos per hectare. The year wise plantation within mining plan period as follows:

Year	Location	Area in Ha.	No of Saplings	Name of the Plants to be planted
2020-21	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	Consultation with forest authorities shall be planted. Artistida, onctarous, Cillianis, Agava mexicana, Euciliopsis binata, Eucalyptus,Sorea robusta
2021-22	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
2022-23	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
2023-24	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
2024-25	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
Total		**2.75**	**4400**	

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

CHAPTER-IV

4.0 STACKING 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.

In Jururi Iron and Manganese mine, mainly two types of waste is being generated. The waste encountered during the mining operation is as follows:

(i) **Top soil:** As the mining operation in the next scheme period will be carried out within the existing quarry in the iron ore zone, top soil generation will be nil.

(ii) **Overburden waste-** containing laterites, shale and BHJ/BHQ.

(iii) **Intercalated waste-** found in between the ore zone having no or negligible mineral content less than the threshold value of iron ore (i.e. below 45% Fe).

(iv) **Mineral Rejects**:
About 80% recovery of +58% Fe ore and 15% recovery of S/G ore (+45% to 58%Fe) is expected to be produced. The remaining 5% will be generated as waste. The information on top soil and mineral rejects and waste is furnished below:

Year	Top Soil (cum)		Mineral Rejects (cum)				Waste	
	Reuse / spreading	Storage	Backfilling	Storage	Blending	Beneficiation	Dumping	Road Maintenance
2020-21	Nil	Nil	Nil	3847.28	15389.1	Nil	Nil	6614
2021-22	Nil	Nil	Nil	3966	15864	Nil	6610	Nil
2022-23	Nil	Nil	Nil	3963	15852	Nil	6605	Nil
2023-24	Nil	Nil	Nil	3967.2	15868.8	Nil	6612	Nil
2024-25	Nil	Nil	Nil	3966	15864	Nil	6610	Nil
TOTAL	Nil	Nil	Nil	**19709.5**	**78837.9**		**33051**	

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.

Details of existing waste dump

Name of the dump	Location (Grid)	Length(m)	Width (m)	Area occupied (m2)	Present volume (m3)	Design capacity (m3)	Remaining Quantity (m3)	Grade of existing dump
Dump – 1 Mineral reject)	2427380 to 2427750N and 336090 to 336225E	380	81	30969	839800	1545670	705870	48.66%Fe
Dump - 2	2427850 to 2427950N and 336360 to 336477E	119	65	7735	38675	164560	125885	39.62%Fe
Dump - 3	2427744 to 2427816 and 336405 to 336495E	75	68	5100	25500	73400	47900	41.37%Fe
Dump - 4	2427739 to 2427845 and 336495 to 336550E	95	49	4655	23275	48900	25625	40.11%Fe

All these dumps has been analyzed by NABL Accredited lab. Based on the results of analysis only dump-1 can be considered as mineral reject dump. Other three are waste dump. Part of the waste dumps and mineral reject dumps are situated within UPL. Hence, it has been planned to shift these materials which are situated within the UPL and disposed of outside the UPL at earmarked site. It will be carried out during conceptual period.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

After shifting, the waste will be disposed within the grid of 336400E to 336550E and 2427750N to 2428000N. Similarly, the mineral reject within the UPL will be re-handled and stored within the grid of 2427370N to 2427685N and 336000E to 336200E .There will be provision of retaining wall, garland drain, and settling pond for this dumping. However, all these protective measures will be constructed during conceptual period before dumping is taken place.

Generation of waste

A total of 5% waste will be generated in the form of intercalated waste out of the volume of ore zone. During the plan period about 66102 MT or 33051 Cu. m of waste is likely to be generated. The year wise waste generation will be as follows:

Year	Generation of Intercalated Waste	
	MT	Cum
2020-21	13228	6614
2021-22	13220	6610
2022-23	13210	6605
2023-24	13224	6612
2024-25	13220	6610
Total	**66102**	**33051**

Location of proposed waste dump:

There exists a waste dump near eastern side of the Old quarry .During scheme period this dump will be extended further 27m in the NE direction. The proposed dump will be within the grid of 336400-336500E and 2427850-2428000N. The dump is situated over non-mineralized area as far surface geology is concerned. However to prove the barrenness a bore hole has been proposed over the proposed dump area.

Proposed Dumping

During the plan period of one year very less quantity i.e 66102MT or 33051cum of waste will be generated. The details are furnished below:

Year	Waste to be dumped (cum)	Dump No	Location of dumping(Grid)	Proposed area(m2)	Proposed dumping RL	No of terrace of proposed dump	Individual terrace height	Slope of terrace
2020-21	6614 cum of waste will be utilised for construction and maintenance of road							
2021-22	6610	Proposed dump-1	336400-336500E and 2427850-2428000N	1653	564	One	4	27°
2022-23	6605			2202	567	One	3	27°
2023-24	6612			2204	570	One	3	27°
2024-25	6610			2203	573	One	3	27°
Total	**33051**							

Additionally 0.350Ha land will be utilised for dumping.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

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

Manner of disposal of waste.

The dumping will be carried out in the re-treating fashion. After attaining the designed height, terracing and immediate plantation of the dead dump slopes shall be done. The positions of proposed dumps so formed in a year wise manner are illustrated in Dump Plan and Section, Plate No. VIII showing proposed R.L. Necessary haul roads has been made and maintained for transportation of waste material. In order to minimize the surface wash off, the maximum stable slope angle for the proposed waste dump shall be made and maintained at 28°.

Configuration and sequence of year wise buildup of dumps

The details of utilization of waste during the plan period are as follows;

Year	Volume (Cu.m)	Utilisation of waste
2020-21	6614	The total waste will be utilised for construction and maintenance of road
2021-22	6610	The waste will be occupied over an area 1526 m2 with an average height of 3 m up-to 564 MRL from surface level
2022-23	6605	The waste will be occupied over an area 1526 m2 with an average height of 3m up-to 567 MRL form second year dump position(564 MRL)
2023-24	6612	The waste will be occupied over an area 1526 m2 with an average height of 3 m up-to 570 MRL from third year dump position(567 MRL)
2024-25	6610	The waste will be occupied over an area 1526 m2 with an average height of 3 m up-to 573 MRL from fourth year dump position (570 MRL)
Total	**33051**	

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

Existing

Till date there is not any protective measures constructed with in the lease area for prevention of pollution of surface water bodies.

Proposed

Retaining wall of 220 m long all around the bottom periphery of waste dumps followed by garland drains of 230m shall be constructed during the plan period of 2020-21. Water in the rainy season that will be percolated through the wastes in the waste dump shall be drained to the garland drain and the retaining wall shall help in arresting movement of waste materials along with water. The garland drains shall be canalized in such a way that the water flows to an area which will be on non-ore bearing and a wasteland. Regular cleaning of the drain shall be done for easy flow of water. Besides the garland drains and the retaining walls, a settling

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

pond of 10 m x 10m x 2m size will be constructed at the end of garland drain, which will accumulate water. Alum shall be added here for settlement of suspended solids. After suspended solids are settled, the water shall be discharged outside the lease area. In the rainy season the water from the pits shall be pumped out to the garland drain at the top of the quarry so that entire water flows to outside the working area keeping the bottom of the pit in dry condition. The dimensions of the precautionary measures to be constructed and its design details will be as follows:

Period	Retaining wall			Garland drain			Settling pond*(1 no)		
	L(m)	B(m)	H(m)	L(m)	B(m)	D(m)	L(m)	B(m)	D(m)
2020-21	220	1.0	2.0	230	1.0	1.5	10	10	2
2021-22	Maintenance			Maintenance			Maintenance		
2022-23	Maintenance			Maintenance			Maintenance		
2023-24	Maintenance			Maintenance			Maintenance		
2024-25	Maintenance			Maintenance			Maintenance		

Engineering details of retaining walls & Garland drains

The average rain fall during last seven years (2004-2010) in Keonjhar district is 1600 with rainy seasons during June to September months. The historic maximum rain fall recorded in the month of September' 2005 is around 631.6 mm. Since the proposed waste dumps are located in areas which is gently sloping, maximum flow of water in rainy season will not endanger the retaining walls. However, the following precautionary measures shall be taken while designing the retaining walls and garland drains.

Retaining Walls

Retaining boulder wall (2.0 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.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Settling Tank

The garland drain shall be channelized to a settling tank of 12m long, 8m width and 4m deep. Side walls and base shall be packed with locally available boulders mixed with cement and sand. Engineering drawing of the retaining wall, garland drain and settling tank are provided in Dump Plan.

f) Mineral Reject stack

Existing Mineral reject stack

Above 45 % Fe to -55% Fe iron ore, which do not have the market at present, is considered as mineral reject of iron ore. All these dumps has been analyzed by NABL Accredited lab. Based on the results of analysis only dump-1 can be considered as mineral reject dump. The details of mineral reject dumps are furnished below:

Name of the dump	Location (Grid)	Length(m)	Width (m)	Area occupied	Total volume(m3)	Grade
Dump – 1 Mineral reject)	2427380 to 2427750N and 336090 to 336225E	380	81	30969	839800	42.66%Fe

Proposed mineral Reject stack

Above 45 % Fe to -55% Fe iron ore, which do not have the market at present, is considered as mineral reject. The Mineral reject generation in the area is estimated in the proposed Mining plan period would be 247884 MT or 9153cum. The details of the generation of Mineral Reject is given below;

Year	Mineral Reject (MT)	Mineral Reject (cum)
2020-21	48091	19236.4
2021-22	49575	19830
2022-23	49537.5	19815
2023-24	49590	19836
2024-25	49575	19830
Total	**247884**	**99153.6**

Utilization of Mineral Reject

Year	Storage (cum)	Blending(cum)
2020-21	3847.28	15389.1
2021-22	3966	15864
2022-23	3963	15852
2023-24	3967.2	15868.8
2024-25	3966	15864
Total	**19709.5**	**78837.9**

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Location of proposed mineral Reject stack:

The proposed mineral reject stack will be within the grid of 2427400 to 2427700N and 336000 to 336220 E. There will be provision of retaining wall, garland drain, and settling pond for this dumping. However based on the marketability of ore the mineral reject will be blended with high grade to make it saleable grade and sold it various consuming agencies as far as practicable.

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

Existing

Till date there is not any protective measures constructed with in the lease area for prevention of pollution of surface water bodies.

Proposal during this plan Period:

i) The area marked for Mineral Reject stacking is devoid of any natural watercourse.

ii) The sides of Mineral Reject stacking are sloped at natural angle of repose.

The dimension of the proposed retaining wall will be as follows;

Period	Retaining wall			Garland drain			Settling pond*(1 no)		
	L(m)	B(m)	H(m)	L(m)	B(m)	D(m)	L(m)	B(m)	D(m)
2019-20	120	1.0	2.0	130	1.0	1.5	10	10	2
Grid Location	2427580 to 2427700			2427570 to 2427700			2427700 and 336000		

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

CHAPTER-V

5.0 USE OF MINERAL AND MINERAL REJECT

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

Sl. No.	Constituents	B/F Grade	S.M.S Grade	KIW Grade	Sponge Grade
1.	Fe	63 - 65%	65% min	63-65%	64% min
2.	SiO_2	—	3% max.	—	—
3.	Al_2O_3	—	—	—	—
4.	$SiO_2 + Al_2O_3$	6.5% max.	—	5% max.	5% max.
5.	Al_2O_3 / SiO_2	1.5% max.	—	1.1	—
6.	P	0.05% max.	—	—	0.03% max.
7.	S	0.02% max.	—	—	—
8.	Cu	0.04% max.	—	—	2% max
9.	CaO + MgO	—	—	0.5% max	0.3% max.
10.	MnO	—	—	—	0.02% max.
11.	Moisture	5% max.	1.5% max.	3% max.	

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

The intermediate industries involved in the up-gradation of mineral before its end use is beneficiation plant, sponge plant, pelletisation plant, pig iron plant etc.

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

The detail requirement of other industries are: steel plant, billet, etc.

d) Indicate precise physical and chemical specification stipulated by buyers

Specification	KIW Grade	TISCO Grade
Fe	64 %	63 – 65 %
SiO2		
Al2O3	5%	0.5 %
SiO2 + Al2O3		
P	2 % Max	0.02 % Max
S	0.03 % Max	0.04 % Max
Cu		Traces
Pb & Others		Traces
Moisture		5 % Max
Size	5 mm 20 mm	5 mm 20 mm

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

To upgrade the ROM to suit the user's requirement the lessee is doing processing of ROM by screening and crushing. The details of crushing and screening have been explained in chapter -VI.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

CHAPTER-VI

6.0 PROCESSING OF ROM AND MINERALREJECT

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

Earlier there was crushing unit of 40TPH capacity within the lease area. However the crushing unit has been damaged and dismantled by the lessee. Therefore a fresh proposal has been made to established one 150TPH mobile crushing and one 150 TPH mobile screening unit within the lease area.

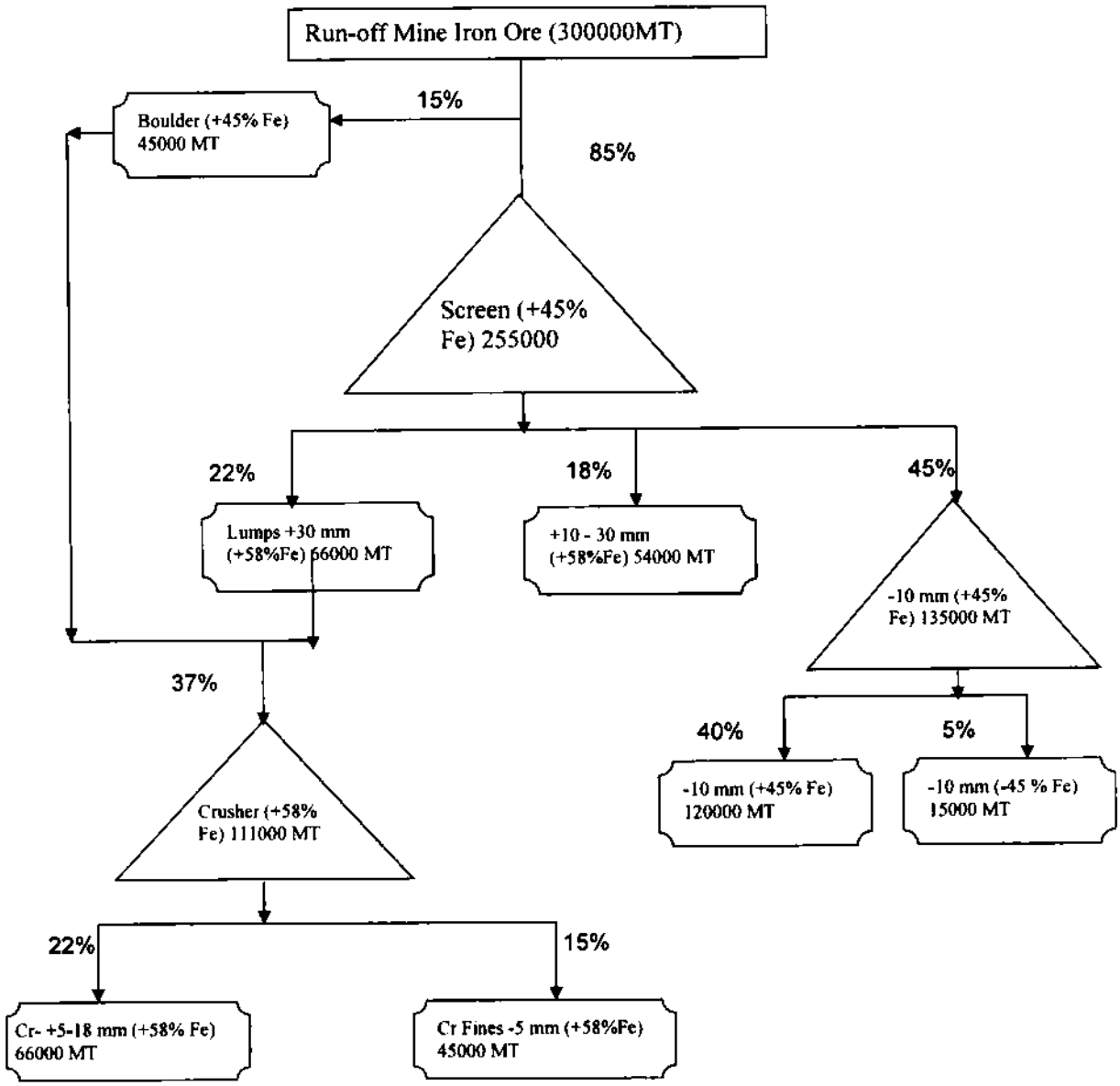
Beneficiation process:

From the blasted ore, the ROM ore will be fed to the Screening unit for the production of 0-10mm, 10-30mm, +30mm sized ore. The +30 mm ore sent to the crushing unit for production of 5-18mm, 0-5mm. So, the various finished products of the screening and crushing units are 0-10mm, 10-30mm, + 5-18mm and 0-5mm.

The flow sheet of Screening and crushing plant.

The flow sheet and Schematic diagram of the beneficiation process are given below with material balance is as follows;

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON



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

Not Applicable

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

Not Applicable

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

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

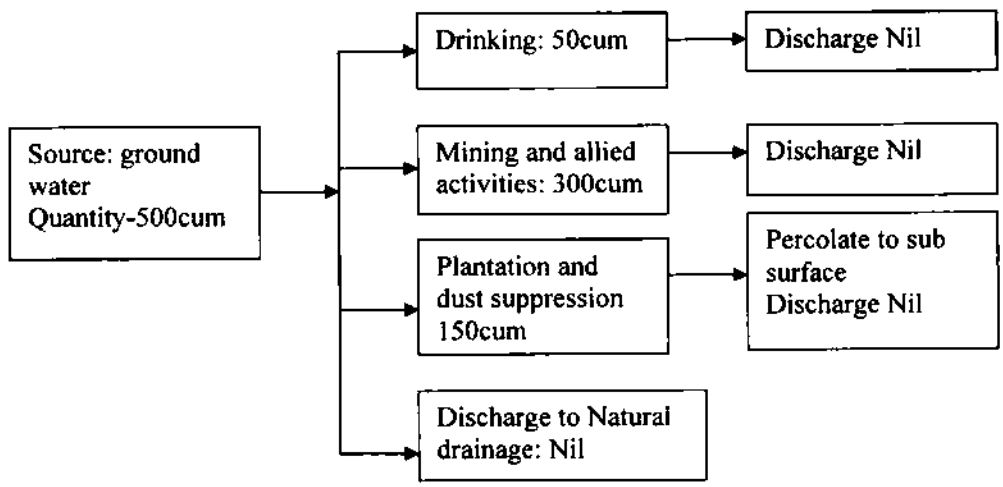
Not Applicable

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

Not Applicable

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

About 500cum/day of water will be required for mining, domestic and processing of ore for which NOC from CGWB has been obtained. The source is ground water. The detail of water balance chart is given below:



A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

CHAPTER-VII

7.0 OTHER

7.1 Site services

The project area is approachable from Joda town which is located at a distance of about 12km. The lease area is on the way of Banspani road. The Jururi Railway siding is nearby the lease area. The lessee is having own railway siding. The area is well connected to NH-215.

As far as mine infrastructure facilities is concerned, an office is there for smooth functioning of mining operation. After resumption of mining operation it has been planned to construct following infrastructure facilities within the lease hold area:

1. Workshop
2. Canteen
3. Temporary Rest shelter

Further, arrangement of electricity, drinking water facility, telecommunication facility will be made for smooth operation of the mines.

b) Employment Potential:
The details of Management and supervisory personnel will be as follows:

Designation	Qualification	Existing	Total Requirement
Mines Manager	Degree in Mining with 1st Class competency certificate holder having more than 10 yrs of experience	1	1
Mining Engineer	Diploma in Mining Engineering	1	1
Geologist	Post Graduate in Geology having more than 10 yrs of experience	Nil	1
Mines Foreman	Foreman's competency certificate holder	1	2
Mining Mate	Mate competency certificate holder	2	2
Drilling Operator	Literate & experienced	2	2
Blaster	Blasting competency certificate holder	1	1
Tipper Operator	Literate & experienced	8	4
Excavator Operator	Literate & experienced	4	4
Blasting helper	Literate & experienced	1	1
Timekeeper/clerk/administration staff/ clericals	Graduate & experienced	6	6
Water tanker operator	Literate & experienced	1	1
Daily rated workers for braking large size ore boulders, collection of ores from benches, collection of generated fines during transportation of ore etc.	Literate & unskilled	50	50

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

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 was collected by M/s Geomin Consultants pvt Ltd, Bhubaneswar (NABL & NABET accredited agency). The data is confirming to the norms of MoEF & CC, GOI. Based on these data, EIA & EMP has been prepared and submitted before SEIAA for grant of environment clearance for 4.20MTPA production of iron ore. The details of Base line data are furnished below:

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

Sl. No	Pattern of Utilization	Area put on use at start of Plan period (Ha)
1	Area under Mining /Quarrying	9.942
2	Waste Dump	2.480
3	Mineral storage/ Sub grade stack	2.900
4	Infrastructure	0.140
5	Roads	1.200
5	Railways	11.124
6	Tailing Pond	0.000
7	Mineral Separation Plant	0.800
8	Magazine	0.040
	Sub Total	**28.626**
9	Safety Zone	2.467
10	Others (Undisturbed)	35.275
	Total	**66.368**

- **Water regime, Quality of air, Ambient noise level, Flora, Climatic conditions**

Water Regime

The ML area is having undulating hilly terrain and poor permeability. The depth of water level below ground level varies depending on the local topography, geology & hydrological conditions. There is perennial water course within the ML area. Surface run off during rainy season follows the gradient of the terrain and passes through the seasonal dry nallahs. Assessment of baseline data on water environment includes:

- Identification of surface water resources
- Identification of ground water resources
- Collection of water samples
- Analyzing water samples collected for Physico-chemical and bacteriological parameters as per standards.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

SAMPLING STATIONS:

Surface water

SL NO	Location
SW1	Kundra Nala (332029E, 2429649N)
SW2	Baitarani River (338857E, 2428146N)
SW3	Kakarpani Nala (336076E, 2426978N)
SW4	Gurha (336408E, 2428342N)
SW5	Dalko(337721E, 2428750N)

Ground water stations

SL NO	Location
GW1	Langlata (338124E, 2427750N)
GW2	Khandabandh (334727E, 2428366N)
GW3	Gurha (334058E, 2424885N)
GW4	Gurtan (336141E, 2425377N)
GW5	Bholberha (339218E, 2428366N)

ii) Quality of air:

The mine is under suspension since 2010. At the time of operation, monitoring of air was carried out. As per SPCB, eight stations were selected for monitoring of ambient air. AAQ monitoring work was carried out at the following stations and the approximate distance from the core zone are presented. Core zone is a temporary station and the buffer zone stations are fixed one.

Zone	Station Code	Station	Direction	Approximate Distance (km)
Core	A_1	Lease area	Inside M.L. Area	---
Buffer	A_2	Jalahari	N	2.5
	A_3	Bandhuaberha	SE	4.3
	A_4	Palsa	S	5.2
	A_5	Gurda	SW	4.5
	A_6	Kakarpani	W	7.5
	A_7	Jaganathpur	SE	7.0
	A8	Bholberha	NE	4.3

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

The details of locations are furnished below:

Zone	Grid location
Core Zone	
Lease Area(Core zone)	(336535E, 2427502N)
Buffer Zone	
Jalahari	(337273E, 2429439N)
Bandhuaberha	(339304E, 2425860N)
Palsa	(335643E, 2424826N)
Guruda	(333918E, 2425138N)
Kakarpani	(334770E, 2422862N)
Jaganathpur	(338830E, 2423295N)
Bholberha	(339337E, 2429582N)

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 analyzed at the sampling locations established in the study area.

- Particulate Matter (SPM)
- Sulphur Dioxide
- Oxides of Nitrogen

Basis of study

Ambient Air quality has been assessed through a net-work of 07 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 down wind direction
- Pre-dominant wind direction and wind pattern

The sampling stations were chosen taking into consideration of all possible intervening factors and the criteria for selection of sampling stations relating to Ambient Air Quality Monitoring.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

The Indian Standards IS: 8829, IS: 5182 and Emissions Regulations published by Central Pollution Control Board were followed for the purpose. The frequency of monitoring for Ambient Air Quality was 24 hourly and also twice a week for the three months in the season. Respirable dust samplers of Envirotech Pvt. Ltd. were used for collection of ambient air samples. The equipment is manufactured as per Indian Standards IS: 5182 and as per the specifications of Central Pollution Control Board - Emission Regulations (December 1985). Procedures followed for collection of air samples from the above mentioned sampling stations for analysis of Suspended Particulate Matter, Respirable Particulate Matter, Sulphur Dioxide, Oxides of Nitrogen & Carbon Monoxide (CO) were as per Indian Standards IS: 5182.

iii) Ambient noise level:

Noise produced at mine will be due to drilling, blasting, compressors, pumps, movement of vehicles, crushing plant, screening plant and other machinery. The noise to be generated by the mining activity may be dissipated within surrounding area. Effect may felt only near the active working area and on the personnel working in the vicinity. Total eight locations have been selected for quarterly monitoring. The details of locations are furnished below:

SL NO	STATION
1	Lease area (336535E, 2427502N)
2	Jalahari(337273E, 2429439N)
3	Bandhuberha (339304E, 2425860N)
4	Palsa(335643E, 2424826N)
5	Gurura(333918E, 2425138N)
6	Kakarpani (334770E, 2422862N)
7	Jagganathpur(338830E, 2423295N)
8	Bholberha(339337E, 2429582N)

iv) Flora and fauna:

Baseline data covering both flora and fauna comprising the terrestrial ecology were compiled using both the available official reports and published literature, supplemented by extensive field study. The fauna was listed and its relative abundance determined while at the same time steps taken to identify any rare and endangered species in the area.

The vegetation was studied by Quadrant method of sampling in both Core (mining lease area) and Buffer zone i.e. within 10 km radius of core area. Quadrant sizes of 10m X 10m were laid for trees and 2m X 2m were laid for herbs and shrubs for studying the floristic composition. The plots were laid randomly and a minimum distance of 200 meters was maintained between the plots. In each quadrat, the species name and number of occurrence of each species were

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

recorded. Girth at Breast Height (GBH) was recorded for trees having > 15 cm. Based on the data collected from the sampling plots dominance; density, frequency and abundance were calculated for the species. Important Value Index (IVI) for the tree species were calculated by summing up the values of Relative dominance, Relative frequency and Relative Density. Shannon's Diversity Index for tree species was calculated by using Microsoft Excel formulas. Approximate number of trees to be felled has been estimated proportionately from the number of trees actually enumerated in the sampling plots. Line transects and fixed width line transect were used for the surveying mammals and birds respectively. Transects were repeated at least four times. For herpetofauna and litter fauna 10 X 10 m sampling plot was used for the survey.

The common flora existing in the lease hold area as well as in the buffer zone around a radius of 10 Kms of the project area are *Shorearobusta, Phyllanthusemblica, Ficusbenghalensis, Madhucaindica, Anoegeissuslatifolia, Diospyrosmelanoxylon, Mangiferaindica,* etc.

v) Climatic conditions:

Climate and meteorology of a place play an important role in the implementation of any developmental project. Meteorology (weather climate) is also the key to understanding local air quality as there is essential relationship between meteorology and atmospheric dispersion involving the wind in the broadest sense of them. The detail studies on climatic condition are being undertaken as a part of Environment clearance. The detail climatic conditions in and around the ML area is furnished below:

❖ **Temperature:**

The climate of the study area is characterized by an oppressively hot summer with high humidity. Summer generally commences in the month of March. Temperature begins to rise rapidly attaining the maximum in the month of May. During the summer maximum temperature can go up to 47.40C. The weather becomes pleasant with onset of monsoon in June and remains as such up to the end of October. The temperature in the month of December is lowest i.e. 70C

❖ **Relative Humidity**

The air is dry except during the South – West monsoon season. The maximum humidity ranges from 55% to 76% with annual average of 64.83% while the minimum humidity ranges from 26% to 43% with an annual average of 34%.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

❖ Rainfall Data

The rain fall data has been obtained from IMD for the financial year 2006-2012. Based on the data the rain minimum Annual rainfall is 1115.6mm during 2012 and the maximum rain fall is 1871mm during 2011.The average rainfall is 1503 mm.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2006	0	0	19	50.1	173.9	199.3	287.1	568.2	247	67.4	36	0	1648
2007	2	94.1	20.6	32.8	110.4	242.9	404.6	355.9	316.5	28.5	77.3	0	1685.6
2008	62.5	11.9	12.7	35.2	98.2	605.1	175.6	193.8	429.1	4.6	15	0	1643.7
2009	0	0	2.8	0.5	133.1	103.5	386	333.4	195.2	123.2	26.8	0	1304.5
2010	1.3	1.3	71	0.4	122.1	114.4	289.2	233.1	238.1	125.2	26.6	29.5	1254.2
2011	0	32.8	31.3	121.2	117.6	359.9	157.5	318.7	677.5	55.1	0	0	1871.6
2012	94.7	7.8	0	46.3	9.5	169.7	225	283.6	212.7	66.3	0	0	1115.6
Average	**22.9**	**21.1**	**22.5**	**40.9**	**109.3**	**256.4**	**276.0**	**326.7**	**330.9**	**67.2**	**26.2**	**4.2**	**1503.3**

❖ Predominant wind direction is South-West.

Predominant wind direction is WSW-ESE during summer. Area remains calm for nearly 50% of the year. The pre-dominant wind directions during different seasons are as follows:

Sl. No	Parameters	Seasons			
		Winter	Summer	Monsoon	Post Monsoon
1	Predominant Wind Direction	NNE-ESE	WSW-ESE	WSW-WNW	NE-East
2	Wind Speed (Km/hr.)	12.20	23.90	41.60	32.10

- **Human settlements**

The base line data for the population of the surrounding area is significant to the study as it enables to predict the population that may be impacted by the mining. During preparation of EIA/EMP report for the mines detail socioeconomic study was conducted. There is no human settlement within the core zone. However, the human settlements within the buffer zone have been taken into consideration. The buffer zone of the project area, encompassing 5km radial area around the core zone, consists of 38 rural villages in Keonjhar District, Orissa.

Human Settlements

During preparation of the EIA/EMP secondary data was obtained. From the secondary data the village wise populations within 5 km radius are given below:

Name of the village	Total Population
Jururi	2515
Jalahari	3021
Bandhuaberha	476
Palsa	1714
Guruda	1108
Kakarpani	543
Jaganathpur	897
Bholberha	556

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

The above villages are considered in the socio-economic study. Secondary data has been obtained from the 2001 census. The study details based on 2001 census data are highlighted below:

- The total population works out to 10830 of which 5604 (51.75%) are male and 5225nos (48.25%) female.
- There are 1465 (13.53%) people belonging to scheduled caste, of which 472 (32.21%) are male 993 (67.78%) are female.
- The total scheduled tribes works out to 4986 (46.04%) of which 3822 (76.65%) are male and 1164 (23.35%) Female. There are 4782 (44.16%) literates
- As for occupational structure, 37.12 % of total populations are Main workers, 3.98 % Marginal workers and remaining 62.87 % are non-workers. Socio-economic studies have indicated that the buffer zone is primarily rural area with a literacy level of about 44.16 % of the population.

- Public buildings, places of worship and monuments

No public buildings, monuments, places of historical importance exist in and around within 5Km radius of the lease hold area.

- Indicate any sanctuary is located in the vicinity of leasehold

No sanctuary exists in and around within 5Km radius of the lease holds area

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

Keeping in mind the environmental baseline scenario as detailed above and proposed Opencast mining activity, it is attempted to assess the likely impact and its extent on various environmental parameters. The environmental attributes that may be affected are air quality, water quality & quantity, soil quality, noise level, ecology, land use, socio-economic, environment, infrastructure development, health, etc. The various activities causing impacts has been considered under various stages namely, "siting", "operational" (mining operation & secondary activities and mine closure).

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

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

Sl. No	Pattern of Utilization	Area put on use at start of Plan period (Ha)	Total area at the end of Scheme period (Ha)	Total area at the end of Conceptual period (Ha)
1	Area under Mining /Quarrying	9.942	10.573	27.578
2	Waste Dump	2.480	2.830	2.632
3	Mineral storage/ Sub grade stack	2.900	3.90	5.900
4	Infrastructure	0.140	0.320	1.300
5	Roads	1.200	1.200	1.361
5	Railways	11.124	11.124	11.124
6	Tailing Pond	0.000	0.000	0.202
7	Mineral Separation Plant	0.800	0.800	0.800
8	Magazine	0.040	0.040	0.040
	Sub Total	**28.626**	**30.787**	**50.937**
09	Safety Zone	2.467	2.467	2.467
10	Others (Undisturbed)	35.275	33.114	12.964
	Total	**66.368**	**66.368**	**66.368**

ii) Air quality

Ambient Air Quality (AAQ) in respect of respirable suspended particulate matter (PM_{10}), Sulphur dioxide (SO_2), oxides of Nitrogen (Nox) and CO was studied and determined quantitatively through monitoring during the time of operation. AAQ monitoring was done at eight selected locations in the study area, taking into consideration all possible intervening factors and the criteria for selection of sampling stations relating to AAQ monitoring and the Indian Standards and Emissions Regulations published by notified the Ministry of Environmental & Forest, Central Pollution Control Board (CPCB). The monitoring was carried out in all the seasons. There was a very clear trend of record of lowest values in the night sampling hours and highest in the day time (fore noon) hours. This is due to very low activity in the area after evening hours. Nevertheless all the values (throughout year) across all parameters were much below the prescribed limit.

Ambient Air Monitoring Results

Zone	Station Code	Station with grid location	Value	Unit: µg/m³		
				PM10	SO_2	NOx
Core Zone	A1	Lease Area (336535E, 2427502N)	Max	64.5	18.5	26.5
			Min	48.4	8.0	10.0
			Average	56.43	13.32	17.12
			95 Percentile	63.1	16.875	24.50
	A2	Jalahari	Max	69.5	18.5	29.00

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

Zone	Station Code	Station with grid location	Value	Unit: µg/m³		
				PM10	SO_2	NOx
Buffer zone		(337273E, 2429439N)	Min	48.3	8.5	14.00
			Average	57.33	13.90	21.75
			95 Percentile	67.5	17.75	28.37
	A3	Bandhuaberha (339304E, 2425860N)	Max	62.0	18.0	28.5
			Min	42.3	8.0	12.0
			Average	51.61	12.65	18.35
			95 Percentile	58.95	17.375	23.5
	A4	Palsa (335643E, 2424826N)	Max	68.4	14.5	38.00
			Min	46.3	8.5	12.5
			Average	55.62	22.73	20.79
			95 Percentile	66.42	15.875	27.87
	A5	Guruda (333918E, 2425138N)	Max	61.3	16.5	22.5
			Min	34.2	9.5	12.5
			Average	48.00	12.38	17.53
			95 Percentile	60.55	15.25	21.5
	A6	Kakarpani (334770E, 2422862N)	Max	56.6	14.00	29.5
			Min	42.4	8.00	12.5
			Average	48.07	11.33	18.2
			95 Percentile	56.25	14.00	21.5
	A7	Jagannathpur (338830E, 2423295N)	Max	48.4	16.5	24.00
			Min	35.7	8.5	9.00
			Average	42.50	11.18	16.31
			95 Percentile	45.7	14.25	21.25
	A8	Bholberha (339337E, 2429582N)	Max	50.5	16.00	28.5
			Min	36.8	8.5	12.00
			Average	43.45	12.71	19.38
			95 Percentile	49.67	15.5	22.5

iii) Water quality

Impact on quality of water

- Surface water samples from the nearby nala & 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.
- Working benches will be kept free from loose overburden/ waste materials. Retaining wall and garland drain has been constructed around the dump to prevent washing off of loose sediments.
- Though mining operation in this area will be opencast, there may be a chance of carrying the loose waste materials generated during mining with rain water flowing in downward direction through these nalas, gullies & streamlets.

However the measures will be taken to ensure that the surface water quality is not affected due to the mining operations by constructing necessary guard walls, check dams, etc. Surface run off of the mines will be directed to the settling ponds.

Ground water

As far as ground water is concerned, it shall not be affected, as the permeability in the rock formations is very poor. Ground water table is struck at a depth of 480m. During the EIA study, geomin had collected five nos of samples from ground water and surface water from different

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

locations both from core and buffer zone. The ground water samples were analysed as per the IS standard 10500 and surface water samples were analysed as per the IS standard 3025. The details of analysis results are as follows:

Ground water

SL NO	Location	PH	Iron	Chloride	Sulphate	CALCIUM
GW1	Langlata(338124E, 2427750N)	7.2	0.11	9.6	7.4	2.5
GW2	Khandabandh (334727E, 2428366N)	7.1	0.15	9.5	8.32	3.7
GW3	Gurha (334058E, 2424885N)	7.11	0.13	10.3	10.1	4.2
GW4	Gurtan(336141E, 2425377N)	7.3	0.20	12.1	11.0	6.1
GW5	Bholberha(339218E, 2428366N)	7.0	0.21	12.5	10.9	7.4

Surface water

SL NO	Location	PH	TDS	Chloride	Sulphate	Iron	Calcium
SW1	Kundra Nala (332029E, 2429649N)	7.1	250	13	12	0.54	2.8
SW2	Baitarani River (338857E, 2428146N)	7.13	256	12	18	0.58	2.7
SW3	Kakarpani Nala (336076E, 2426978N)	7.21	310	16	16	0.69	3.9
SW4	Gurha (336408E, 2428342N)	7.3	280	21	24	0.70	5.1
SW5	Dalko(337721E, 2428750N)	7.4	301	25	14	0.71	2.4

(Iv) Noise level

To observe the noise level, eight temporary stations were chosen. Monitoring was done on hourly basis for a continuous period of one day during the study season. The minimum and maximum values are as follows:

SL NO	STATION	DAY		NIGHT	
		Min	Max	min	max
1	Lease area (336535E, 2427502N)	43.5	54.9	35.7	38.7
2	Jalahari(337273E, 2429439N)	42.7	54.6	36.9	39.5
3	Bandhuberha(339304E, 2425860N)	42.5	54.0	34.8	38.5
4	Palsa(335643E, 2424826N)	40.9	53.5	36.7	38.3
5	Gurura(333918E, 2425138N)	41.1	54.6	33.8	39.2
6	Kakarpani(334770E, 2422862N)	41.3	54.7	33.6	37.2
7	Jagganathpur(338830E, 2423295N)	41.8	53.5	32.3	35.3
8	Bholberha(339337E, 2429582N)	39.8	52.1	34.8	37.9

V) Vibration Levels (Due To Blasting)

The controlled blasting technique was practiced and the impact of vibration due to blasting has been reduced to absolute lowest limits. The area in immediate vicinity is not feeling any vibration due to blasting. There is also no danger of fly rocks due to blasting in Mines.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

(vi) Impact on Water regime

The drainage pattern in this area is mostly controlled by River Sona and Baitarani river. As the Mining activities is/will be far away from the river and there will be no change in the drainage system due to Present mining operation. Hence there will be no adverse impact on the said water regime due to the mining and other allied activities.

(vii) Impact on Acid mine drainage

As on date there is no data about the acid Mine drainage within the surrounding water body

(viii) Impact on Surface subsidence

Not applicable

(Ix) Impact on Socio- economics

The proposed project, does not involve any displacement of human habitation, hence no habitation package is needed for displacement.

The mining activity envisages the deployment of local laborers. So, it is likely that the general economic condition of the local people will improve. The peripheral development package will also improve their health and sanitation.

Apart from introducing eco-friendly mining special attention for up-liftment of socio economic conditions of the nearby villages by providing following facilities has been proposed. Health and education facilities created in the project shall be extended to villagers also.

1. Roads development in the project shall be utilized by the villagers also which shall connect them to nearby town,
2. Drinking water facilities, Cultural and recreational centers.
3. Afforestation of the village areas, distribution of seedlings and involving people in such programmes.
4. Providing employment to local people will be the one of the major factors for upliftment of the society.

The service sector has raised employment of local people by ancillary activities like transportation of mineral and supply of consumer goods to the mine. The impacts that have been and further will be are:

- Better economic status of the community
- Faster industrial development of the area
- Higher inputs in the area towards infrastructural facilities provided for better access to markets, health care, education, communication, etc.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

(x) Historical Monuments etc.

There are no historical monuments within the buffer zone of the lease hold area. However, the mining lease hold area of Jururi Iron and Manganese Mines is falling within the seismic zone II, adverse impact is not anticipated.

(xi) Impact on Biodiversity.

The forest in and around the lease area is deciduous type with low density of tree. The forest in the buffer zone is undisturbed very thick, dry and deciduous type. The trees shed their leaf during February to march and during the period the forest floor is covered with litter. On the onset of rains new leaves emerge and reach their maximum leaf index by October. The forest is having good regeneration potential in the region.

Soil erosion is taking place due to deforestation, illicit felling of trees followed by podu cultivation. As this region is thick in forest cover, the place is also rich in types and kinds of animal inhabitants.

EIA study has indicated that the deforestation and illegal cutting of trees and Podu cultivation may have Impact on the area. However, these may not be discernible. Changes in and around leasehold area to impact biodiversity. Thus, existing impact on environment shall largely remain the same.

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

❖ **Ambient Air Quality.**

Ambient Air Quality (AAQ) in respect of respirable suspended particulate matter (PM10), Sulphur dioxide (SO_2), oxides of Nitrogen (Nox) and CO was studied and determined quantitatively through planned monitoring. AAQ monitoring was done at six selected locations in the study area, taking into consideration all possible intervening factors and the criteria for selection of sampling stations relating to AAQ monitoring and the Indian Standards and Emissions Regulations published by notified the Ministry of Environmental & Forest, Central Pollution Control Board (CPCB). The monitoring was carried out in all the seasons. There was a very clear trend of record of lowest values in the night sampling hours and highest in the day time (fore noon) hours. This is due to very low activity in the area after evening hours. Nevertheless all the values (throughout year) across all parameters were much below the prescribed limit.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

8.2.3 Noise Characteristics.

The main source of noise in the project area is limited to plying of Dumper & Tipper only. In order to have an idea of the present noise level of the project site, a detailed measurement of noise level was carried out at different locations within the proposed project (core zone) site and buffer zone. One location at core Zone and seven locations in buffer zone were selected for the purpose. The present status of the Noise level around the mines site is within the standard.

8.2.4 Water Quality:

The water surface and ground water sources were monitored for their quality and it is observed that all the water quality parameter is within limit. Additional measures may be regarded to contain the pollution due to enhancement of production.

8.2.5 Impact on Biodiversity.

The forest in and around the lease area is deciduous type with low density of tree. The forest in the buffer zone is undisturbed very thick, dry and deciduous type. The trees shed their leaf during February to march and during the period the forest floor is covered with litter. On the onset of rains new leaves emerge and reach their maximum leaf index by October. The forest is having good regeneration potential in the region.

Soil erosion is taking place due to deforestation, illicit felling of trees followed by podu cultivation. As this region is thick in forest cover, the place is also rich in types and kinds of animal inhabitants.

EIA study has indicated that the deforestation and illegal cutting of trees and podu cultivation may have impact on the area. However, these may not be discernible. Changes in and around leasehold area to impact biodiversity. Thus, existing impact on environment shall largely remain the same.

8.3.0 Progressive reclamation Plan :

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

8.3.1 Measures for controlling air pollution

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.GURUBALASUBRAMANIAM
QUALIFIED PERSON

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.

Air quality monitoring will be conducted as per the guideline of SPCB/MoEF. Monitoring of air will be undertaken after the resumption of Mining operation.

8.3.2 Measures for controlling water pollution

The garland drains around quarry and dumps shall be constructed. In addition check dams, two stage settling ponds and afforestation on existing dumps and on vacant land has been proposed. These measures shall be taken to ensure that the surface water quality in the project area is within permissible limit in respect of all the parameters for all four seasons. However, it is anticipated that there may be slight increase in water pollution load due to enhancement of production. The measures being proposed for water treatment and conservation water are as follows: -

a. Extension of garland drain around quarry, waste dump yard etc.

b. Construction of more check dams around the dump site to arrest flow of loose sediments before discharge into the drainage system of the region through settling tanks.

c. Drains to be cleaned up periodically.

d. Strengthen of small stone/ rock barriers across the drains at intervals to check the water current and to arrest the solid particles.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

e. Effluent water from the quarry to be pumped regularly and discharged to the adjacent garland drains.

f. All the water of mines has to pass into the settling tanks and after settling, the water shall be used for plantation & dust suppression.

g. Water shall be treated before use for drinking purpose. Before water is supplied for consumption particularly for drinking purpose it has to be ensured that the water is free from any pathogens.

Water quality will be monitored as per the SPCB/MoEF guideline. Monitoring will be done after the resumption of mining operation.

8.3.3 Noise Pollution Control

As general precaution, to reduce the effect of high noise level, the following ameliorating measures have been proposed in addition to the measures being already taken up:-

- Provision of protective devices like acoustic wool, earplugs, ear muffs to workers exposed to noise of more than 80 dB (A) provided.
- Provision of sound proof cabins for the workers deployed on machines producing higher level of sound like Dozers, dumpers, shovels etc.
- Proper maintenance of noise generating machinery including transporting vehicles would be ensured.
- A thick green belt shall be provided around the periphery of mine to screen the noise.
- Reducing the exposure time of workers wherever required.

8.3.4 Vibration levels (due to blasting)

During the time of mining operation ground vibration was not there due to blasting. However, Vibration study has not been carried out within the lease area during blasting. After resumption of mining operation, vibration study will be carried out. Accordingly, the precautionary measures will be adopted.

8.3.5 Water regime

Run off after rain can create pollution problem in the surrounding water regime. The disturbed land and loose overburden is very much susceptibility to erosion and silting may be the result. Therefore, as a precautionary measure following activity will be undertaken:

a. Extension of garland drain around quarry, waste dump yard etc.

b. Construction of more check dams around the dump site to arrest flow of loose sediments before discharge into the drainage system of the region through settling tanks.

c. Drains to be cleaned up periodically.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

d. Strengthen of small stone/ rock barriers across the drains at intervals to check the water current and to arrest the solid particles.
e. Effluent water from the quarry to be pumped regularly and discharged to the adjacent garland drains.
f. All the water of mines has to pass into the settling tanks and after settling, the water shall be used for plantation & dust suppression.

8.3.6 Acid Mine Drainage

As on date there is no data about the acid Mine drainage within the surrounding water body.

8.3.7 Surface Subsidence

Not Applicable

8.3.8 Socio-Economics

The proposed project, does not involve any displacement of human habitation, hence no habitation package is needed for displacement.

The mining activity envisages the deployment of local laborers. So, it is likely that the general economic condition of the local people will improve. The peripheral development package will also improve their health and sanitation.

Apart from introducing eco-friendly mining (Fully Mechanised). special attention for upliftment of socio economic conditions of the nearby villages by providing following facilities has been proposed. Health and education facilities created in the project shall be extended to villagers also.

5. Roads development in the project shall be utilized by the villagers also which shall connect them to nearby town,
6. Drinking water facilities, Cultural and recreational centers.
7. Afforestation of the village areas, distribution of seedlings and involving people in such programmes.
8. Providing employment to local people will be the one of the major factors for upliftment of the society.

8.3.9 Historical monuments etc.

No public buildings, monuments, places of historical importance exist in and around within 5Km radius of the lease hold 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 plan period.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

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

Out of the total ML area of 66.368Ha the area of degradation under mining will be 27.578 hects. Considering the present exploration data and estimated mineable reserve within the ML area, it can be observed that, none of the quarries are going to be exhausted during ensuing scheme period. The ultimate quarry limit has been delineated considering the present exploration data.

The reclamation procedure will start after complete exhaust of minerals in the Pit area. Based on the present exploration data it can be observed that the Old quarry will be exhausted first during conceptual period. Therefore the reclamation will be started from the Old quarry by means of bench plantation.

During conceptual period it has been planned to reclaim the mined out land, both by means of back filling & plantation and bench plantation. Back- filling will be done at lower elevated area where as the dead benches in the hilly terrain where back filling cannot be possible will be reclaimed by means of plantation.

Out of the total mined out land of 27.578 hects an area of 2.856 Ha can be reclaimed by means of back filling and plantation and balance 24.722 Ha will be reclaimed by means of bench plantation. However, as none of the quarry area has been exhausted till date plantation will be carried out safety zone area of ML boundary and Railway line.

Year wise plantation programme during plan period:

During scheme period of 5 years, it has been planned to undertake plantation over 2.75 Ha in the safety zone and along the railway siding. The plantation would be carried out @ 1600nos per hectare. The year wise plantation within mining plan period as follows:

Year	Location	Area in Ha.	No of Saplings	Name of the Plants to be planted
2020-21	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	Consultation with forest authorities shall be planted. Artistida, onctarous, Cillianis, Agava mexicana, Euciliopsis binata, Eucalyptus,Sorea robusta
2021-22	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
2022-23	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
2023-24	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
2024-25	Boundary Safety Zone & safety zone along Railway Siding	0.55	880	
Total		**2.75**	**4400**	

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

8.3.2 Top Soil Management:

The generation of top soil will be nil.

8.3.3 Tailings Dam Management:

Not Applicable

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

Not Applicable

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

Not Applicable

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

During 2019-20

Items	Details	2020-21	2021-22	2022-23	2023-24	2024-25
Dump management	Area to be afforested (ha) / coir matting	–	–	–	–	–
	No of saplings to be planted	–	–	–	–	–
	Cumulative no of plants					
	Cost including watch and care during the year (Rs.)	–	–	–	–	–
Management of worked out benches	Area available for rehabilitation (ha)	Nil	Nil	Nil	Nil	Nil
	Afforestation done (ha)	Nil	Nil	Nil	Nil	Nil
	No of saplings to be planted in the year	Nil	Nil	Nil	Nil	Nil
	Cumulative no of plants	Ni	Ni	Ni	Ni	Ni
	Any other method of rehabilitation(specify)	Nil	Nil	Nil	Nil	Nil
	Cost including watch and care during the year	Nil	Nil	Nil	Nil	Nil
Reclamation and rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /stope wise (ha)	–	–	–	–	–
	Void filled by waste / tailings (ha)	–	–	–	–	–
	backfilled area to be afforested					
	Rehabilitation by making water reservoir	Nil	Nil	Nil	Nil	Nil
	Any other means specify)	Nil				
Rehabilitation of waste land within lease (Along the safety zone by gap filling)	Area available (ha) (Along the safety zone of nala and road)	0.55 (880 nos of sapling)	0.55 (880 nos of sapling)	0.55 (880 nos of sapling)	0.55 (880 nos of sapling)	0.55 (880 nos of sapling)
	Area to be rehabilitated	–				
	Method of rehabilitation	Plantation				
Others (specify)	Retaining wall (around dump)	220m x2mx 1.5m	Maintenance			
	Garland drain (around dump and mineral reject stack)	230 x 1.5 x 1.0m	Maintenance			
	Settling tank (near dump)	One (10mx 8mx2m)	Maintenance			

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

	Environment Monitoring	To be done as per MoEF & CC guide line	To be done as per MoEF & CC guide line	To be done as per MoEF & CC guide line	To be done as per MoEF & CC guide line	To be done as per MoEF & CC guide line

8.4 Disaster Management and Risk Assessment:

- Geological & climatic hazards such as land slide, subsidence and inundation are not expected owing to the competence of strata available in the lease hold.
- Though earthquake is felt several times in Odisha, damage to man & materials have not been occurred to this part of area.
- Keeping in view the past occasions, flooding is not expected, as the lease hold is located in hilly terrain and much above the HFL of the area.
- No mine fire is possible, since eruption of inflammable gas in the workings is a remote possibility.

However, it has been planned to make all types of arrangement to meet any type of eventualities.

The dumps will be stabilized properly. No disaster is foreseen keeping in view last 10 years of mining record of the mines.

Risk assessment is a process whereby risks are analyzed, assessed and risk management priorities are evaluated. It is defined as the characterization of the potential adverse effect to human health & environment due to environmental hazards.

Objectives of risk assessment:-

- identifying hazardous activities
- assessment of risk level and severity in different operations
- identification of control measures
- setting monitoring process
- reduce the impact of mishaps of all kinds
- reduce the inherent potential for major accidents

Methodology of Risk assessment:-

- Collection of information & identification of hazard
- Classify their severity and probability of occurrence
- Identification of exposed risks
- Assess the risk and risk rating based on

- Probability
- Exposure

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

- Consequence
- Prioritization of the risks
- Implementation of control measures
- Monitoring risk assessment
- Evaluation and correction

Risk assessment is mainly based on the environmental impact of various parameters.

i) Land contamination:-

The potential for contamination during operation of mine site is, waste rock dump which is regard as contaminated land.

ii) Aquatic toxicity:-

The risk assessment in aquatic toxicity system is based on the total metal concentration in various chemical form or oxidation state. Mn ore does not contain appreciable concentration of toxic elements.

iii) Acid mine drainage:-

The mining of iron ore does not involve any processing operation by using chemicals. Hence there is no risk at mine site with regard to control of acid mine drainage

iv) Tailing dam:-

Not Applicable

v) Human health:-

The chemicals from tailing dam and waste heaps may severely affect the human health. However there is no tailing dam or any effluent generation during the mining of iron ore. Hence there is no risk involved to human health due to iron ore mining operation.

Factors of risks involved due to human induced activities in connection with mining operations are 1) Removal of O.B and side burden 2) Drilling 3) Blasting 4) Excavation of ore and 5) transportation of ore.

Other factors due to natural activities are 1) fire 2) water inundation 3) electricity and 4) natural calamities.

S.No	Factors	Causes of risks	Control measures
1	Removal of O.B	a) Top soil & O.B bench may slide due to its unconsolidated nature. b) Vibration due to movement of vehicles in the O.B benches	Over all O.B bench slope angle will be maintained not more than 45°.Bench height shall not exceed 10 m in O.B
2	Drilling	a) Due to high pressure of compressed air hoses may burst.	During preventive & Periodical maintenance and replacement of worn out accessories in the compressor and

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

			drill equipment
3	Blasting	a) Fly rock, ground vibration and noise etc., b) Improper charging of explosives	Burden and spacing will be kept optimum on trail basis and inclined drilling will be done. Explosive charge per delay will be minimized.
4	Excavation of Ore	a) Hauling and loading equipment are in such proximity while excavation b) Swinging of bucket over the body of tipper c) Driving of un authorized person	Operator shall not operate the machine when person & vehicles are in such proximity Shall not swing the bucket over the cab and operator leaves the machine after ensuring the bucket is on ground Shall not allow any unauthorized person to operate the machine by effective supervision
5	Transportation of ore	a) Operating the vehicle " noise to tail" b) Overloading of material c) While reversal & overtaking of vehicle d) Operator of truck leaving his cabin when it is loaded	It will be ensured that all these causes will be nullified by giving training to the operators. No over loading. Audio visual reverse horn will be provided Proper training will be given
6	Fire due to electricity and Oil	a) Due to the short circuit of cables & other electrical parts. b) Due to the leakage of inflammable liquid like diesel, oil etc,	Commutator & electrical parts shall be cleaned frequently with the help of dry air blower All fastening parts and places will be lighted.
8	Natural calamities	Unexpected happenings	The mine management is capable to deal with the situation

Disaster Management Plan:

The management is able to deal with the situation efficiently to reduce confusion keeping in view of the likely sources of danger in the mine.

Structure of the Disaster Management Plan:-

1) Out line of Disaster management plan :-

The purpose of disaster management plan is to restore the normalcy for early resumption of mining operation due to an unexpected, sudden occurrence resulting to abnormalities in the course of mining activity leading to a serious danger to workers or any machinery or the environment.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

2) System of communication:

An internal communication system for the department head and to their line of command with telephone will be provided. Also the telephone nos and addresses of adjoining mines, rescue station, police station, Fire service station, local hospital, electricity supply agency and standing consultative committee members are made available for the mine management

3) Consultative committee:

A standing consultative committee will be formed under the head of Mines manager. The members consists of safety officer / medical officer / Asst. manager/ public relation officer/ Foreman/ and environmental engineer.

4) Facilities & Accommodation:-

Accommodation and facilities for medical centre, rescue room and for various working groups will be provided.

5) First Aid & medical facilities:-

The mine management will have first aid for use in emergency situation. All casualties would be registered and will be given first aid. The centre will have facilities for first aid & minor treatment, resuscitation, ambulance and transport. It will have proper telephone / wireless set for quick communication with hospitals where the complicated cases are to be sent.

6) Stores and equipment :
A detailed list of equipment available its type & capacity and items reserved for emergency.

7) Transport services:-
A well-defined transport control system will be provided to deal with the situation.

8) Functions of public relations group:-

To make a cordial relation with government officials and other social service organization and working groups. To liaise with representatives of the mine to ameliorate the situation of panic, tension, sentiments, grievances and misgivings created by any disaster. To ameliorate the injured, survivors and family members of affected persons by providing moral support and establishing contact with relatives of victims.

9) Security :-
Manning of security posts

10) Catering & Refreshment :-

Arrangement to be made for the victims, rescue teams and others

8.5 Care and maintenance during temporary discontinuance:

Temporary discontinuance may happen due to various causes such as,

- Court order.
- Natural Calamities.
- Accident (Mine related).
- Slope failure.
- Failure in fulfilment of statutory requirement.
- Local issue.
- Any other unforeseen circumstance.

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

However, since it will be a temporary discontinuance, the following measures can be under taken partly/fully depending upon the causes.

- If the mine will be discontinued temporarily for more than 120 days, notice will be given 30 days before the date of such discontinuance to the concerned authorities.
- During discontinuance period safety arrangement and fencing will be provided to avoid the entry of unauthorized persons.
- The accessibility to the mine from the surface will be prevented by providing fencing arrangement.
- Care & maintenance of machineries as per the machine operating manuals.
- Tightening of the security at the time of discontinuance.
- Repair & maintenance of haul road.
- Regular monitoring of air, water, noise etc. in the permitted area and inspection of quarry working by competent persons/experts.

8.6 Financial Assurance:

Sl. No.	Head	Area put on use at start of plan A	Additional requirement during plan period B	Total C=(A+B)	Area considered as fully reclaimed & rehabilitated D	Net area considered for calculation E=(C-D)
1.	Area under mining	9.942	0.631	10.573	Nil	10.573
2.	Storage for topsoil	Nil	Nil	Nil	Nil	Nil
3.	Waste dump site	2.480	0.350	2.830	Nil	2.830
4	Mineral storage	2.900	1.00	3.900	Nil	3.900
5	Infrastructure (Workshop, administrative building)	0.140	0.180	0.320	Nil	0.320
6.	Roads	1.200	Nil	1.200	Nil	1.200
7.	Railway	11.124	Nil	11.124	Nil	11.124
8.	Tailing pond	Nil	Nil	Nil	Nil	Nil
9.	Effluent treatment plant	Nil	Nil	Nil	Nil	Nil
10	Mineral Separation Plant	0.800	Nil	0.800	Nil	0.800
11.	Township area	Nil	Nil	Nil	Nil	Nil
12.	Others (Magazine)	0.040	Nil	0.040	Nil	0.040
	Grand Total :	**28.626**	2.161	**30.787**		**30.787**

अनुमोदित
APPROVED
REGIONAL CONTROLLER OF MINES
INDIN BUREAU OF MINES
भुवनेश्वर/BHUBANESWAR

As per Mineral Conservation and Development Rules – 2017 under Rule 27 , 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 30.787 x Rs.300000/-= Rs.9236100/-(Rupees Ninety two lakhs thirty six thousand one hundred only) at the rate of Rs.300000/-per hectare. Copy of the Bank Guarantee is attached as **Annexure-20.**

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

PART-B

9.0 Certificate and Undertaking

This is to certify that the Progressive Mine Closure Plan of Jururi Iron and Manganese Mines 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.

10.0 Plans & Sections - This Progressive Mine Closure Plan is submitted as per the Rule 23 under MCDR 2017. Plans and sections for this plan have been referred to that of Mining Scheme, which is being submitted simultaneously for approval.

Managing Director
M/s Tarini Mineral Pvt Ltd

A.GURUBALASUBRAMANIAM
QUALIFIED PERSON

CONSENT LETTER/ UNDERTAKING/ CERTIFICATE FROM THE LESSEE

1.0 The Review of Mining Plan in respect of Jururi Iron and Manganese Mine over an area of 66.368 Ha of M/s Tarini Minerals Pvt. Ltd, Jururi Village, P.S./Tahasil-Joda, District Keonjhar, State Odisha under rule 17(2) of MCR 2016 has been prepared by qualified person Shri A. Gurubalasubramaniam, B. E. in Mining having professional experiences of more than five 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 Review of the Mining Plan with the said qualified person at his address below

A. Gurubalasubramaniam, Qualified Person
At: Unchabali, Po: Bamebari, Joda, Keonjhar, Odisha Mob: 9437251461 Email: ags@altradegroup.com

I hereby undertake that all modifications / updating as made in the said Review of Mining Plan by 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.

2.0 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.

3.0 It is certified that the Progressive Mine Closure Plan in respect of Jururi Iron and Manganese Mine over an area of 66.368Ha, of M/s Tarini Minerals Pvt. Ltd., Jururi Village, P.S./Tahasil - Joda, District Keonjhar,State Odisha complies with

A Gurubalasubramaniam
Qualified Person

INDRANI PATNAIK

(MINES OWNER)

A/6, COMMERCIAL ESTATE, CIVIL TOWNSHIP, ROURKELA - 769 004

Phone : 0661-2400139, 2400014, Fax : 0661-2402226

TO WHOM SO OVER IT MAY CONCERNED

This is to Certify that A. Gurubalasubramaniam, S/o S. Avinasilingagurunathan, Village- Chatrapatti, District –Virudunagarworking in our Unchabali Iron and Manganese Ore Mine since 2010 to till date. He has professional experience of working in the supervisory capacity in the field of Mining in our Mines since 2010.

Indrani Patnaik

Smt. IndraniPatnaik

(Lessee)

Unchabali Iron and Manganese Mines

Place: Rourkela

Date: 15/06/2020

164

A. Gurubalasubramaniam

Qualified Person

Anna Univer

of the Anna University hereby makes known

GURUBALASUBRAMANIAM A

the Degree of Bachelor of Engineering

MINING ENGINEERING

satisfactorily completed the prescribed course

of Engineering and having been

Examiners to be qualified to receive the

by them in the First Class with

held in the month of

Given und

104 (4)

A. GURUBALASUBRAMANIAM
QUALIFIED PERSON