



भारत सरकार  
खान मंत्रालय  
भारतीय खान ब्यूरो  
क्षेत्रीय खान नियंत्रक का कार्यालय

**BY E.MAIL / REGD. PARCEL**

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E-mail: ro.bhubaneswar@ibm.gov.in

No. MPM/FM/14-ORI/BHU/2015-16 / 605

Plot No.149, Pokhariput,  
Bhubaneswar,  
Odisha-751 020.  
दिनांक / Date: 14.09.2016

To

Shri Vineel Krishna, IAS,  
Managing Director,  
M/s OMC Limited,  
OMC House, Bhubaneswar,  
Odisha – 751001.

Sub: Approval of Modified Mining Plan along with Progressive Mine Closure Plan under Rule-17 of MCR 2016 of Khandabandh Iron Ore Mines of M/s Odisha Mining Corporation Limited over an area of 366.311 HA in Keonjhar district of Odisha.

Ref:

- Your letter no. 15409/PMC/OMC/2015 dated 01.12.2015.
- This office letter of even no. dated 03.12.2015.
- This office letter of even no. dated 14.12.2015 addressed to the Director of Mines, Govt. of Odisha, copy endorsed to you.
- This office letter of even no. dated 02.03.2016.
- Your qualified person letter no. 11.16.Q76QSOM.IBM dated 23.03.2016.
- This office letter of even no. dated 04.05.2016.
- Your letter no. 8018/OMC/PMC/2016 dated 01.06.2016.
- This office letter of even no. dated 07.07.2016.
- Your letter no. 10675/OMC/PMC/2016 dated 20.07.2016.
- Your letter no. 12712/OMC/PMC/2016 dated 01/02.09.2016.
- Your letter no. 12844/OMC/PMC/2016 dated 07.09.2016.

Sir,

In exercise of the power delegated to me under Rule 17 (3) of Mineral Concession Rules, 2016 vide Gazette Notification No. S.O. 1857 (E) dated 18.05.2016, I hereby Approve the Modified Mining Plan including Progressive Mine Closure Plan of Khandabandh Iron Ore Mines over an area of 366.311 ha of M/s Odisha Mining Corporation Limited in Keonjhar district of Odisha State submitted under Rule 17 (3) of Mineral Concession Rules, 2016. This approval is subject to the following conditions:

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

- iv. Indian Bureau of Mines has not undertaken verification of the mining lease boundary on the ground and does not undertake any responsibility regarding correctness of the boundaries of the leasehold shown on the ground with reference to lease map & other plans furnished by the applicant / lessee.
- v. At any stage, if it is observed that the information furnished, data incorporated in the document are incorrect or misrepresent facts, the approval of the document shall be revoked with immediate effect.
- vi. If this approval conflicts with any other law or court order/ Direction under any statute, it shall be revoked immediately.
- vii. Validity of this document shall expire on the day, as per the provision of MMDR Amendment Act 2015 dated 26.03.2015 or on 31.03.2018 whichever is earlier.

**Encl: - One copy of approved Modified Mining Plan.**

भवदीय / yours faithfully,

14/9/16  
(M BISWAS)

क्षेत्रीय खान नियंत्रक / Regional Controller of Mines

Copy for kind information to:-

1. MECON Limited, RM & Mining Section, P.O. Doranda, Ranchi-834 002, Jharkhand.
2. The Director of Mines, Directorate of Mines, Government of Odisha, Heads of the Department Building, New Capital, Bhubaneswar- 751001, Odisha along with one copy of approved Modified Mining Plan by **REGISTERED PARCEL**.

(M BISWAS)

क्षेत्रीय खान नियंत्रक / Regional Controller of Mines



**MODIFIED MINING PLAN**  
**(UNDER RULE 17(3) of MCR 2016)**

**&**

**PROGRESSIVE MINE CLOSURE PLAN**

**(UNDER RULE 23(B) OF MCDR 1988)**

**VOLUME – I (TEXT)**

**IN RESPECT OF KHANDABANDH IRON ORES MINES**

**LEASE AREA: 366.311 HECTARES**

Forest Land	Area, Ha
Reserved/ Protected Forest	Nil
Village Forest	97.217
Others (DLC)	209.973
Others (SABIK)	37.999
Total Forest land area	345.189
Non Forest land area	21.122

**MINERAL: IRON ORE**

**VILLAGE: KHANDABANDH, JAROLI, JALAHARI, GURUDA, JAJANG**

**TALUKA: BARBIL, DISTRICT: KEONJHAR**

**STATE: ODISHA**

**CATEGORY : "A" FULLY MECHANISED (FM) OPENCAST MINES**

**EXECUTED LEASE PERIOD: 30.11.1963 TO 29.11.1993**

**DATE OF EXPIRY OF LEASE : 29.11.2033**

LEASE RENEWAL	APPLICATION DATE	PERIOD	EXPIRY DATE
1 <sup>st</sup> RML	09.11.1992	20 years	29.11.2013
2 <sup>nd</sup> RML	14.11.2012	20 years	29.11.2033

**PROPOSED PLAN PERIOD: 01.04.2013 TO 31.03.2018**

**LESSEE**

**M/S ODISHA MINING CORPORATION LIMITED.**

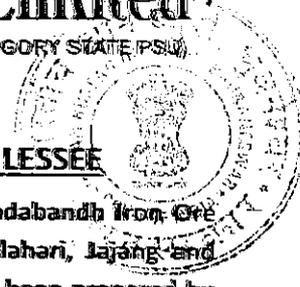
**OMC HOUSE, POST BOX NO.- 34, BHUBANESWAR - 751001,**

**ODISHA, PIN - 751001**

**PREPARED BY**

**Manmohan Nayak**  
**Mining Engineer & Qualified person**  
**OMC Ltd.**

**PK Bhattacharjee**  
**Mining Engineer & Qualified person**  
**MECON Ltd.**

**CONSENT LETTER / UNDERTAKING / CERTIFICATE FROM THE LESSEE**

01. The Modifications proposed in the approved mining plan in respect of Khandabandh Iron Ore Lease over an area of 366.311 hectares in village Khandabandh, Jaroli, Jalahari, Lajang and Guruda, in Distt. Keonjhar of Odisha state under Rule 17(3) of MCR 2016 has been prepared by following qualified persons

This is to request the Regional Controller of Mines, Indian Bureau of Mines, Bhubaneswar to make any further correspondence regarding any correction of the Modifications proposed in the approved mining plan with the said qualified person at their address given below:

PK Bhattacharjee, 8E(Min) FCC(R), Sr. Manager (Mining) Raw material & Mining Division MECON Ltd., P.O-Doranda, Ranchi – 834002 Tel.No. 0651-2483645 Fax No. 0651-2482189, 2482214 e-mail: mining@meconlimited.co.in	Manmohan Nayak, M.Tech(Mining), AME(Min), IM.Sr.(Geol), FCC(R) Planning Cum Monitoring Cell OMC Ltd., Bhubaneswar-751001 Tel.No. 0674 – 2377538 Fax No. 0674-2391629, 2396889, 2394772 e-mail: immcon_mine@yahoo.co.in
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We hereby undertake that all modifications / updating as made in the said Modifications proposed in the approved mining plan by the said qualified persons be deemed to have been made with our knowledge and consent and shall be acceptable on us and binding in all respects.

02. We undertake to implement CCOM's circular no. 2/2010 (addendum) regarding system of construction & maintenance of boundary pillars. The Modified Mining Plan document has been prepared adopting the lease boundary as per the authenticated lease plan and the land schedule authenticating 345.189 Ha. of forest land (307.190 Ha. as per HAL & 37.999 Ha. as per SABLIK settlement) by the Tehsildar.
03. It is certified that the Progressive Mine Closure Plan of Khandabandh Iron Ore Mine of The Odisha Mining Corporation Ltd, Odisha, Bhubaneswar over an area of 366.311 hectares complies with all statutory Rules, Regulations, Orders made by the Central or State Government, Statutory Organization, Court etc. which have been taken into consideration and wherever any specific permission is required, the Lessee will approach the concerned authorities.  
The information furnished in the Progressive Mine Closure Plan is true and correct to the best of our knowledge and records.
04. The provisions of Mines Act, Rules and Regulations made there under have been observed in the Modifications proposed in the approved mining plan over an area of 366.311 hectares in Keonjhar district of Odisha State belonging to Khandabandh Iron Ore Mine and where specific permissions are required, the Lessee will approach the DGMS. Further, standards prescribed by DGMS in respect of miners' health will be strictly implemented.
05. We do hereby undertake to complete exploration in respect of entire ML area over 366.311 Ha. of Khandabandh Iron Ore lease in time bound manner in accordance with Ministry of Mines letter No.10/75/2008-MV dated 23.12.2010.

Place : Bhubaneswar

Date :

R. Vineel Krishna, IAS,

Managing Director & Owner of the Mine



**CERTIFICATE**

The provisions of the Mineral Conservation and Development Rules 1988 have been observed in the preparation of the Modified Mining Plan for Khandabandh iron ore Lease over an area of 366.311 Ha, of M/s Odisha Mining Corporation Limited, in Villages - Khandabandh, Jaroli, Jalahari, Jajang and Guruda in Distt. Keonjhar of Odisha state and whenever specific permissions are required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

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

Place: Bhubaneswar

Date: 2.9.2016

(Manmohan Nayak)

(Mining Engineer, Qualified Person)

OMC Limited, Bhubaneswar - 751001



MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.



VOLUME – I (TEXT)

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(Qualified Person)

  
(Qualified Person)



**CERTIFICATE**

The provisions of the Mineral Conservation and Development Rules 1988 have been observed in the preparation of the Modified Mining Plan for Khandabandh Iron ore Lease over an area of 366.311 Ha, of M/s Odisha Mining Corporation Limited, in Khandabandh, Jaroli, Jalahari, Jajang and Guruda villages under Barbil Tahsil of Keonjhar district of Odisha state and whenever specific permissions are required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

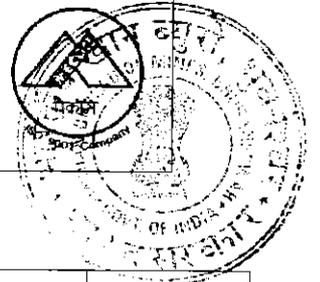
The information furnished in the Modified Mining Plan is true and correct to the best of our knowledge.

Place: Ranchi  
Date: 1.9.2016

  
(PK Bhattacharjee)  
(Mining Engineer, Qualified Person)  
MECON Limited, Ranchi – 834002



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**LIST OF ANNEXURES**

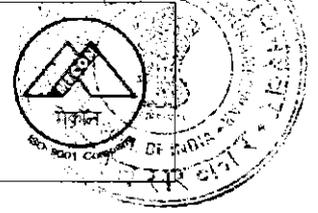
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(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



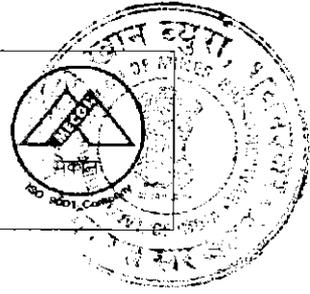
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(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



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(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**INTRODUCTION**

Khandabandh Iron ore lease is owned by M/s Odisha Mining Corporation Limited (OMC Ltd.), A Gold category Govt. of Odisha Mining PSU. Khandabandh Iron ore lease of M/s Odisha Mining Corporation is located in village Khandabandh, Jaroli, Jalahari, Jajang and Guruda under Joda PS, Barbil Tahsil and Champua subdivision of Keonjhar district of Odisha state between latitude 21°55'40.27579"N–21°57'29.90066"N & longitude 85°23'12.66888"E – 85°24'51.95389"E and is covered by survey of India toposheet no. 73 G/5.

**Status of Lease**

Lease deed for Khandabandh lease was executed on 30.11.1963 for a lease area of 366.311 Ha for a period of 30 years. Copy of lease deed for Khandabandh lease is enclosed at annexure 7. Subsequently, application for 1<sup>st</sup> RML was made on 09.11.1992. Copy of Form D & Form J for 1<sup>st</sup> RML of Khandabandh lease is given at annexure 8. Application for 2<sup>nd</sup> RML was made on 14.11.2012. Copy of Form D & Form J for 2<sup>nd</sup> RML of Khandabandh lease is given at annexure 9. As per Mineral (Mining by Govt. Company) Rules 2015, the lease is deemed to be extended till 29.11.2033.

**Status of Environment clearance**

Environment clearance for the lease has been granted by MoEF vide letter no. J-11015/1081/2007-IA.II(M) dated 15.12.2008 for a rated iron ore production capacity of 1.0 million tonnes per annum. A copy of the same is enclosed as Annexure- 15).

**Status of Forest Clearance**

DFO, Keonjhar has granted permission for conducting mining operation in 71.781 Ha of non forest land and 113.746 Ha of broken up DLC forest area vide letter no. 7565 dated 27.08.2010. Copy of cover letter of application submitted for forest diversion is given at annexure 12. The lessee has obtained permission from the office of Deputy Director of Mines, Joda for working in non forest land vide letter no 7559/Mines dated 26.12.2012. Copy of the same is enclosed as annexure 13. The lessee has also obtained permission from the office of Deputy Director of Mines, Joda for working in non forest land and DLC Broken land vide letter no 7565/Mining, Keonjhar dated 27.08.2010. Copy of the same is enclosed as annexure 14.

The process of estimation of total forest land (including sabik forest land) has been initiated. The total forest land has been assessed by the Tahsildar and the same has been forwarded to DFO, Keonjhar. Copy of the same has been enclosed as Annex.-11. Fresh application for diversion of the forest land will be accordingly submitted by OMC once the same has been authenticated by the concerned officials of the state government.

**Status of Consents from State Pollution Control Board**

Consent to operate was valid till as 31.03.2013. Consent to establish has been granted by State Pollution Control Board on 26.04.2011 for 1.0 Million tonnes of Iron ore per annum and was valid till 25.04.2012. Copy of the Consent to Establish & Consent to Operate is enclosed as annexure 16.

**Status of Surface Right**

The lessee has surface right over an area of 343.606 Ha. Copy of letter of grant of surface right permission is given in annexure – 17. Copy of land schedule is given at annexure 11.

  
(Qualified Person)

  
14/9/16  
क्षेत्रीय खान नियंत्रक  
REGIONAL CONTROLLER OF MINES  
भारतीय खान ब्यूरो  
INDIAN BUREAU OF MINES  
(Qualified Person)  
भुवनेश्वर/BHUBANESWAR



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**Common Boundary Working Permission**

The lessee has been also granted common boundary working permission with Jarouri Iron & Mn Mines of M/s Kalinga Mining Corporation near lease pillar 16 to 26 by DGMS vide letter no R/4768 dated 11.12.1995. Copy of the same is enclosed as annexure 36. Initial working has been carried out near pillar 23 to 26. The area has been fenced off & boundary pillars have been erected at site.

**Status of Approvals under MCDR**

Mining plan alongwith PMCP for 1<sup>st</sup> lease renewal period prepared under Rule 24A of MCR 1960 & MCDR 1988 was approved by IBM. The mining plan was valid till 2007-08. In the meantime, modification to mining plan prepared under Rule 10 of MCDR 1988 for last three years i.e. 2005-06 to 2007-08 was approved by IBM vide letter no. 314(3)/2006-MCCM(C)/MP-6 dated 23.10.2006. The modified mining plan was valid upto 31.03.2008. Scheme of Mining under rule 12 of MCDR 1988 was approved by IBM vide letter no. 314(3)/2008-MCCM(CZ)/MS-36 dated 18.06.2009. The scheme of mining was valid upto 31.03.2013.

Subsequently, modification to scheme of mining for period 2011-12 to 2012-13 was prepared under rule 10 of MCDR 1988 has been approved by IBM vide letter no. 314(3)/2011-MCCM(CZ)/MS-27 dated 11.11.2011. Copy of approval letter of modification to scheme of mining is enclosed as annexure 10. Presently mine is not working since 05.01.2010 due to want of forest clearance. IBM issued violation regarding non submission of the scheme of mining document for the period 2013-14 to 2017-18. OMC was not able to prepare the above document due to want of lease plan authenticated by competent authority of state govt. However, scheme of mining for the period 2013-14 to 2017-18 was submitted to IBM by lessee. IBM asked to submit the geo-referenced lease plan duly authenticated by competent authority of state govt. in order to comply with the requirement joint boundary survey was conducted by state Govt. & accordingly geo-referenced lease plan has been prepared by State Govt. which has been handed over to OMC vide letter no. III(A)-03/93-9830/MD dated 13.11.2015. Copy of the letter received from Director of Mines, Govt. of Odisha for handing over the authenticated DGPS map is enclosed as annexure 38. Accordingly present document is submitted for period ending upto 31.03.2018 after receipt of Geo-referenced Lease plan from the Director of Mines, Govt. of Odisha.

The ML area granted, RML applied area at different points of time in chronological order is given in the table below:-

S.No	Event with justification, if any	Remarks
1	Lease deed for Khandabandh was executed on 30.11.1963 for a lease area of 366.311Ha for a period of 30 years.	Lease Period : 30.11.1963 to 29.11.1993
2	The 1 <sup>st</sup> lease renewal application to State Govt. was made on 09.11.1992 for a period of 20 years.	1 <sup>st</sup> RML Period : 30.11.1993 to 29.11.2013
3	The 2 <sup>nd</sup> lease renewal application to State Govt. was made on 14.11.2012 for a period of 20 years.	2 <sup>nd</sup> RML Period : 30.11.2013 to 29.11.2033 as per Mineral (Mining by Govt. Company) Rules 2015

Details of last approved documents in chronological order is given below.

S.No	Document & Rule No.	Details of Approval	Validity period	Remarks
1.	Mining plan along with progressive mine closure plan under rule 24A & Rule 23 (B) of MCDR, 1988.	Mining Plan was approved by the Controller of Mines, Indian Bureau of Mines	Valid upto 31.03.2008	Mining Plan prepared for 1 <sup>st</sup> lease renewal period .
2.	Modification to mining plan & PMCP prepared under	Approved by IBM letter no. 314(3)/2006-MCCM(C)/MP-6	Valid upto 31.03.2008	Modification period : 2005-06 to 2007-08

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



S.No	Document & Rule No.	Details of Approval	Validity period	Remarks
	Rule 10 & Rule 23 (B) of MCDR 1988 respectively.	Nagpur dated 23.10.2006.		Reason : Due to production enhancement for last three years of scheme period.
3.	Scheme of Mining & PMCP prepared under rule 12 & 23 (B) of MCDR 1988 respectively .	Approved by IBM vide letter no. 314(3)/2008-MCCM(CZ)/MS-36 dated 18.06.2009	Valid upto 31.03.2013	Period : 31.03.2008 to 31.03.2013
4.	Modification to scheme of mining & PMCP under rule 10 & 23 (B) of MCDR 1988 respectively.	Approved by IBM vide letter no. 314(3)/2011-MCCM(CZ)/MS-27 dated 11.11.2011.	Valid upto 31.03.2013	Modification Period : 2011-12 to 2012-13 Reason : Production enhancement & or complying the violations pointed out by IBM

As per Mineral (Mining by Govt. Company) Rules 2015 the lease is deemed to be extended till 29.11.2033. Therefore, present submission is a Modified Mining Plan under 17(3) of MCR 2016 for an area of 366.311 Ha. and for the period from 01.04.2013 to 31.03.2018 along with progressive mine closure plan prepared under rule 23(B) of MCDR 1988 in the new universal format prescribed by IBM. All the annexure referred above and anywhere in this document have been enclosed as a separate volume, namely volume II (Annexure).

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**1.0 GENERAL**

**Shri Vineel R Krishna, Managing Director & Nominated Owner  
Odisha Mining Corporation Limited, Bhubaneswar.**

**a. Name of applicant/ lessee/ Rule 45 registration No.**

A list of board of directors is enclosed as Annexure – 1.  
A copy of the relevant extract from the minutes of the 416<sup>th</sup> meeting approved by Board regarding appointment of Nominated Owner of the mine is enclosed as Annex. – 2.  
A copy of photo id & address proof of the nominated owner of the mine is enclosed as Annexure – 3.  
Undertaking of Board of Directors regarding their working in other firms/company/organisation under Section 184 (1) and Rule 9(1) is given in annexure 4.  
The number of state-wise leases already held by the applicant/ applied for, indicating the type of minerals, areas, location etc is enclosed as Annexure – 6.

Registration No. of OMC Ltd. under Rule 45	IBM/4269/2011
Address	OMC House, Post Box No. 34 Bhubaneswar - 751001
District	Keonjhar
State	Odisha
Pin Code	751001
Phone	0674-2393431, 2395689, 2393389
Fax	0674-2391629, 2396889, 2394772
Gram	-
Telex	-
e-mail	info@orissamining.com

**b) Status of the applicant**

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

Certificate of incorporation is enclosed as Annex. – 5.

**c) Mineral(s) which is / are include in the prospecting license (For fresh grant)** Not applicable

**d) Mineral(s) which is / are include in the lease deed** Iron ore

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

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



f) Name of Recognised Person under rule 15(1) of MCR, 2016 or a Person employed under clause (c) of Sub rule (1) of rule 42 of MCDR, 1988 (Applicable for Scheme of Mining only) preparing Mining Plan:

Manmohan Nayak, Manager (Mining),  
Mining Engineer & Qualified person  
OMC Limited

Jointly with

Name of the RQP preparing the mining  
plan

PK Bhattacharjee, Sr. Manager (Mining),  
Mining Engineer & Qualified Person  
MECON Limited, Ranchi

Copy of the documentary proof of educational qualification &  
experience certificate of qualified persons is enclosed as  
Annexure – 20.

Address

OMC House, Post Box No. 34, Bhubaneswar – 751001  
&  
MECON Limited, P.O – Doranda, Ranchi – 834002, Jharkhand  
0674 – 2377538

Phone

&  
0651 - 2483645  
0674-2391629, 2396889, 2394772

Fax

&  
0651 - 2482189, 2482214  
immcon\_mine@yahoo.co.in

e-mail

&  
mining@meconlimited.co.in

Telex

-

Registration No.

NA

Date of grant / renewal

NA

Valid upto

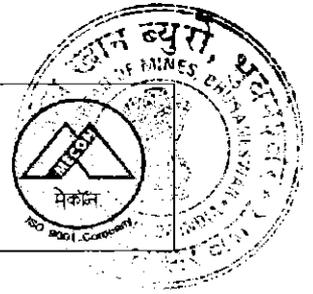
NA

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**2.0 LOCATION AND ACCESSIBILITY**

**a) Lease Details (Existing Mine)**

Name of Mine  
Khandabandh Iron ore lease (Lease Area : 366.311 Ha)

Khandabandh Iron ore lease of M/s Odisha Mining Corporation is bounded between latitude 21°55'40.27579"N to 21°57'29.90066"N & longitude 85°23'12.66888"E to 85°24'51.95389"E and is covered by survey of India toposheet no. 73 G/5.

DGPS readings of the boundary pillar co-ordinates is given below:-

**Coordinates of Lease Boundary Pillar**

Pillar No.	Coordinates		Pillar No.	Coordinates	
	Longitude	Latitude		Longitude	Latitude
1	85°23'13.30619"	21°55'40.27579"	31	85°24'40.80459"	21°56'51.31991"
2	85°23'13.11180"	21°55'52.18284"	32	85°24'39.87412"	21°56'47.12059"
3	85°23'12.86358"	21°55'58.05815"	33	85°24'39.31236"	21°56'44.42352"
4	85°23'12.66888"	21°56'05.88592"	34	85°24'38.60550"	21°56'41.32543"
5	85°23'16.81635"	21°56'11.18619"	35	85°24'36.75892"	21°56'32.90762"
6	85°23'23.46556"	21°56'20.12635"	36	85°24'35.82321"	21°56'28.58692"
7	85°23'29.88330"	21°56'28.20126"	37	85°24'35.43823"	21°56'26.86672"
8	85°23'32.39013"	21°56'31.19654"	38	85°24'30.50658"	21°56'26.86805"
9	85°23'37.53236"	21°56'38.07667"	39	85°24'23.13630"	21°56'26.86696"
10	85°23'41.89188"	21°56'43.69220"	40	85°24'12.93082"	21°56'26.86508"
11	85°23'45.49768"	21°56'48.34145"	41	85°24'10.72753"	21°56'26.86211"
12	85°23'47.05635"	21°56'53.85913"	42	85°24'10.72865"	21°56'26.27495"
13	85°23'49.91310"	21°57'03.94991"	43	85°24'10.74418"	21°56'20.32327"
14	85°23'52.39468"	21°57'12.76529"	44	85°24'10.72153"	21°56'10.65889"
15	85°23'55.59292"	21°57'24.09037"	45	85°24'06.97034"	21°56'10.65783"
16	85°23'57.25111"	21°57'29.90066"	46	85°24'03.16530"	21°56'10.65460"
17	85°24'03.19670"	21°57'21.50948"	47	85°24'00.83658"	21°56'10.66178"
18	85°24'10.94305"	21°57'18.35506"	48	85°23'57.80302"	21°56'10.69395"
19	85°24'11.95806"	21°57'17.97961"	49	85°23'55.25931"	21°56'07.73185"
20	85°24'14.55316"	21°57'16.95559"	50	85°23'51.78673"	21°56'04.77728"
21	85°24'20.94624"	21°57'14.46297"	51	85°23'50.23275"	21°56'04.84835"
22	85°24'25.34119"	21°57'12.73484"	52	85°23'47.65882"	21°56'06.20627"
23	85°24'31.65188"	21°57'12.99016"	53	85°23'41.92962"	21°56'06.52837"
24	85°24'37.90813"	21°57'13.26421"	54	85°23'36.09474"	21°56'07.18207"
25	85°24'47.46136"	21°57'13.62503"	55	85°23'31.78817"	21°56'05.69143"
26	85°24'51.01641"	21°57'13.76590"	56	85°23'27.66798"	21°56'04.25456"
27	85°24'51.51488"	21°57'03.88004"	57	85°23'26.17620"	21°56'03.47264"
28	85°24'51.95389"	21°56'54.92122"	58	85°23'24.71997"	21°56'00.95219"
29	85°24'45.86016"	21°56'54.67076"	59	85°23'21.18060"	21°55'55.66431"
30	85°24'43.20871"	21°56'51.00238"	60	85°23'18.58586"	21°55'51.50094"

Lat/long of any boundary point.

Date of grant of lease  
30.11.1963

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



Details	Date of Application	Period	Expiry Date
Lease Deed Execution	30.11.1963	30 years from 30.11.1963	29.11.1993
1 <sup>st</sup> RML	09.11.1992	20 years from 30.11.1993	29.11.2013
2 <sup>nd</sup> RML	14.11.2012	20 years from 30.11.2013 as per Mineral (Mining by Govt. Company) Rules 2015	29.11.2033

Name of lease holder M/s Odisha Mining Corporation Limited  
 Address OMC House, Post Box No. 34  
 Bhubaneswar – 751001, Odisha  
 Tel. 0674-2393431, 2395689, 2393389  
 Fax 0674-2391629, 2396889, 2394772  
 e-mail immcon\_mine@yahoo.co.in, info@orissamining.com  
 Mobile +919437260607

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

Forest (Specify)	Area, Ha	Non Forest (Specify)	Area, Ha
Reserved/ Protected Forest	Nil	Waste Land	21.122
Village Forest	97.217	Grazing Land	
Others (DLC)	209.973	Agriculture Land	
Others (SABIK)	37.999	Others i.e. Hutments etc. (Specify)	
<b>Total</b>	<b>345.189</b>	<b>Total</b>	<b>21.122</b>

Total lease area / applied area 366.311 Ha  
 District & State District : Keonjhar, State : Odisha  
 Taluka At & P.O. : Joda  
 Village Khandabandh, Jaroli, Jajang, Jalahari and Gurda.

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

Precise area plan (Geo-referenced lease map) of Khandabandh Iron Ore lease is shown in plate no MEC/Q76Q/11/16/02. Authenticated original lease plan of Khandabandh Iron Ore lease is shown in plate no MEC/Q76Q/11/16/02A

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

The approaches to the mine are as follows:

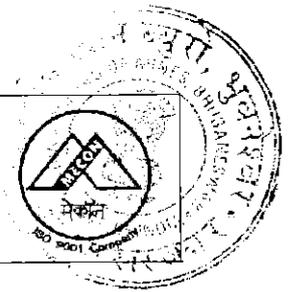
Rail	:	The nearest Railway station is Banspani (on Padapahar – Barajamda – Gua branch line of South Eastern Railway) at a distance of about 7 km from the mine lease.
Road	:	Khandabandha mine lease area is well connected with Joda town (at a distance of 9.5 km on northern side) through a State road, which passes close to the leasehold and links with NH-215 linking Rourkela and Panikoiili.
Air strips	:	Bhubaneswar (Odisha) at a distance of 500 km

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**Toposheet No. with latitude & longitude of all corner boundary point/pillar**

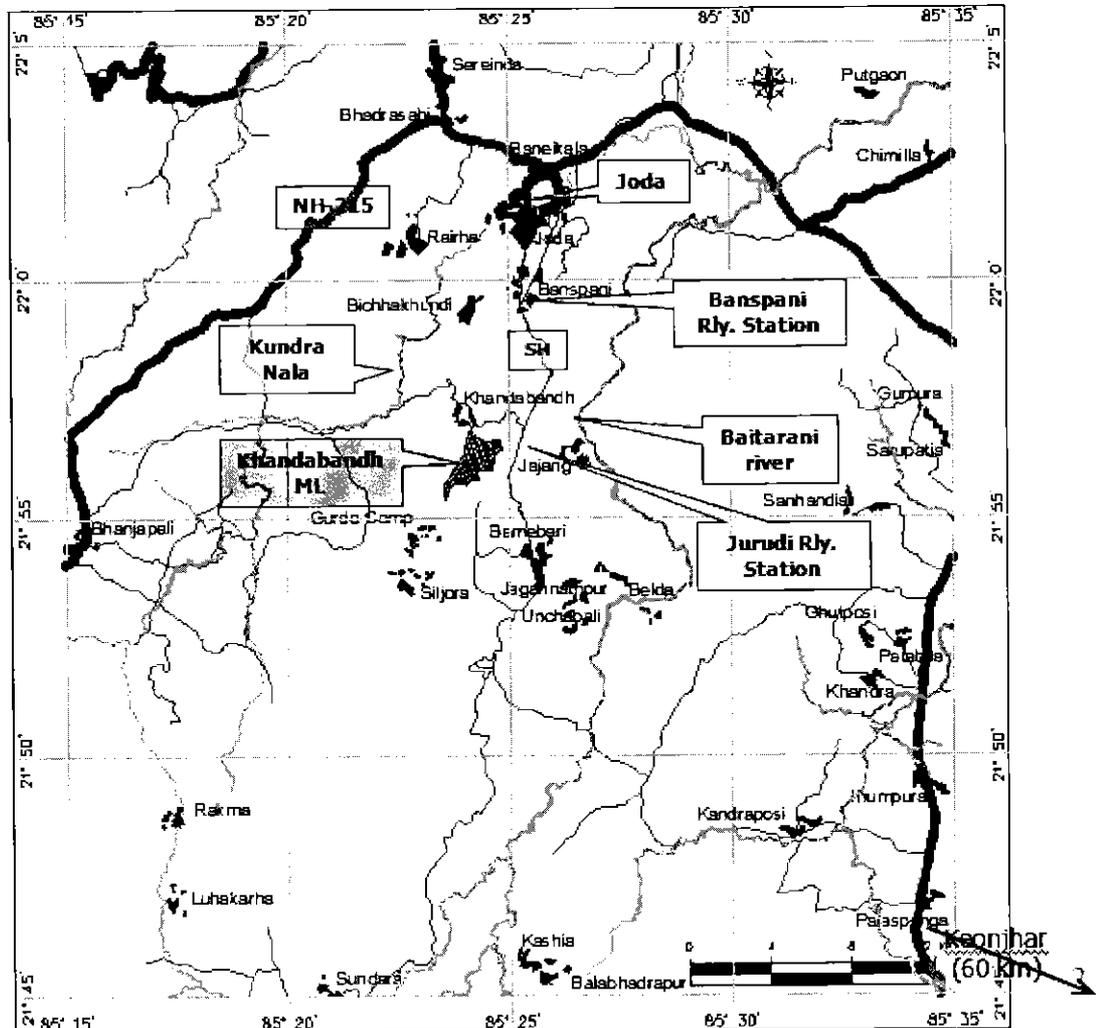
Khandabandh Iron ore lease of M/s Odisha Mining Corporation is bounded between latitude 21°55'40.27579"N to 21°57'29.90066"N & longitude 85°23'12.66888"E to 85°24'51.95389"E and is covered by survey of India toposheet no. 73 G/5.

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

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

General location map of lease area showing access routes is given below.

**Figure 1 : General location map**



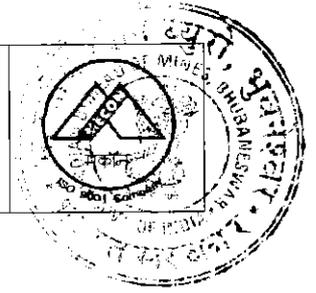
The same has been shown in the key plan as Drg. No. MEC/Q76Q/11/16/01.

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



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

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

Scheme of Mining for period 2008-09 to 2012-13 prepared under rule 12 of MCDR 1988 was approved by IBM vide letter no. 314(3)/2008-MCCM(CZ)/MS-36 dated 18.06.2009. The scheme of mining was valid upto 31.03.2013.

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

Modification to scheme of mining for period 2011-12 to 2012-13 was prepared under rule 10 of MCDR 1988 has been approved by IBM vide letter no. 314(3)/2011-MCCM(CZ)/MS-27 dated 11.11.2011. Copy of approval letter of modification to scheme of mining is enclosed as annexure 10.

**Reason for Modification :**

A few violations under provisions of MCDR 1988 was pointed out by a task force team comprising of IBM official, Mining officer Joda & DMG, Govt. of Odisha during their visit to mines on 05.05.2010. Accordingly, RCOM, Bhubaneswar issued orders of suspension of mining operation vide letter no. H/11021/2/2010/BBS dated 25.08.2010. For revocation of the suspension order issued for violation of rule 13 (1), last approved scheme of mining was modified.

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

Review of proposals made in the last approved Scheme of Mining & Modified Scheme of Mining and actual achievement for the last scheme period w.e.f 2008-09 to 2012-13 for khandabandh Iron Ore Mines is given below.

**i. Exploration:**

**Review of exploration in Iron Ore Deposit:**

Year	Planned Exploration	Actual Exploration	Reasons for Deviation
2008-09	Nil	Nil	No deviation
2009-10	50 Nos	11 Nos.	Due to non-availability of Forest clearance
2010-11	50 Nos.	193 Nos.	Additional drilling to delineate ore bearing zones
2011-12	50 Nos	28 Nos.	Due to non-availability of Forest clearance
2012-13	40 Nos.	Nil	Due to non-availability of Forest clearance
<b>Total</b>	<b>190 Nos.</b>	<b>232 Nos.</b>	

Actual exploration is in 22.10% excess of planned exploration.

**ii. Mine Development and Exploitation**

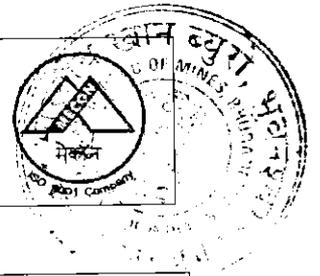
The achievement position as against the target in respect of ore, sub grade & waste are given below:

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**Overall Targets for Iron Ore and Waste removal**

Year	Ore, Million tonnes		Sub grade, Million cubic meters		Waste, Million cubic meters	
	Planned	Actual	Planned	Actual	Planned	Actual
2008-09*	-	0.120338	-	0.002006	-	0.026742
2009-10	0.998694	0.086479	0.016645	-	0.607315	0.027757
2010-11	1.00242	-	0.016707	-	0.726496	-
2011-12	0.99963	-	0.01666	-	0.483265	-
2012-13	0.9963	-	0.01675	-	0.739000	-
<b>Total</b>	<b>3.997044</b>	<b>0.206817</b>	<b>0.066762</b>	<b>0.002006</b>	<b>2.556076</b>	<b>0.054499</b>

\* By the time the scheme of mining was submitted the year was passed. Therefore proposal for remaining four years i.e. 2009-10 to 2012-13 was made on the Scheme of Mining.

The actual production of ore, sub grade & waste against their planned figures are 5.17%, 3% & 2.1% respectively, over the last five years of the scheme period. Operation in the mine has been suspended due to want of forest clearance since 05.01.2010 therefore planned ore, waste & subgrade production could not be achieved.

iii. **Afforestation:**

iv. **Land Reclamation and Rehabilitation:**

There was no proposal to reclaim the mined out area during the last approved mining scheme period in the years 2008-09 to 2010-11.

Year	Afforestation, No. of Saplings	
	Planned	Actual
2008-09	1600	-
2009-10	1600	-
2010-11	1600	2000
2011-12	1000	-
2012-13	1000	-
<b>Total</b>	<b>6800</b>	<b>2000</b>

Actual afforestation is 29.41% of the planned figures. The mine is not in operation since 2010, the planned afforestation could not be achieved.

v. **Waste dump management:**

A total of 0.054499 million cubic meters of waste was generated against the planned figure of 2.556076 million cubic meters during last scheme period. The generated wastes which was around 2.1% of the planned figure, was dumped in the planned areas only.

3.4 **Give status of compliance of violations pointed out by IBM**

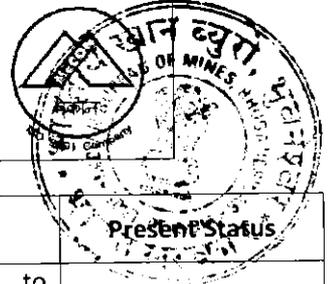
The violations pointed out during the last 5 years and their compliance status as submitted to IBM by OMC has been enclosed as Annexure – 21.

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



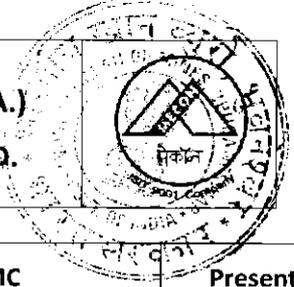
Rule No.	Nature of violation observed by IBM	Compliance by OMC	Present Status
13(1)	<p>1. Modification to approved scheme of mining was approved vide letter dated 11.11.2011 and is having proposals valid up to 31.03.2012. Scheme of mining for remaining lease period up to 29.11.2013 has not been submitted so far to the Regional Controller of Mines, Bhubaneswar 120 days before the expiry of earlier approved proposals.</p>	<p>The mining scheme (010.04.13 to 29.11.13) of Khandabandh Iron Ore Mines has been awarded to M/s Earth &amp; Environment, Bhubaneswar on 18.10.2012. In this connection, we wish to make the following submission for your kind consideration. The mining operation has been stopped w.e.f 05.01.2010 for want of forest clearance. The preparation of this mining scheme had to be done by following our prevalent process of inviting tenders from consultant firms. Since OMC Ltd. is public sector company of Govt. of Odisha, we lost time due to the procedures of tendering and awarding of work to the consultant. The consultant M/s Earth &amp; Environment was awarded the work on 18.12.2012. Mining scheme will be submitted shortly.</p>	<p>Assignment of preparation of Modified Mining plan has been awarded to M/s MECON Ltd. Draft modified mining plan has been submitted at IBM Bhubaneswar &amp; is under process of scrutiny/finalization.</p>
	<p>2. Mining operations are not being carried out in accordance with the modification to the approved scheme of mining letter no. 314(3)/2011 MCCM(CZ)/MS/33 dated 11.11.2011 to the extent indicated below:</p> <ul style="list-style-type: none"> <li>It was proposed to explore 47 no. of bore hole during the year 2011-2012 &amp; 43 no. of bore holes during the year 2012-2013 against which only 30 no. of bore holes were carried out so far.</li> </ul>	<p>The balance bore hole could not be done due to forest restriction.</p>	<p>Presently mine is not operational.</p> <p>The balance bore hole has not been drilled.</p>
Rule 27(4)	<p>Surface plans maintained updated under the provision of Rule 28 of MCDR, 1988 at the site, is not matching with actual field conditions in respect of sub grade ore stocks exists in the lease area.</p>	<p>IBM Notified vide letter no. T-5031/CGBM/2007 dtd. 16.10.2009 related to threshold value of cut off grade 45% Fe to stack the material separately. The mine has been closed since 5.1.2010 due to non availability of forest clearance. In the short span of this time period, we are unable to keep the materials separately. However, action has been taken to analyze and specify the grade wise stock of sub grade ore and waste material through an out side analytical agency M/s Inspectorate Griffith India (Pvt.) Ltd. After getting analysis report, it will be shown in the</p>	<p>Analysis has been done for different stocks &amp; updated surface plan has been submitted alongwith the present submitted document.</p>

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



Rule No.	Nature of violation observed by IBM	Compliance by OMC	Present Status
		surface plan and will be submitted to your good office within 3 months.	
33(2)	In deposit – VI, Retaining wall along bottom periphery of ore stock yard and dump yard has not been maintained effectively to prevent wash off ore and waste material there from.	Tender action has been initiated for construction of retaining wall along bottom periphery of ore stock yard and dump yard to prevent wash off of ore and waste material.	Boulder walls have been constructed around the bottom of periphery of ore stock yard. Retaining wall construction has not been started.
45(1) (b) (i)	A whole time Mining Engineering having 10 (ten) years of professional experience has not been employed as per the provision of amended Rule.	Mining operation of Khandabandh iron ore mines has been stopped since 05.01.2010 due to want of forest clearance. However Sri M.K Sethi with Degree in Mining Engineering is posted at Khandabandh as Mining Engineer having 5 years of professional experience. After resumption of mining operation, a Mining Engineer having more than 10 years experience will be posted.	Sri M.K Sethi with Degree in Mining Engineering is posted at Khandabandh as Mining Engineer having 8 years of professional experience.

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

The mining operation is under suspension with effect from 05.01.2010 due to want of forest clearance.

**3.6 In case the MP/SOM is submitted under rules 9 and 10 of the MCDR'88 or under rule 17(3) of the MCR'2016 for approval of modification, specify reason and justification for modification under these rules:**

Present Modification of Mining Plan is submitted under rule 17(3) of MCR 2016.

**Reason**

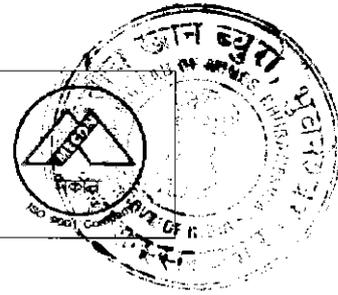
As per Mineral (Mining by Govt. Company) Rules 2015 the lease is deemed to be extended till 29.11.2033. Therefore, present submission is a Modified Mining Plan under 17(3) of MCR 2016 for an area of 366.311 Ha. and for the period from 01.04.2013 to 31.03.2018 along with progressive mine closure plan prepared under rule 23(B) of MCDR 1988 in the new universal format prescribed by IBM.

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**PART – A**

**1.0 GEOLOGY AND EXPLORATION**

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

i. **Physiography & Drainage**

The lease area is a part of the Bonai Synclinorium and is characterised by hilly topography. Within the mine lease, there are three prominent relict mounds having R.L.s at 657 m, 677 m and 674 m in north, west and south-west of the area respectively. The mining block lies at altitudes between 525 and 677 mRL. Almost the entire area is hilly. The hill slopes are moderately steep. In this area there are a few peaks exceeding 700 mRL, the highest being at 797 mRL at 6 km south-west of the lease area.

The area has dendritic pattern of drainage. Because of the hilly topography, there are numerous seasonal drainage channels but only a few perennial streams / rivers (Kundra Nala, Baitarani River, Karo River). The mine lease is drained by Baitarani River. The seasonal drainage channels coming out of the lease area drain into the Baitarani River which flows at a distance of 2.8 km east of the mine lease.

ii. **Vegetation**

The forest in the leasehold is classified as Northern Tropical Dry Deciduous Forests. The average tree density in core zone is about 1640 trees/ha. The forest is under moderately degraded stage with tree closely spaced and height ranging from 2 to 12m and girth class ranging from 20 to more than 40 cm. Shorea robusta, is the most dominant species with Diospyros melanoxylon, Buchnanian lanzen, Schleicheria oleosa (Kusum), Syzygium cumini (Jamu), Phyllanthus emblica (Aonla), Caserea elliptica (Khakra), Lagerstroemia parviflora (Sidha) etc. as common associates.

Mongoose, Kuji Neola, Fox, Jackal, rats sloth bear, Cobra, krait, lizard etc. are major faunal species found in the area.

iii. **Climate & Rainfall of the Lease Area**

The lease area lies in tropical region where climate is characterised by very hot summers and cool winters. Summer is typically from March to June when monthly temperature ranges from a maximum of 42°C during daytime to a minimum of 15°C at night. Winter is from November to February when the maximum temperature during day goes up to 37°C and minimum temperature at night becomes as low as 8°C.

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

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

**Regional Geology**

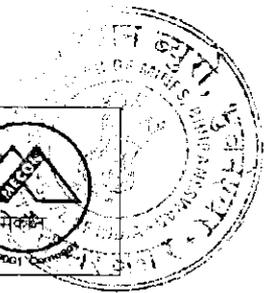
Jamda – Koira Valley Synchlinorium is one of the principal Banded Iron Formations (BIF) encircling the Singhbhum Granite Complex. This formation contains an isolated deposit at Gandhamardan hill which lies southeast of Jamda – Koira valley deposit popularly known as famous horse shoe shaped Singhbhum Bonai Iron Ore Synchlinorium. Khandabandha mining

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**

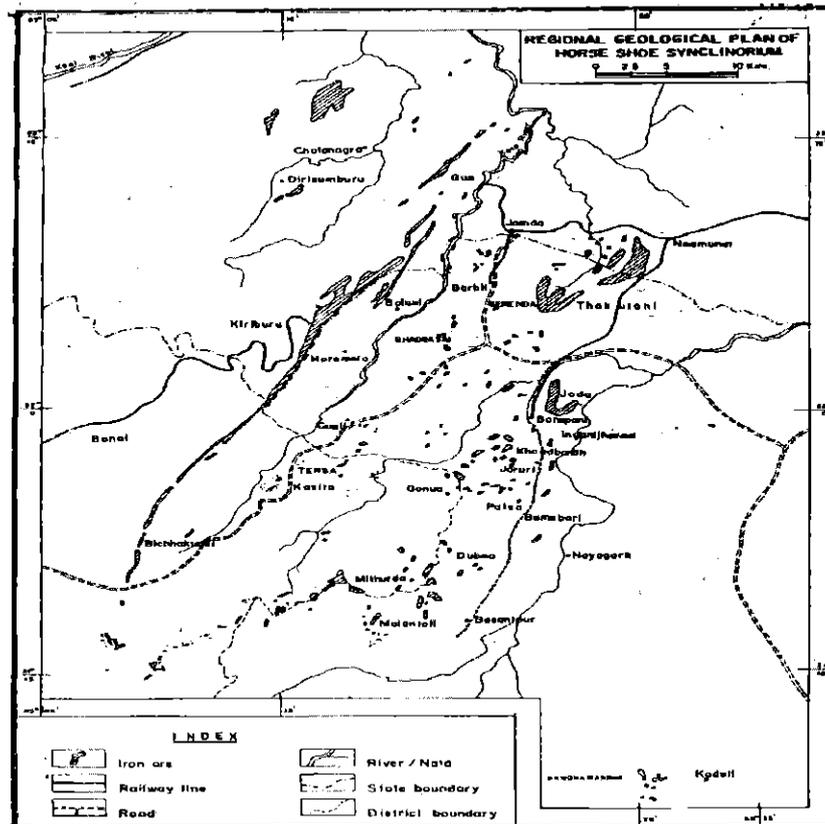


lease area belongs to Bonai iron ore synclinorium. The stratigraphic succession of the area is as follows :

KOLHAN GROUP	SANDSTONE, CONGLOMERATE - BRECCIA
----- UNCONFORMITY -----	
Mixed Facies Formation	<ul style="list-style-type: none"> <li>• Basic lava, tuffs and tuffites of volcanic facies</li> <li>• Iron, manganese, lenses of iron formation, chert, and small dolomite patches of chemical facies.</li> </ul>
Banded Shale Formation	<ul style="list-style-type: none"> <li>• Minor lenses of sandy and silty shale of clastic facies.</li> <li>• Upper banded shale member</li> <li>• Lower black shale member</li> </ul>
Banded Iron Formation	<ul style="list-style-type: none"> <li>• Lower black shale – chert member</li> <li>• Finely banded jaspilite member</li> <li>• Coarsely banded jaspilite member</li> </ul>
Volcanic Formation	<ul style="list-style-type: none"> <li>• Tuffaceous shale</li> <li>• Basic lava</li> </ul>
Basal Sandstone	<ul style="list-style-type: none"> <li>• Gritty sandstone, quartzite conglomeratic at places with interbedded lava at top.</li> </ul>
----- UNCONFORMITY -----	
Singbhum Granite with enclaves of older metabasic and meta-sedimentary rocks.	

Regional geological map of the area is given in figure 2.

**Figure 2. : Regional Geological Map**

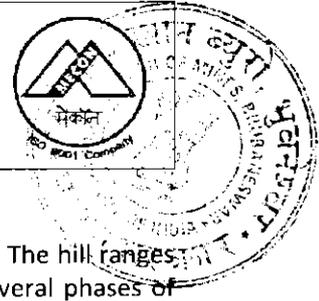


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(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**Regional Structure**

The horse-shoe shaped iron ore deposit form a northerly plunging synclinorium. The hill ranges broadly delineate the folded limbs of the synclinorium. Superimpositions of several phases of deformation in the area have results a complex fold system.

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

**Local Geology**

**Lithology**

Khandabandh ML area being the north-western continuation, the nature of the ore body and its structural dispositions being the closure part of the famous iron ore synclinorium. The horse shoe shaped iron ore deposits form a northerly plunging synclinorium. The hill ranges broadly delineate the folded limbs of the synclinorium. Superimpositions of several phases of deformation in the area have resulted in a complex fold system. Litho units encountered in the leasehold are :

- Laterite,
- Lateritic Iron Ore,
- Ferruginous Shale
- Banded Iron Formation which hosts the Iron ore (Mostly soft laminated & hard laminated ore and variegated shale.

**Laterite**

The formation is encountered in all the five deposits of this lease hold area with an average 2 m of capping. The northern part of the leasehold area is highly lateritised.

**Lateritic Iron Ore**

The lateritic iron ore is a low grade iron ore which always occurs in association with Goethite and Limonite. This is well exposed in the Quarry-4 and also encountered in few boreholes at Deposit-IV & V.

**Ferruginous Shale**

Ferruginous shale is an accumulation of fine grained sediments which is rich in iron. It typically exhibits a reddish hue if ferric iron is present or a green tint if the iron is ferrous. Dark grey or black shale, however, often results from the presence of significant amount of organic matter. In this lease hold area, the reddish yellow ferruginous shale occurs almost in all the deposits and the paddy plain. The shale occurring to the west of the lease hold area is ferruginous in nature and bears a gradational contact with iron ore bodies at places. During the course of exploration, most of the drill holes have encountered the shale with an average thickness of 3.00 m to 13.00 m followed by iron ore.

**Banded Iron Formation (BIF)**

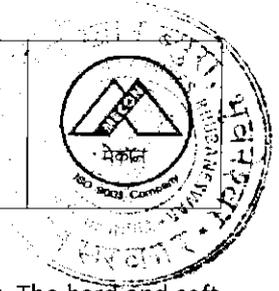
This formation is the most widely occurring formation around the area occupying topographically higher elevations. Because of the folded structures, BHJ has been observed in the crest of the mounts at places especially in the West and Central-West part of the lease hold area i.e. Deposit No. I and also in the North-Central Part called Deposit No.VI trending NE-SW and dipping variably at moderate angle of 20° to 70°.

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
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Iron ore bodies overlie the BHJ in the east and ferruginous shale in the West. The hard and soft laminated ore are widely developed in the Deposit-I, IV, V & VI, fringing the BHJ and ferruginous shale members. Sometimes BHJ occur as undigested patches within iron ore. As revealed by the borehole data, hard massive/laminated ore is abundant in Quarry-4 and the soft friable ore (SLO) is abundant in Deposit-V (Quarry-3) & Deposit-VI. Floats of iron ore is well exposed in the North-Eastern side of the Quarry-1.

**Local Structure:**

***Deposit -I (Quarry -1)***

The deposit -I mostly comprises of hard massive ore with fines & micro laminations. Pockets of laterite associated floats of iron ore has been marked in both north & south part of the deposit. Soft laminated ore & blue dust is also exposed in the quarry benches from 2427850 N to 2427950 N. General strike trend of foliation is NW-SE dipping mostly NE at an angle of 18° to 70°. Two major sets of joints are deciphered in the deposit in direction NE-SW (vertical) and NNW-SSE (vertical).

***Deposit -II***

It is located in the north eastern part of the lease. Mostly hard massive & laminated ore occurs in this deposit. The general trend of ore body is NW-SE dipping 30° easterly to SW.

***Deposit - III (Quarry -5)***

It is located in south of deposit-II. Mostly occurrence of hard massive, soft laminated & blue dust have been found in the deposit -III. The general trend of ore body is NE-SW with moderate dip of 20° to 25° towards NW.

***Deposit - IV***

Deposit -IV is located in the southern part of the lease. The general trend of ore body is N-S with moderate dip of 10° to 25° towards west. Soft laminated ore & massive ore is also exposed in the quarry benches from 2426350 N to 2426450 N. Hard massive ore is clearly exposed in the floor as well as southern sidewall of quarry. Two sets of joints have been observed in the deposit with minor anticlinal folds in NE part of the quarry.

***Deposit -V (Quarry -3)***

The deposit mostly comprises of soft laminated ore & blue dust. Iron ore floats are also marked in both eastern and western side of the deposit. The general trend of ore body is NW-SE with moderate dip of 20° to 26° towards north east. No structures have been marked in the deposit.

***Deposit - VI***

This deposit is located in the North western part of the lease. The quarry is well exposed with soft laminated ore with hard boulder undigested BHJ. The deposit is highly folded with anti-synclorium pattern of fold. The general trend of ore body is NE-SW with a dip of 25° to 28° towards north west.

**A. (i) Name of prospecting /exploration agency :**

1. M/s Odisha Mining Corporation Ltd.
2. M/s MAPL, Asansol

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**(ii) Address**

1. Geology Division, M/s Odisha Mining Corporation Ltd.  
OMC House, Post Box No. 34  
Bhubaneswar – 751001
2. M/s Mining Associates Pvt. Limited (MAPL),  
Atwal Nagar, S.B. Gorai Road,  
Asansol – 713-301 West Bengal.

**(iii) E mail addresses and phone no.**

1. M/s Odisha Mining Corporation  
E-mail: info@orissamining.com, Tel. : (0674) 2393431, 2395689, 2393389
2. M/s Mining Associates Pvt. Limited (MAPL)  
E-mail : rajesh.bansal@miningassociates.co.in, Tel : (0341) 2220757, 2220758, 2205765

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

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

**Geological Mapping**

Out of the total lease area of 366.311 Ha, 108.02 Ha area & 130.35 Ha area has been geologically mapped at an scale of 1 : 500 and 1 : 1000 respectively. Besides, 12.25 Ha area of deposit V has also been mapped at an scale of 1 : 1500. Details of deposit-wise Geological mapping of carried out at Khandabandh Iron Ore Lease is given below.

Deposit/ Quarry	Area Covered by Geological Mapping, Ha			
	Scale of Mapping			Total
	1:500	1:1000	1:1500	
Deposit I	48.75	12.25	-	61.00
Deposit II	3	4	-	7.00
Deposit III	5	21	-	26.00
Deposit IV	42.02	23.8	-	65.82
Deposit V	3	65.5	12.25	80.75
Deposit VI	6.25	3.8	-	10.05
<b>Total</b>	<b>108.02</b>	<b>130.35</b>	<b>12.25</b>	<b>250.62</b>

Topographical map of Khandabandh Iron Ore Lease has been prepared at 5 m contour interval.

**ii) Number of boreholes indicating type (Core/RC/DTH), diameter, spacing, inclination, Collar level, depth etc with standard borehole logs duly marking on geological plan/sections.**  
All the deposits of Khandabandh Iron Ore Lease has been explored by Geology division of OMC Ltd. & M/s MAPL at less than 100 m x 100 m grid interval A total of 781 nos. of exploratory boreholes with a total meterage of 25521.29 m has been drilled at Khandabandh Iron Ore Lease.

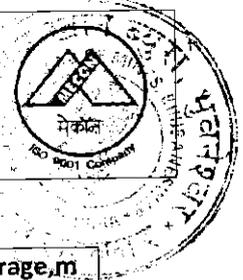
**A summary of the exploration carried out for G1 areas indicating mapping, pitting, drilling (No./ spacing), sample drawn/ analyzed etc, existing pit data, grade variation, thickness for Khandabandh Iron Ore Lease is given in the table below:**

  
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(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**Details of year-wise core drilling already carried out**

Year	Deposit/Quarry	No. of Bore Holes	Total Meterage,m
Cumulative till March'2004		78	1895.44
2004-05	Nil	Nil	Nil
2005-06	Deposit-IV	11	476.6
	Deposit-III	10	380.25
	Deposit-VI	9	184.3
	<b>Sub total</b>	<b>30</b>	<b>1041.15</b>
2006-07	Deposit-IV	21	1014.2
	Deposit-V	11	620.4
	<b>Sub total</b>	<b>32</b>	<b>1634.6</b>
2007-08	Nil	Nil	Nil
2008-09	Nil	Nil	Nil
2009-10	Deposit-V	11	558.65
	<b>Sub total</b>	<b>11</b>	<b>558.65</b>
2010-11	Deposit-I	31	1087.8
	Deposit-III	55	2474.4
	Deposit-IV Main	17	601.9
	Deposit-V	58	2063.9
	Quarry-5 (Dep-V)	12	519.3
	Deposit-VI	20	495.05
	<b>Sub total</b>	<b>193</b>	<b>7242.35</b>
2011-12	Deposit-I	16	844
	Deposit-III	Partly 1 Hole	34.5
	Deposit-V	6	866.7
	Deposit-VI	6	65
	<b>Sub total</b>	<b>28</b>	<b>1810.2</b>
2012-13	Nil	Nil	Nil
	<b>Total</b>	<b>294</b>	<b>12286.95</b>
<b>Grand Total (Cumulative till March'2013)</b>		<b>372</b>	<b>14182.39</b>

**Details of year-wise DTH drilling already carried out**

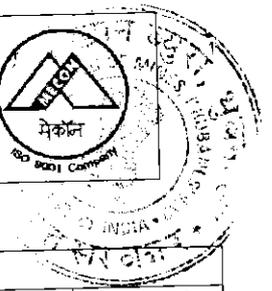
Year	Deposit/Quarry	No. of Bore Holes	Total Meterage,m
Cumulative till March 2004		<b>207</b>	<b>6084.00</b>
2004-05	Deposit-I	55	1440.00
	Deposit-III	28	718.00
	Deposit-IV	42	1277.00
	Deposit-V	37	1060.00
	Deposit-VI	20	505.00
	<b>Sub Total</b>	<b>182</b>	<b>5000.00</b>
2005-06	Nil	Nil	Nil
2006-07	Deposit-II	10	396.00
	Deposit-III	10	370.00
	<b>Sub Total</b>	<b>20</b>	<b>766.00</b>
2007-08 To 2012-13	Nil	Nil	Nil
	<b>Grand Total</b>	<b>202</b>	<b>5766.00</b>
<b>Cumulative achievement</b>		<b>409</b>	<b>11850.00</b>

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
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LESSEE: THE ODISHA MINING CORPORATION LTD.**



**Summary of Core & DTH Drilling**

Deposit/ Quarry	Grid	No. of Boreholes	Meterage	Depth From/ to	Grade From/ to, Fe%	Level of Exploration
All Deposits (Cumulative upto March 2004)	Less than 100 m x 100 m	285	7979.44	0.6/99.20	5.32/69.16	G1
Deposit I	Less than 100 m x 100 m	102	3371.8	2.3/90.0	23.83/69.11	G1
Deposit II	Less than 100 m x 100 m	10	396	0.6/51.1	18.8/69.12	G1
Deposit III	Less than 100 m x 100 m	103	3942.65	9.5/99.2	5.32/69.16	G1
Deposit IV	Less than 100 m x 100 m	91	2893.1	1.2/86.3	6.72/68.1	G1
Deposit V	Less than 100 m x 100 m	135	5688.95	3.6/47.15	33.51/69.06	G1
Deposit VI	Less than 100 m x 100 m	55	1249.35	3.6/42	38.35/69.06	G1
<b>Total</b>	<b>Less than 100 m x 100 m</b>	<b>781</b>	<b>25521.29</b>	<b>0.6/99.20</b>	<b>5.32/69.16</b>	<b>G1</b>

All the above boreholes have been shown in the geological plan. Forest permission for drilling boreholes in forest area is given at annexure 29. Form J for permission of drilling boreholes and Form K indicating details of already drilled boreholes have been given at annexure 30 & 31 respectively. A summary of the exploration already carried out in the Khandabandh Iron Ore Lease is given below.

**Status of Exploration as per UNFC**

Sl. No.	Name of the Mineral	Name of the Lessee	Name of the Lease	Status of Working	Non Forest Area, Ha	Forest Area, Ha	Total Area, Ha
A	B	C	D	E	F	G	H=F+G
1	Iron Ore	M/s Odisha Mining Corporation Ltd.	Khandabandh Iron Ore Lease	Working Mines but presently working has been suspended	71.781	294.530	366.311

Deposit	Lease Area explored as per UNFC Norms, Ha				Balance area to be explored	Remarks/Comments
	G1 Level	G2 Level	G3 Level	Non Mineralised area	Total	
	I	J	K	L	O= M + N	
Deposit -I	34.78474	NIL	NIL	NIL	17.67266	
Deposit -II	15.47394	NIL	NIL	NIL	4.868298	
Deposit -III	14.01683	NIL	NIL	35.6916	29.93979	
Deposit -IV	54.61704	NIL	NIL	NIL	26.40891	
Deposit -V	58.7126	NIL	NIL	NIL	26.85855	
Deposit -VI	21.31235	NIL	NIL	NIL	25.95369	
<b>Total</b>	<b>198.9175</b>	<b>NIL</b>	<b>NIL</b>	<b>35.6916</b>	<b>131.7019</b>	

iii) Details of samples analysis indicating type of sample (surface/sub-surface from pits/trenches/borehole etc) Complete chemical analysis for entire strata for all radicals may be undertaken for selected samples from a NABL accredited Laboratory or Government

(Qualified Person)

(Qualified Person)

	<b>MODIFIED MINING PLAN OF KHANDABANDH IRON ORE LEASE (366.311 HA.) LESSEE: THE ODISHA MINING CORPORATION LTD.</b>	
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laboratory or equivalent. Entire mineralized area may be analyzed meter wise with 10% of check samples. (At least for 10% of total samples may be analyzed in accordance to BIS and reports from NABL accredited/other government laboratory).

Sampling and analysis of core samples generated during the course of drilling had been done to know the Fe, Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub> & other constituents required to assess the quality of ore and waste. Samples were drawn at every one meter inside ore zone and representative samples were also analyzed in non ore bearing litho units. The analysis was carried out by SUPCO. A total of 6829 nos of samples from core boreholes, 2200 nos. of samples from DTH boreholes and 46 nos. of grab samples (incl. 6 nos. from quarry faces) leading to a total 9075 nos. of samples have been analyzed so far. Copy of the NABL tests report is given in annexure 17B.

- iv) **Expenditure incurred in various prospecting operations.**  
The expenses incurred in the exploration, analysis of exploration data carried out during the last 5 years is around 13.2106 crores INR. Copy of the work order for exploration is given at annexure 32. Payment details to exploration agency has been given at annexure 33.
- f) **The surface plan of the lease area may be prepared on a scale of 1: 1000 or 1: 2000 with contour interval of maximum of 10 m depending upon the topography and size of the area duly marked by grid lines showing all features indicated under Rule 28(1)(a) of MCDR 1988.**  
The surface plan of the leasehold area is enclosed as Drg. No. MEC/Q76Q/11/16/05 to 5B. However, the mine has permission to prepare the drawing in a scale of 1: 4000.
- g) **For preparation of geological plan, surface plan prepared on a scale of 1: 1000 or 1: 2000 scale specified under para 1.0 (f) of Part A of the format may be taken as the base plan. The details of exploration already carried out along with supporting data for existence of mineral, locations proposed exploration, various litho units along with structural features, mineralized/ore zone with grade variation if any may be marked on the geological plan along with other features indicated under Rule 28 (1)(b) of MCDR 1988.**  
The geological plan of the leasehold area showing all the above features is enclosed as Drg. No. MEC/Q76Q/11/16/03 to 3G. The lessee has permission to prepare the drawing in a scale of 1: 4000.
- h) **Geological sections may be prepared on natural scale of geological plan at suitable interval across the lease area from boundary to boundary.**  
The geological sections of the leasehold area showing all the above features is enclosed as Drg. No. MEC/Q76Q/11/16/04A to 4G.
- i) **Broadly indicate the future programme of exploration with due justification(duly marking on Geological plan year wise location in different colours) taking into consideration the future tentative excavation programme planned in next five years.**  
In order to explore the possibility of occurrence of more ore in the unexplored area of south-western side of the lease, 15 no .of boreholes have been proposed in the phased manner after approval of forest diversion proposal (FDP) of the ML. Subsequently upon proving the existence of ore in this area further drilling at 200 m x 200 m grid will be carried out to enhance the confidence level of resources. Following exploration proposal will be undertaken after approval of FDP of the ML.

  
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**MODIFIED MINING PLAN  
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Year	BHID	Proposed borehole location		Proposed Depth, m	Purpose
		Easting	Northing		
2016-17	PBH/01	334600	2426900	30	To ascertain the existence of ore in unexplored area of Deposit IV
	PBH/02	334700	2426900	30	
	PBH/03	334800	2426900	30	
	PBH/04	334800	2426800	30	
	PBH/05	334700	2426800	30	
	PBH/06	334600	2426800	30	
	PBH/07	334800	2426700	30	
	PBH/08	334700	2426700	30	
	PBH/09	334600	2426700	30	
	PBH/10	334500	2426700	30	
	PBH/11	334500	2428200	30	To prove the existence of extension of deposit I in NW side
	PBH/12	334600	2428200	30	
	PBH/13	334500	2428100	30	
	PBH/14	334600	2428100	30	
	PBH/15	334500	2428000	30	
<b>Subtotal</b>		<b>15 Nos.</b>		<b>450 m</b>	
2017-18	PBH/16	335100	2428300	30	To ascertain the existence of ore in unexplored area in Deposit VI
	PBH/17	335200	2428300	30	
	PBH/18	335100	2428200	30	
	PBH/19	335200	2428200	30	To ascertain the existence of ore in unexplored area in Deposit II
	PBH/20	335300	2428200	30	
	PBH/21	335300	2428100	30	To ascertain the existence of ore in unexplored area in Deposit III
	PBH/22	335500	2427500	30	
	PBH/23	335700	2427500	30	To ascertain the existence of ore in unexplored area in Deposit V
	PBH/24	335700	2427300	30	
	PBH/25	335500	2427300	30	
PBH/26	335300	2427300	30		
<b>Subtotal</b>		<b>11 Nos.</b>		<b>330 m</b>	
<b>Total</b>		<b>26 Nos.</b>		<b>780 m</b>	

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

**Reserve/Resource as per last approved Modified Scheme of Mining**

Summary of the reserves/resources (As on 01.04.2011) as per approved modification to the last approved scheme of mining is given below.

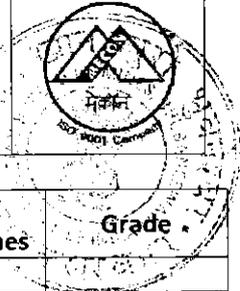
Classification	Code	Quantity, Million Tonnes	Grade
Total Mineral Resources (A + B)		12.349	+58%Fe
		1.000	45-58% Fe

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



Classification	Code	Quantity, Million Tonnes	Grade
<b>A. Mineral Reserves</b>			
1. Proved Mineral Reserves	121	8.229	+58% Fe
		0.586	45-58% Fe
2. Probable Mineral Reserves	122	2.591	+58% Fe
		0.414	45-58% Fe
<b>Total Mineral Reserve (A)</b>		<b>11.82</b>	<b>+45 Fe</b>
<b>B. Remaining Resources</b>			
1. Feasibility Mineral Resources (Difference between Proved Geological & Proved Mineable)	222	0.131	+58% Fe
2. Pre-feasibility Mineral Resources (Difference between Probable Geological & Probable Mineable)	222	-	-
3. Measured Mineral Resources	331	-	-
4. Indicated Mineral Resources	332	1.389	+58% Fe
5. Inferred Mineral Resources	333	-	-
6. Reconnaissance Mineral Resources (Difference between Possible Geological & Possible Mineable)	334	0.009	+58% Fe

**Depletion of Reserve :**

Since mining operation in the lease has been suspended since 05.01.2010, no production has been carried out from the lease.

**Re-assessment of Reserve/Resources**

A total of 781 nos. of boreholes have been drilled in Khandabandh Iron Ore Lease as on 31.03.2012. In the resource/reserve estimates of last approved modification to approved scheme of mining a total of 559 nos. of boreholes drilled till 2009-10 (incl. 10 Nos. of additional boreholes drilled during 2009-10) has been considered. However, 222 nos. of additional boreholes were drilled during 2009-10 to 2011-12 (Excl. 10 Nos. of additional boreholes drilled during 2009-10 which was earlier considered for reserve estimation).

Besides, cut-off grade for saleable ore was 58% Fe in last approved modification to approved scheme of mining.

Therefore, re-assessment of resource/reserves have been carried out considering all the 781 nos. of boreholes drilled till 2011-12 as per the revised threshold value of 45% Fe prescribed by IBM and considering ore containing 55% Fe as saleable ore.

Following input data have been considered for re-assessment of resources/reserve

1. Updated surface plan with current pit positions & face mapping data provided by OMC.
2. Exploration data of 781 Nos. of boreholes incl. Assay, litho collar & survey data.
3. Statutory Barrier of 7.5 m along mining lease boundary and 10 m along village roads.
4. The threshold value considered as per the IBM guidelines is 45% Fe.

  
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**Methodology****C. Preparation of Database**

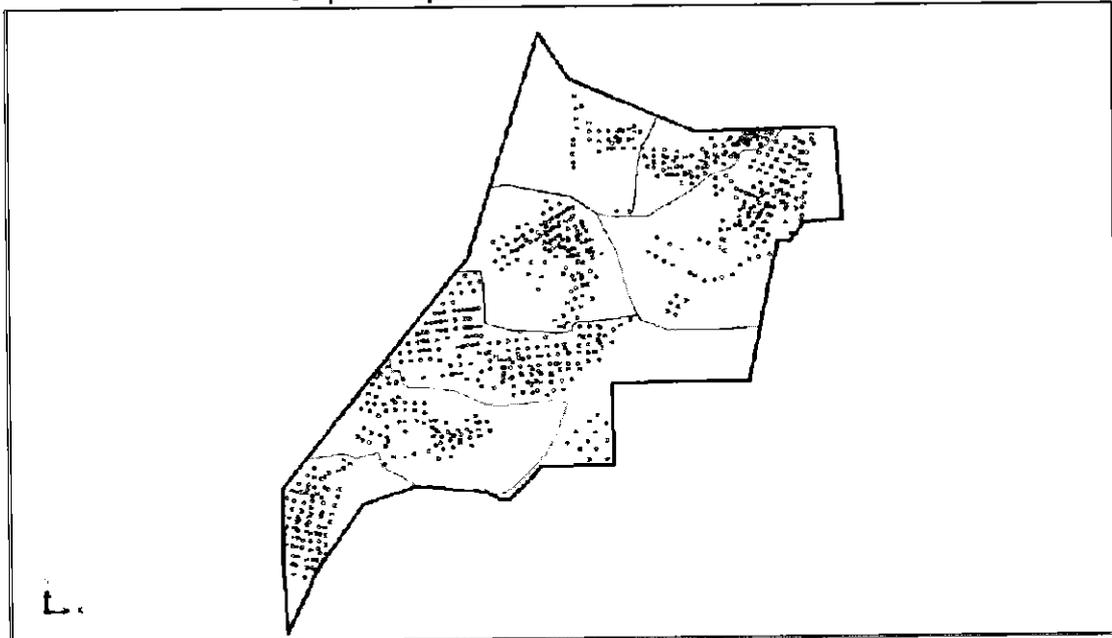
Four basic files namely collar, survey, assay and litho files are required in Comma Separated Value (CSV) format for further processing by SURPAC Software. Litho codes used for database preparation is given below.

**Litho Codes Used for Database Preparation**

Litho Type	Litho code
Ore (Fe%>55%)	1
Subgrade (Fe% between 45 – 55%)	2
Waste (Fe% less than 45%)	3

**(ii) Delineation of Ore Geometry and Construction of Ore Body****Preparation of Transverse Sections**

Boreholes were displayed in SURPAC graphics window alongwith litho, Fe%, SiO<sub>2</sub>% & Al<sub>2</sub>O<sub>3</sub>%. 18,19,22,13,17,16 & 10 nos. Of transverse sections at 50 m interval were extracted from in the strike direction for Deposit I, II, III, IV, IV(Main), V & VI respectively. The envelopes of ore, subgrade and waste were delineated at each section considering the continuity of Fe content, mineralisation, lithology and other geological features. Lateral influence of 20-25 m from the last boreholes has been considered during preparation of sections depending upon ore thickness.

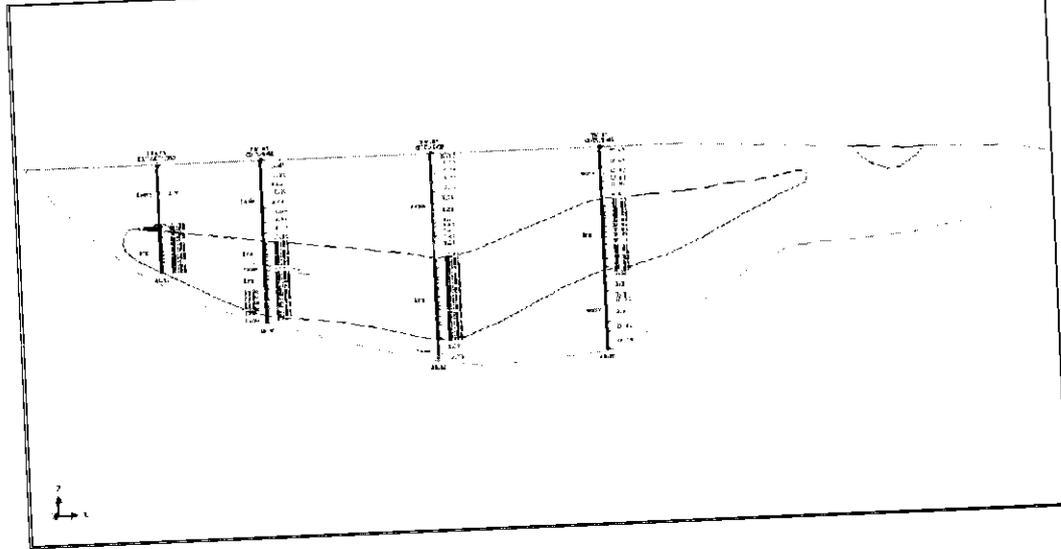
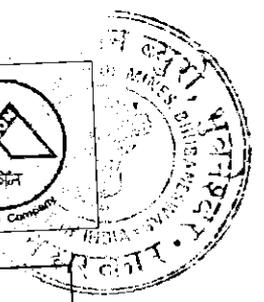
**Graphical representation of Drill holes****Typical Transverse Section with Delineated Envelopes**

  
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**MODIFIED MINING PLAN  
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**Preparation of Digital Terrain Model (DTM) of Surface Topography**

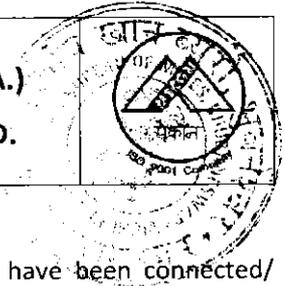
The digitized contour of updated surface plan with Z values have been transformed into digital terrain model (DTM) utilizing the principle of triangulation and wire framing of points with X, Y and Z co-ordinates. Digital terrain model is the most effective way of representing a surface in three dimensional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

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



  
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(Qualified Person)



### 3-D Solid Modeling of Ore Body

The litho-wise envelopes of the respective transverse cross sections have been connected/joined to form litho-wise solid ore body models. Ore type-wise 3-D solid model of Khandabandh Iron Ore Lease is presented in the figure below:-

**Litho-wise three dimensional solid model**



### (iii) **Geo-statistical analysis (Variogram modeling)**

The continuity of mineralization in different directions can be well judged through analysis of variograms. In addition, the range of influence of sample in different directions can be deciphered. A variogram is evaluated with respect to sill, range and nugget effect. The variogram function is defined as follows.

$$\Gamma(h) = \frac{1}{2n} \sum [z(x+h) - z(x)]^2$$

Where, n = Number of sample pairs at distance 'h'

$\gamma(h)$  = Variogram value at distance 'h'

Z(x) = Assay value at point x

Z(x+h) = Assay value at point x+h

The  $\gamma(h)$  is calculated for different distance pair 'h' and is plotted against distance pair. As the distance pair increases the  $\gamma(h)$  value also increases and levels off after certain distance pair. The distance pair at which the  $\gamma(h)$  value levels off is known as 'Range' beyond which samples become statistically independent without any correlation. This distance provides an idea of range of influence of a particular sampling point. The value of  $\gamma(h)$  at which the graph levels off is known as 'sill'. This value is related to the theoretical variance of the data set. 'Nugget' is the value of  $\gamma(h)$  at zero distance pair. The inherent variability of the data is represented by nugget. The deposit with zero or very low nugget effect possesses uniform grade distribution.

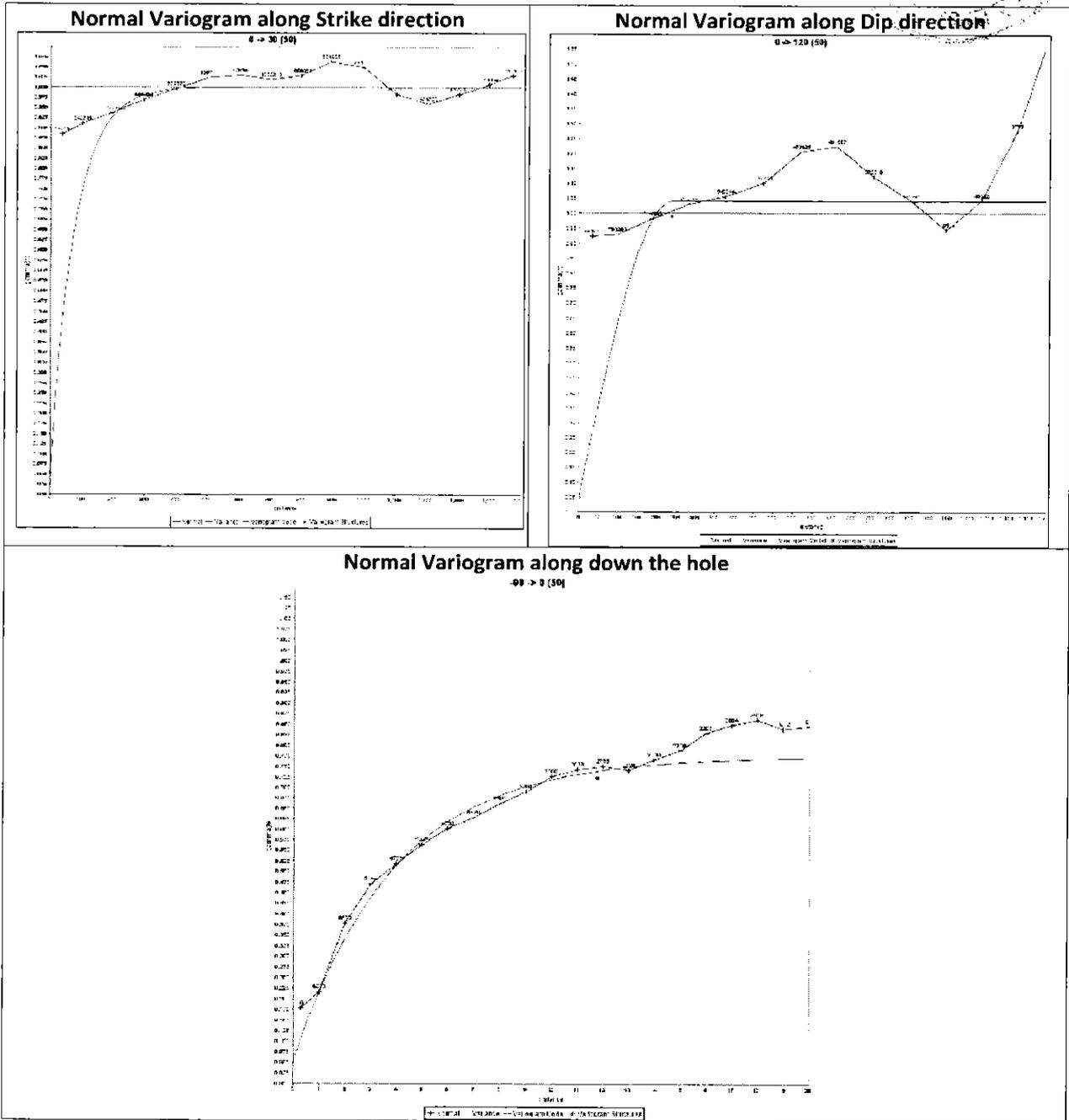
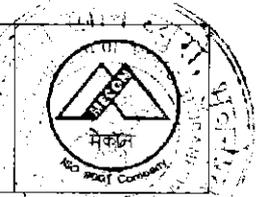
Variogram modeling has been carried out for determining the spatial variability of mineralisation & grade distribution in different directions. In order to ascertain the variability of entire deposit of Khandabandh Iron Ore Lease, composites of all the samples of 1 m length were extracted & the normal variograms of composited assay data have been developed along strike & dip direction of the deposit and also along borehole depth. The fitted Variogram model along strike, dip and along the borehole direction of the deposit is given below. The variogram model parameter and results of variogram modeling for above three directions is also given below.

  
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**Variogram model parameters in three orthogonal directions**

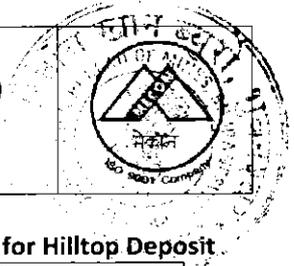
Sl. No.	Direction	Azimuth	Plunge	Spread	Lag	Maximum Distance
1	Along Dip Direction	120	0	50	100 m	1500 m
2	Along Strike direction	30	0	50	100 m	1500 m
3	Along Borehole depth	0	-90	50	1 m	20 m

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**Results of variogram modeling in three orthogonal directions for Hilltop Deposit.**

Sl. No.	Direction	Nugget	Sill	Range
1	Along Dip Direction	0.0524	0.989375	229.499
2	Along Strike direction	0.0524	0.9492	233.349
3	Along Borehole depth	0.0524	0.722786	11.780

Block model estimation parameters derived from Variogram Modeling

A summary of the ore type-wise estimation parameters alongwith the anisotropy ratio utilized for block model estimation is given below.

**Litho-wise Block Model estimation parameters**

Litho Type	Bearing of Major Axis	Anisotropy Factor		No. of Samples		Max Search Dist. Major axis	Max. Vert. Search distance
		Semi-major	minor	Min	Max		
Ore	30	1	5	3	15	100	10
Subgrade	30	1	2	3	15	100	10
Waste	30	1	1	3	15	100	10

**(iv) Block Modeling**

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

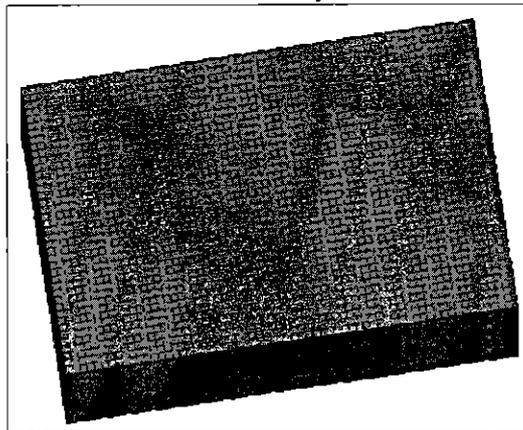
- Selection of Block Size

Considering the accuracy desired, borehole spacing and mining constraints, a unit block of 5 m x 5m x 1 m have been selected for grade estimation.

- Development of Block Model

In order to cover the entire extent of Khandabandh Iron Ore Lease in three dimensions, a dummy block model with unit block sizes as indicated above have been generated. An unconstrained dummy block model is shown in the figure below:-

**Unconstrained dummy block model**

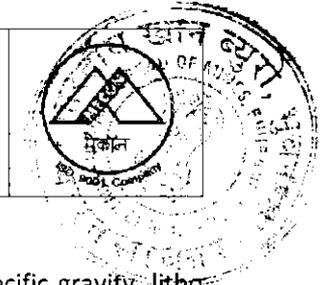


  
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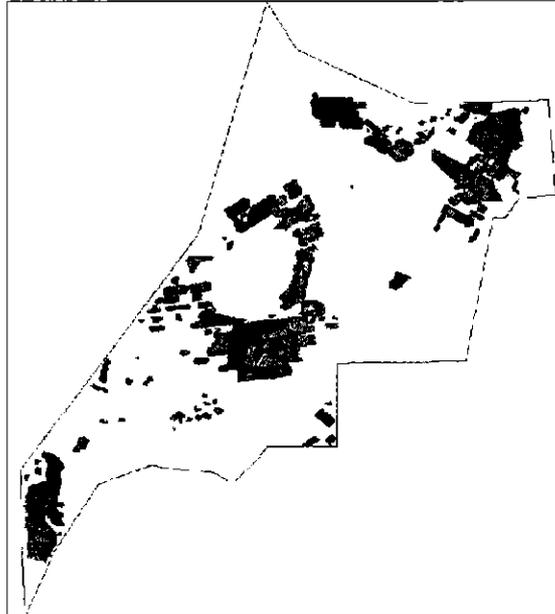


**MODIFIED MINING PLAN  
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- Addition of Attributes  
Attributes are the properties of individual block such as Fe, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, specific gravity, litho code, recovery % etc. These attributes were added in the dummy block model using suitable technique.
- Application of Constraints  
Constraints are the logical combination of spatial operators and objects such as DTM of surface contour, solid model of ore zone, block etc. With which the block model can be enveloped/ intersected with respect to inside/ outside and above/ below their spatial position. *The block model developed for Khandabandh Iron Ore Lease has been constrained with the surface DTM with updated pit positions, mining lease boundary, statutory safety barriers as well as litho type-wise 3-D solid models as developed and discussed in the preceding paragraphs.* In this way, the blocks have been enveloped within ore zone boundary and surface topography for the purpose of grade interpolation and reserves estimation. Constrained block model of Khandabandh Iron Ore Lease is give below.

**Constrained block model of Khandabandh Iron Ore Lease**



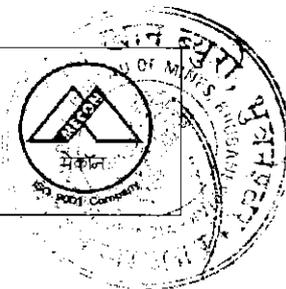
- Block model estimation  
Block model estimation parameters such as anisotropic ratio, search distances etc. Were derived from the results of variogram analysis discussed in previous para. Khandabandh Iron Ore Lease is uniform in mineralisation. It is not erratic in behaviour. The coefficient of variation of grades in all the ores are low in the range of 0.03 – 0.093 indicating uniform grade distribution and the deposit has also been explored at almost uniform grid of 100 m x 100 both along dip and strike direction, the globally accepted technique of Inverse Square Distance (ISD) method has been used for ore reserve estimation for different litho types. The parameters for reserve estimation have been derived from the statistical and geo-statistical analysis done previously. A search ellipsoid as indicated below has been used to select samples for assigning grade to the blocks. The axial parameters and its search orientation were derived from the results of geo-statistical analysis.

  
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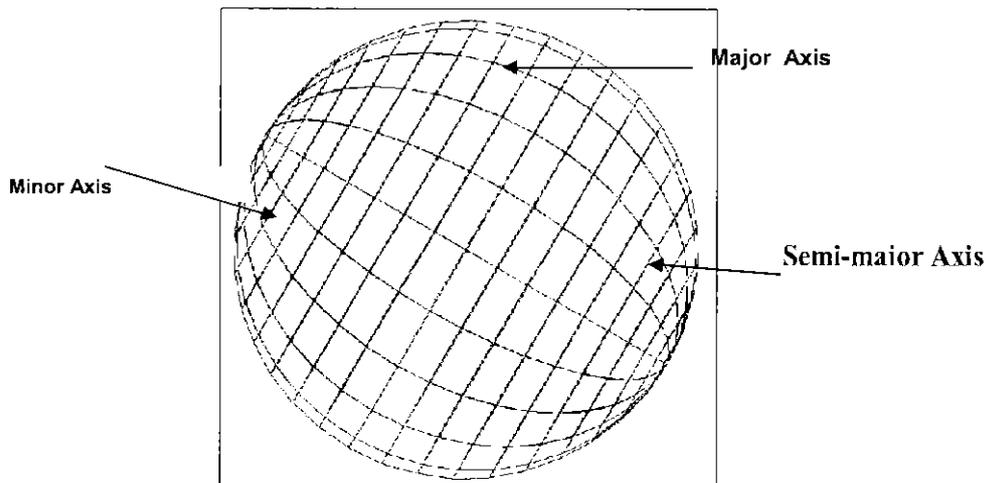
  
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**MODIFIED MINING PLAN  
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Ellipsoid Visualiser



- 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.

The section wise resources established by geological x-section method for different deposit at 45% Fe cut off is given below.

**Resources established by cross-section method (As on 01.04.2015)**

**Deposit I**

Section No	Cross-sectional Area, Sq. m	Length of Influence	Volume, cu. m	Sectional Tonnage Factor.,t/cu.m	Qty, Million Tonnes
1D1	1444.0	50	72201.7	2.94	0.212
1D2	4899.2	50	244961.1	2.98	0.729
1D3	8056.0	50	402798.4	2.97	1.197
1D4	4235.5	30	127065.6	2.99	0.380
1D5	3149.1	30	94473.4	2.95	0.278
1D6	5478.0	25	136950.9	2.97	0.406
1D7	4480.3	26	116486.8	3.00	0.349
1D8	2041.8	14	28584.7	2.90	0.083
1D9	1300.7	24	31216.0	3.00	0.094
1D10	983.2	18	17697.3	3.00	0.053
1D11	1567.1	42	65816.2	2.84	0.187
1D12	1887.3	28	52845.4	3.00	0.159
1D13	2114.1	50	105703.0	2.92	0.309
1D14	2421.6	48	116237.1	2.95	0.343
1D15	2686.4	48	128948.4	2.95	0.381

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**MODIFIED MINING PLAN  
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Section No	Cross-sectional Area, Sq. m	Length of Influence	Volume, cu. m	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
1D16	2824.1	50	141206.6	2.90	0.410
1D17	2025.4	40	81016.3	2.81	0.228
1D18	1385.9	42	58208.0	3.00	0.175
<b>Total</b>	<b>52979.7</b>		<b>2022416.7</b>		<b>5.973</b>
<b>Recovery factor for Deposit - I</b>					<b>72.38%</b>
<b>Total balance recoverable geological resource of Deposit - I</b>					<b>4.32</b>

**Deposit II**

Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. M	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
2D1	408.8736	24	9813.0	3.00	0.029
2D2	1438.8132	30	43164.4	3.00	0.129
2D3	3961.256	20	79225.1	2.99	0.237
2D4	1078.647	24	25887.5	2.99	0.077
2D5	104.9004	24	2517.6	2.96	0.007
2D6	271.044	26	7047.1	2.95	0.021
2D7	38.083	40	1523.3	2.50	0.004
2D8	46.7422	22	1028.3	2.50	0.003
2D9	271.4374	36	9771.7	2.80	0.027
2D10	130.129	20	2602.6	2.83	0.007
2D11	171.8186	34	5841.8	2.54	0.015
2D12	331.7938	24	7963.1	2.98	0.024
2D13	333.2834	24	7998.8	2.93	0.023
2D14	275.4938	24	6611.9	2.94	0.019
2D15	493.3048	25	12332.6	2.95	0.036
2D16	677.0734	22	14895.6	2.99	0.045
2D17	629.6979	24	15112.7	2.72	0.041
2D18	3146.4193	44	138442.4	2.77	0.384
2D19	1968.3052	46	90542.0	2.99	0.270
<b>Total</b>	<b>15777.116</b>		<b>482321.7</b>		<b>1.400</b>
<b>Recovery factor for Deposit - II</b>					<b>58.02%</b>
<b>Total balance recoverable geological resource of Deposit -II</b>					<b>0.812</b>

**Deposit III**

Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. M	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
3D1	62.9	50	3146.1	3.00	0.009
3D2	1863.9	50	93196.1	2.98	0.278
3D3	2140.4	45	96318.3	2.99	0.288
3D4	2729.7	50	136484.2	2.98	0.407
3D5	2544.2	40	101769.3	3.00	0.305
3D6	4111.9	40	164476.4	2.97	0.489

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**MODIFIED MINING PLAN  
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Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. M	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
3D7	7459.4	35	261079.2	2.95	0.770
3D8	1991.7	30	59751.5	2.82	0.168
3D9	2139.2	30	64177.0	2.75	0.176
3D10	3259.4	40	130375.7	2.99	0.390
3D11	4107.6	35	143767.3	2.98	0.429
3D12	929.2	30	27875.0	3.00	0.084
3D13	489.8	40	19590.9	2.99	0.059
3D14	635.0	35	22224.1	2.97	0.066
3D15	777.8	30	23335.5	3.00	0.070
3D16	7488.1	45	336964.6	3.00	1.010
3D17	10.7	50	536.5	3.00	0.002
3D18	0.0	45	-	-	-
3D19	0.0	72.5	-	-	0.000
3D20	115.8	30	3473.7	3.00	0.010
3D21	141.8	25	3545.6	3.00	0.011
3D22	-	-	-	-	-
<b>Total</b>	<b>42741.1</b>		<b>1692087.2</b>		<b>5.020</b>
<b>Recovery factor for Deposit - III</b>					<b>61.53%</b>
<b>Total balance recoverable geological resource of Deposit -III</b>					<b>3.089</b>

**Deposit IV**

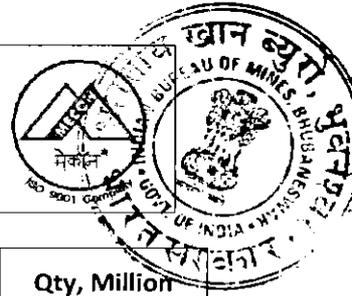
Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. m	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
4D1	1062.0611	50	53103.1	2.90	0.154
4D2	2926.7755	50	146338.8	2.98	0.436
4D3	3382.1084	50	169105.4	2.97	0.502
4D4	3700.6166	50	185030.8	2.91	0.539
4D5	3939.7094	50	196985.5	3.00	0.590
4D6	3981.9653	50	199098.3	2.97	0.592
4D7	3155.6974	50	157784.9	3.00	0.473
4D8	2614.5934	50	130729.7	2.96	0.388
4D9	886.859	40	35474.4	2.95	0.105
4D10	1075.2557	40	43010.2	2.99	0.129
4D11	864.5508	40	34582.0	2.99	0.103
4D12	620.0196	40	24800.8	2.98	0.074
4D13	-	-	-	-	-
4D14	49.413	25	1235.3	3.00	0.004
4D15	93.1434	40	3725.7	3.00	0.011
4D16	202.8644	35	7100.3	3.00	0.021
4D17	109.721	35	3840.2	2.50	0.010
4D18	51.8091	20	1036.2	2.76	0.003
4D19	-	-	-	-	-
4D20	412.6026	35	14441.1	2.64	0.038
4D21	358.273	30	10748.2	3.00	0.032

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Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. m	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
4D22	723.924	30	21717.7	2.75	0.060
4D23	227.432	25	5685.8	2.98	0.017
4D24	318.1404	30	9544.2	2.73	0.026
4D25	361.1756	30	10835.3	3.00	0.033
4D26	126.0576	30	3781.7	3.00	0.011
4D27	41.0507	40	1642.0	3.00	0.005
4D28	350.8924	35	12281.2	2.98	0.037
4D29	34.8468	35	1219.6	3.00	0.004
4D30	145.2688	40	5810.8	3.00	0.017
<b>Total</b>	<b>29025.9809</b>		<b>1490689.2</b>		<b>4.414</b>
<b>Recovery factor for Deposit - IV</b>					<b>83.98%</b>
<b>Total balance recoverable geological resource of Deposit -IV</b>					<b>3.707</b>

**Deposit V**

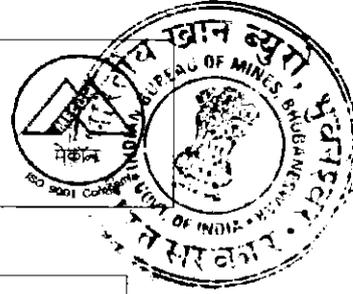
Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. M	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
5D1	7514.586	50	375729.28	2.96	1.111
5D2	12046.78	50	602339.24	2.93	1.767
5D3	18015.9	50	900795.20	3.00	2.699
5D4	14684.63	50	734231.61	2.96	2.171
5D5	14153.85	40	566153.80	2.96	1.675
5D6	11329.59	35	396535.74	2.95	1.172
5D7	6756.462	35	236476.18	2.95	0.697
5D8	1693.59	20	33871.80	2.94	0.099
5D9	1871.638	40	74865.54	2.94	0.220
5D10	2652.772	45	119374.73	2.75	0.329
5D11	1734.8	40	69392.02	2.88	0.200
5D12	2108.045	40	84321.79	2.95	0.249
5D13	143.5402	40	5741.61	3.00	0.017
5D14	47.9192	35	1677.17	2.85	0.005
5D15	610.7916	35	21377.71	2.82	0.060
5D16	0	21	-	-	-
<b>Total</b>	<b>95364.9</b>		<b>4222883.41</b>		<b>12.472</b>
<b>Recovery factor for Deposit - V</b>					<b>73.88%</b>
<b>Total balance recoverable geological resource of Deposit -V</b>					<b>9.214</b>

  
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(Qualified Person)



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**Deposit VI**

Section No	Cross-sectional Area, Sq. m	Length of Influence	Volume, cu. m	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
6D1	0	32.5	0.0	0.00	0.000
6D2	0	32.5	0.0	0.00	0.000
6D3	0	12	0.0	0.00	0.000
6D4	407.484	50	20374.2	3.00	0.061
6D5	514.6115	50	25730.6	2.94	0.076
6D6	1861.5009	50	93075.0	3.00	0.279
6D7	3799.1705	50	189958.5	3.00	0.570
6D8	3013.7542	50	150687.7	2.97	0.447
6D9	1476.7203	41	60545.5	0.00	0.000
6D10	2200.8323	50	110041.6	2.50	0.275
6D11	3257.048	50	162852.4	2.50	0.407
<b>Total</b>	<b>16531.122</b>		<b>813265.6</b>		<b>2.115</b>
<b>Recovery factor for Deposit - VI</b>					<b>74.03%</b>
<b>Total balance recoverable geological resource of Deposit -VI</b>					<b>1.566</b>

**Slice Plan Method**

Deposit-wise resources established by slice plan method using SURPAC software is given below.

**Resources established by slice plan method as on 01.04.2015**

Deposit /Quarry	Slice RL, mRL	Qty, Million Tonnes	Fe%
Deposit I	666.0 -> 672.0	0.0003	49.32
	660.0 -> 666.0	0.003	51.54
	654.0 -> 660.0	0.017	58.84
	648.0 -> 654.0	0.032	59.46
	642.0 -> 648.0	0.062	61.98
	636.0 -> 642.0	0.088	62.92
	630.0 -> 636.0	0.079	62.55
	624.0 -> 630.0	0.077	62.33
	618.0 -> 624.0	0.078	63.74
	612.0 -> 618.0	0.060	63.46
	606.0 -> 612.0	0.081	62.43
	600.0 -> 606.0	0.096	62.69
	594.0 -> 600.0	0.107	64.13
	588.0 -> 594.0	0.137	63.68
	582.0 -> 588.0	0.212	63.58
	576.0 -> 582.0	0.389	62.26
	570.0 -> 576.0	0.588	62.47
564.0 -> 570.0	0.488	62.02	
558.0 -> 564.0	0.445	62.11	
552.0 -> 558.0	0.432	63.16	

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



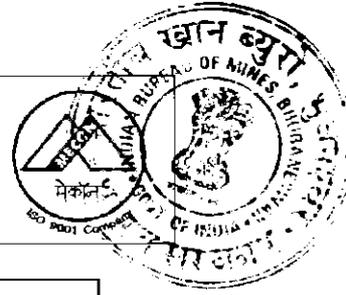
Deposit /Quarry	Slice RL, mRL	Qty, Million Tonnes	Fe%
	546.0 -> 552.0	0.405	63.12
	540.0 -> 546.0	0.356	62.82
	534.0 -> 540.0	0.226	63.06
	528.0 -> 534.0	0.144	62.85
	522.0 -> 528.0	0.071	61.53
	516.0 -> 522.0	0.030	60.58
	510.0 -> 516.0	0.012	55.16
	504.0 -> 510.0	0.012	49.87
	498.0 -> 504.0	0.009	52.2
	492.0 -> 498.0	0.003	51.79
<b>Sub Total</b>		<b>4.738</b>	<b>62.58</b>
<b>Recovery Factor</b>		<b>72.38%</b>	
<b>Total balance recoverable geological resource of Deposit -I</b>		<b>3.429</b>	<b>62.58</b>
Deposit II	642.0 -> 648.0	0.002	65.3
	636.0 -> 642.0	0.013	62.83
	630.0 -> 636.0	0.035	58.98
	624.0 -> 630.0	0.096	59.24
	618.0 -> 624.0	0.148	58.84
	612.0 -> 618.0	0.195	59.93
	606.0 -> 612.0	0.206	60.65
	600.0 -> 606.0	0.132	60.77
	594.0 -> 600.0	0.093	61.44
	588.0 -> 594.0	0.067	61.08
	582.0 -> 588.0	0.138	64.18
	576.0 -> 582.0	0.132	64.89
	570.0 -> 576.0	0.065	63.3
	564.0 -> 570.0	0.025	61.73
558.0 -> 564.0	0.011	58.83	
552.0 -> 558.0	0.002	58.41	
<b>Sub Total</b>		<b>1.359</b>	<b>61.22</b>
<b>Recovery factor for Deposit - II</b>		<b>58.02%</b>	
<b>Total balance recoverable geological resource of Deposit -II</b>		<b>0.788</b>	<b>61.22</b>
Deposit III	630.0 -> 636.0	0.001	51.5
	624.0 -> 630.0	0.122	60.68
	618.0 -> 624.0	0.555	62.37
	612.0 -> 618.0	0.658	61.64
	606.0 -> 612.0	0.432	60.82
	600.0 -> 606.0	0.384	61.24
	594.0 -> 600.0	0.445	61.44
	588.0 -> 594.0	0.419	61.77
	582.0 -> 588.0	0.400	62.97
	576.0 -> 582.0	0.378	62.78
570.0 -> 576.0	0.261	62.65	

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



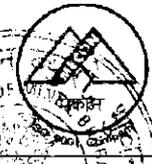
Deposit /Quarry	Slice RL, mRL	Qty, Million Tonnes	Fe%
	564.0 -> 570.0	0.239	62.73
	558.0 -> 564.0	0.198	63.13
	552.0 -> 558.0	0.178	63.16
	546.0 -> 552.0	0.162	62.36
	540.0 -> 546.0	0.136	63.91
	534.0 -> 540.0	0.134	65.26
	528.0 -> 534.0	0.118	64.99
	522.0 -> 528.0	0.082	64.87
	516.0 -> 522.0	0.023	64.07
	510.0 -> 516.0	0.000	64.4
<b>Sub Total</b>		<b>5.326</b>	<b>62.28</b>
<b>Recovery factor for Deposit - III</b>		<b>61.53%</b>	<b>3.277</b>
<b>Total balance recoverable geological resource of Deposit -III</b>		<b>3.277</b>	<b>62.28</b>
Deposit IV & IV Main	666.0 -> 672.0	0.031	63.27
	660.0 -> 666.0	0.024	49.39
	654.0 -> 660.0	0.172	56.03
	648.0 -> 654.0	0.619	60.98
	642.0 -> 648.0	1.012	61.93
	636.0 -> 642.0	0.956	62.36
	630.0 -> 636.0	0.724	62.88
	624.0 -> 630.0	0.441	63.2
	618.0 -> 624.0	0.205	63.89
	612.0 -> 618.0	0.078	64.22
	606.0 -> 612.0	0.035	65.91
	600.0 -> 606.0	0.023	66.08
	594.0 -> 600.0	0.014	65.74
	588.0 -> 594.0	0.006	65.03
582.0 -> 588.0	0.0002	61.93	
<b>Sub Total</b>		<b>4.340</b>	<b>62.09</b>
<b>Recovery factor for Deposit – IV &amp; IV Main</b>		<b>83.98%</b>	
<b>Total balance recoverable geological resource of Deposit - IV&amp; IV Main</b>		<b>3.644</b>	<b>62.09</b>
Deposit V	678.0 -> 684.0	0.011	58.19
	672.0 -> 678.0	0.068	57.09
	666.0 -> 672.0	0.158	58.65
	660.0 -> 666.0	0.246	59.41
	654.0 -> 660.0	0.261	59.81
	648.0 -> 654.0	0.212	58.66
	642.0 -> 648.0	0.204	61.05
	636.0 -> 642.0	0.279	62.65
	630.0 -> 636.0	0.315	63.53
	624.0 -> 630.0	0.341	64.53
618.0 -> 624.0	0.314	63.81	

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



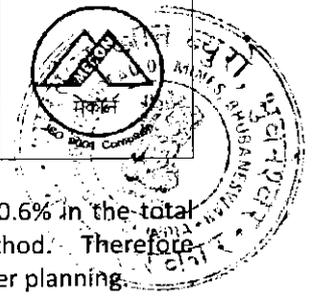
Deposit /Quarry	Slice RL, mRL	Qty, Million Tonnes	Fe%
	612.0 -> 618.0	0.298	62.68
	606.0 -> 612.0	0.329	62.7
	600.0 -> 606.0	0.356	63.15
	594.0 -> 600.0	0.410	62.29
	588.0 -> 594.0	0.461	62.03
	582.0 -> 588.0	0.563	62.2
	576.0 -> 582.0	0.696	62.07
	570.0 -> 576.0	0.762	62
	564.0 -> 570.0	0.934	62.16
	558.0 -> 564.0	0.752	62.99
	552.0 -> 558.0	0.653	63.12
	546.0 -> 552.0	0.639	63.26
	540.0 -> 546.0	0.644	62.46
	534.0 -> 540.0	0.660	62.89
	528.0 -> 534.0	0.651	62.82
	522.0 -> 528.0	0.626	63.21
	516.0 -> 522.0	0.569	63.54
	510.0 -> 516.0	0.472	63.29
	504.0 -> 510.0	0.367	63.29
	498.0 -> 504.0	0.263	62.19
	492.0 -> 498.0	0.173	61.41
	486.0 -> 492.0	0.071	61.51
	480.0 -> 486.0	0.006	62.68
<b>Sub Total</b>		<b>13.768</b>	<b>62.49</b>
<b>Recovery factor for Deposit – V</b>		<b>73.88%</b>	
<b>Total balance recoverable geological resource of Deposit -V</b>		<b>10.172</b>	<b>62.49</b>
Deposit VI	660.0 -> 666.0	0.000	63.27
	654.0 -> 660.0	0.059	63.55
	648.0 -> 654.0	0.152	62.14
	642.0 -> 648.0	0.199	60.63
	636.0 -> 642.0	0.182	60.97
	630.0 -> 636.0	0.191	61
	624.0 -> 630.0	0.211	60.24
	618.0 -> 624.0	0.220	60.35
	612.0 -> 618.0	0.203	61.15
	606.0 -> 612.0	0.170	62.21
	600.0 -> 606.0	0.107	62.13
594.0 -> 600.0	0.012	54.33	
588.0 -> 594.0	0.001	46.22	
<b>Sub Total</b>		<b>1.707</b>	<b>61.12</b>
<b>Recovery factor for Deposit – VI</b>		<b>74.03%</b>	
<b>Total balance recoverable geological resource of Deposit -VI</b>		<b>1.264</b>	
<b>Grand Total</b>		<b>22.574</b>	<b>62.28</b>

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**MODIFIED MINING PLAN  
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LESSEE: THE ODISHA MINING CORPORATION LTD.**



It is vividly indicated from the above tables that there is a variation of only 0.6% in the total resource established by cross-section method and slice plan method. Therefore reserve/resource estimated by slice plan method has been considered for further planning.

The detailed calculation of the Slice-wise reserves/ resources established at 45% Fe cut off for Khandabandh iron ore mines as on 01.04.2015 is given in Annexure 22.

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

**Justification of UNFC classification**

**1. Measured mineral resources (331)**

All the deposits have been drilled at a grid spacing of 100 m x 100 m or even less. Geological mapping has been done at 1 : 500/1:1000. Topographical map of the area has been prepared at 5 m contour interval. Chemical analysis of borehole samples alongwith grab samples have been carried out. Therefore entire Reserve/resource has been categorized under 331 category of UNFC.

**2. Proved Mineral Reserves (111)**

The mine was in operation since 30.11.1963. Feasibility study has been carried out incl. equipment selection, processing, EIA/EMP Studies, economic evaluation and mine plans/scheme of mining have been approved by statutory authority, the reserve falling within the surface right area of non forest land has been considered as Proved Mineral Reserves (111).

**3. Probable Mineral Reserves (121)**

Although the mine was in operation since 30.11.1963, feasibility study has been carried out incl. equipment selection, processing, economic evaluation and mine plans/scheme of mining have been approved by statutory authority but the mine is not having forest clearance therefore, the reserve falling within forest land has been considered as Probable Mineral Reserves (121).

**4. Feasibility Mineral Resources (211)**

The part of mineral resources within the non forest surface right area which is economical but has been blocked in statutory barriers & ultimate pit slopes has been considered as Feasibility Mineral Resources (211).

**5. Pre-Feasibility Mineral Resources (221)**

The part of mineral resource falling outside the non forest surface right area, which is has been blocked in statutory barriers & ultimate pit slopes or which is not economical due to grade constraints has been considered as Pre-Feasibility Mineral Resources (221).

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

**(As on 01.0.4.2015)**

Level of Exploration	Resource, Million Tonnes	Avg. Grade, Fe%
Detailed Exploration (G1)	22.574	62.28%
<b>Total</b>	<b>22.574</b>	<b>62.28%</b>

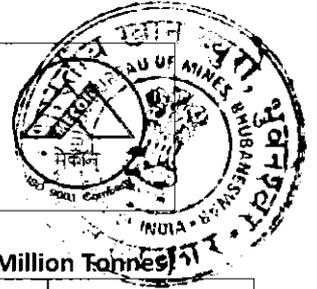
The reserves established as per the standard norm of UNFC is given in the table below:-

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



(In Million Tonnes)

Deposit/ Quarry	Resources type	Total tonnage cut-off (+45%	Non-Saleable grade (45% - 55% Fe)	Saleable grade (+55% Fe)
Deposit I	Measured mineral resources (331)	3.429 (62.58% Fe)	0.214 (50.71% Fe)	3.216 (63.37% Fe)
Deposit II	Measured mineral resources (331)	0.788 (61.22% Fe)	0.090 (51.82% Fe)	0.698 (62.44% Fe)
Deposit III	Measured mineral resources (331)	3.277 (62.28% Fe)	0.194 (50.63% Fe)	3.083 (63.01% Fe)
Deposit IV & IV (Main)	Measured mineral resources (331)	3.644 (62.09% Fe)	0.180 (49.09% Fe)	3.464 (62.76% Fe)
Deposit V	Measured mineral resources (331)	10.171 (62.49% Fe)	0.517 (50.25% Fe)	9.654 (63.14% Fe)
Deposit VI	Measured mineral resources (331)	1.264 (61.12% Fe)	0.061 (50.24% Fe)	9.654 (61.67% Fe)
<b>Total</b>		<b>22.574</b> (62.28% Fe)	<b>1.256</b> (50.39% Fe)	<b>21.318</b> (62.99% Fe)

*Note : Fe % indicated in the brackets are average Fe % .*

The Measured / Indicated resources under different classes of land are given below:

Deposit/ Quarry	Resources type	Total tonnage	Non Forest land	Forest land	
				Already Diverted	All remaining forest land applied for diversion
(in Million Tonnes)					
Deposit I	Measured mineral resources (331)	3.429 (62.58% Fe)	0.193 (62.19% Fe)	-	3.236 (60.60% Fe)
Deposit II	Measured mineral resources (331)	0.788 (61.22% Fe)	0.009 (57.34% Fe)	-	0.779 (61.73% Fe)
Deposit III	Measured mineral resources (331)	3.277 (62.28% Fe)	-	-	3.277 (62.28% Fe)
Deposit IV & IV Main	Measured mineral resources (331)	3.644 (62.09% Fe)	0.767 (60.99 % Fe)	-	2.877 (62.25 % Fe)
Deposit V	Measured mineral resources (331)	10.171 (62.49% Fe)	-	-	10.171 (62.49% Fe)
Deposit VI	Measured mineral resources (331)	1.264 (61.12% Fe)	0.015 (61.14% Fe)	-	1.249 (49.76% Fe)
<b>Total</b>		<b>22.574</b> (62.28% Fe)	<b>0.984</b> (60.99% Fe)	-	<b>21.590</b> (62.46% Fe)

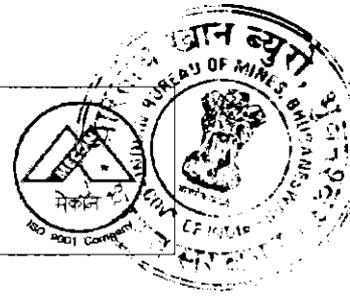
*Note: Fe % indicated in the brackets are average Fe % .*

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**MODIFIED MINING PLAN  
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LESSEE: THE ODISHA MINING CORPORATION LTD.**



The Measured / Indicated resources under mineable and non-mineable portions are:-

Deposit/ Quarry	Resources Type	Total tonnage	Blocked/Non-mineable							Total
			Mineable	Stat. barrie rs	UPL			Grade constr aints	Others	
					Non forest Land	Already diverted forest land	All remaining forest land applied for diversion			
(in Million Tonnes)										
Deposit I	Measured mineral resources (331)	3.429	3.109	-	0.178	-	0.112	0.031	-	0.321
Deposit II	Measured mineral resources (331)	0.788	0.722	0.014	0.002	-	0.039	0.011	-	0.067
Deposit III	Measured mineral resources (331)	3.277	3.214	-	0.000	-	0.059	0.003	-	0.063
Deposit IV & IV Main	Measured mineral resources (331)	3.644	2.591	0.065	0.409	-	0.530	0.050	-	1.054
Deposit V	Measured mineral resources (331)	10.171	10.139	-	0.000	-	0.019	0.013	-	0.032
Deposit VI	Measured mineral resources (331)	1.264	1.257	0.004	0.000	-	-	0.003	-	0.006
<b>Total</b>		<b>22.574</b>	<b>21.032</b>	<b>0.083</b>	<b>0.589</b>	<b>-</b>	<b>0.760</b>	<b>0.110</b>	<b>-</b>	<b>1.542</b>

Feasibility Study was then carried out as enclosed in Annexure – 26 and the reserves/ resources classified thereafter for the Khandabandh iron ore deposit is given below:-

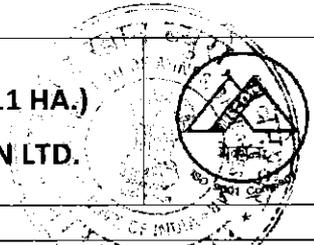
Deposit / Quarry	RESERVES				REMAINING RESOURCES				Remaining Measured Resources
	Economic (Mineable) Reserves	Qty.	Break-up land wise		Potentially Economic (Non- mineable)	Qty.	Constraints wise quantities		
			(in Million Tonnes)				(in Million Tonnes)		
Deposit I	Proved (111)	0.002	0.000	Diverted forest land	Feasibility Mineral Resources (211)	0.037	0.034	Ultimate pit limit	Nil
			0.002	Non-forest land			0.000	Lease barrier	
			0.000	All remaining forest land applied for diversion			0.003	Low grade part	
Deposit I	Probable (121)	3.107	0.000	Diverted forest land	Pre- Feasibility Mineral Resources (221)	0.283	0.256	Ultimate pit limit	Nil
			0.000	Non-forest land			0.000	Lease barrier	
			3.107	All remaining forest land applied for diversion			0.027	Low grade part	
Deposit II	Proved (111)	0.007	0.000	Diverted forest land	Feasibility Mineral Resources (211)	0.006	0.002	Ultimate pit limit	Nil
			0.007	Non-forest land			0.000	Lease barrier	
			0.000	All remaining forest land applied for diversion			0.004	Low grade part	
Deposit II	Probable (121)	0.715	0.000	Diverted forest land	Feasibility Mineral Resources (221)	0.060	0.039	Ultimate pit limit	Nil
			0.000	Non-forest land			0.014	Lease barrier	
			0.715	All remaining forest			0.007	Low grade	

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**MODIFIED MINING PLAN  
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LESSEE: THE ODISHA MINING CORPORATION LTD.**



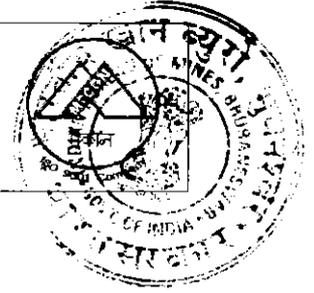
Deposit / Quarry	RESERVES				Potentially Economic (Non-mineable)	REMAINING RESOURCES			Remaining Measured Resources
	Economic (Mineable) Reserves	Qty.	Break-up land wise			Qty.	Constraints wise quantities		
			(in Million Tonnes)				(in Million Tonnes)		
				land applied for diversion			part		
Deposit III	Probable (121)	3.214	0.000	Diverted forest land	Feasibility Mineral Resources (221)	0.063	0.059	Ultimate pit limit	Nil
			0.000	Non-forest land			0.000	Lease barrier	
			3.214	All remaining forest land applied for diversion			0.004	Low grade part	
Deposit IV & IV Main	Proved (111)	0.505	0.000	Diverted forest land	Feasibility Mineral Resources (211)	0.146	0.141	Ultimate pit limit	Nil
			0.505	Non-forest land			0.000	Lease barrier	
			0.000	All remaining forest land applied for diversion			0.005	Low grade part	
Deposit IV	Probable (121)	2.086	0.000	Diverted forest land	Feasibility Mineral Resources (221)	0.908	0.798	Ultimate pit limit	Nil
			0.000	Non-forest land			0.065	Lease barrier	
			2.086	All remaining forest land applied for diversion			0.045	Low grade part	
Deposit V	Probable (121)	10.139	0.000	Diverted forest land	Feasibility Mineral Resources (221)	0.032	0.019	Ultimate pit limit	Nil
			0.000	Non-forest land			0.000	Lease barrier	
			10.139	All remaining forest land applied for diversion			0.013	Low grade part	
Deposit VI	Proved (111)	0.031	0.000	Diverted forest land	Feasibility Mineral Resources (211)	0.000	0.000	Ultimate pit limit	Nil
			0.031	Non-forest land			0.000	Lease barrier	
			0.000	All remaining forest land applied for diversion			0.000	Low grade part	
Deposit VI	Probable (121)	1.226	0.000	Diverted forest land	Feasibility Mineral Resources (221)	0.006	0.000	Ultimate pit limit	Nil
			0.000	Non-forest land			0.004	Lease barrier	
			1.226	All remaining forest land applied for diversion			0.002	Low grade part	

  
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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
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**Category wise updated reserve with grade**

Category wise updated reserves with grade are given in table 3.6.

**(Table 3.6) Reserves as per UNFC classification (as on 1.04.2015)**

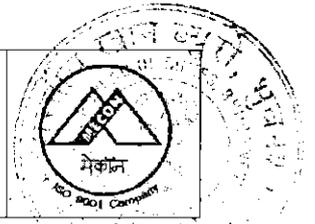
Sl. No	Reserve Category (UNFC Classification)	Deposit/Quarry	Qty. in Million Tonnes	Grade (Fe%)
1	Proved Mineral Reserves (111)	Deposit I	0.002	65.52%
		Deposit II	0.007	58.00%
		Deposit IV	0.505	60.76%
		Deposit VI	0.031	61.19%
		<b>Total</b>	<b>0.546</b>	<b>60.87%</b>
2	Probable Mineral Reserves (121)	Deposit I	3.107	62.63%
		Deposit II	0.715	61.49%
		Deposit III	3.214	62.28%
		Deposit IV	2.086	62.92%
		Deposit V	10.139	62.50%
		Deposit VI	1.2259	61.19%
		<b>Total</b>	<b>20.486</b>	<b>62.46%</b>
<b>Total Mineral Reserves (1+2)</b>			<b>21.032</b>	<b>62.29%</b>
3	Probable Mineral Reserves (122)	NIL	NIL	NA
4	Feasibility Mineral Resource (211)	Deposit I	0.037	+45%
		Deposit II	0.006	+45%
		Deposit IV	0.146	+45%
		Deposit VI	0.000	+45%
		<b>Total</b>	<b>0.189</b>	<b>+45%</b>
5	Pre Feasibility Mineral Resource (221)	Deposit I	0.283	+45%
		Deposit II	0.061	+45%
		Deposit III	0.063	+45%
		Deposit IV	0.908	+45%
		Deposit V	0.032	+45%
		Deposit VI	0.006	+45%
<b>Total</b>			<b>1.353</b>	<b>+45%</b>
6	Feasibility Mineral Resource (222)	NIL	NIL	NA
7	Remaining measured resource (331)	NIL	NIL	NA
8	Indicated Resource (332)	NIL	NIL	NA
9	Inferred Resource (333)	NIL	NIL	NA
10	Reconnaissance Resource (334)	NIL	NIL	NA
<b>Total Mineral Resources (3+4+5+6+7+8+9+10)</b>			<b>1.542</b>	<b>+45%</b>
<b>Grand Total (1 to 10)</b>			<b>22.574</b>	<b>(62.28% Fe)</b>

  
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**MODIFIED MINING PLAN  
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LESSEE: THE ODISHA MINING CORPORATION LTD.**



A summary of updated reserves/resource as on 01.04.2015 as per UNFC Category is given below.

**Summary of updated reserves/resource as on 01.04.2015**

Reserves			Resources		
UNFC Category	Reserve, Million tonne	Fe%	UNFC Category	Resource, Million tonne	Fe%
111	0.546	60.87%	211	0.189	+45%
121	20.486	62.46%	221	1.353	+45%
<b>Total</b>	<b>21.032</b>	<b>62.29%</b>	<b>Total</b>	<b>1.542</b>	<b>+45%</b>
<b>Grand Total</b>	<b>22.574 Million Tonnes</b>				

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

Following recovery factors have been considered for different deposits based on the analysis report of OMC.

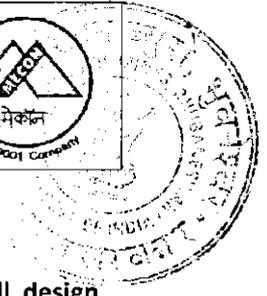
Deposit	Recovery Factor
Deposit - I	72.38%
Deposit - II	58.02%
Deposit - III	61.53%
Deposit - IV	83.98%
Deposit - V	73.88%
Deposit - VI	74.025%

  
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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**2.0 MINING**

**A. OPEN CAST MINING:**

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

**Minning Method :** The Khandabandh Iron ore Mines comes under Category-A (Fully Mechanized category) as per the IBM guidelines. Prior to suspension of mining operation, the deposit was worked by opencast mining method.

**Bench Configuration:** Presently average height of bench is 6.0m whereas, width of bench has been maintained at 6-10m. Bank slope angle varies from 65° – 75°. Approach road to different deposits of the lease has been maintained at 1 in 16 gradient.

**Drilling & Blasting:** Presently the mine is not operational due to suspension orders issued by RCOM, IBM for violation of rules of MCDR 1988. Prior to suspension deep hole drilling & blasting was used to break the Ore & waste. Drilling was being carried out using 115 mm dia. Drill machines with 3.0 m burden & 3.5 m spacing. Holes were charged with ANFO/slurry explosives and initiated using electric detonator/detonating fuse.

**Loading & Transportation:** Blasted material were loaded into 20 t capacity tippers using 0.9 m<sup>3</sup> which in turn was transported to mobile crushing & screening unit for further size reduction & screening. Manual labours are also being deployed for sorting & sizing of lump to +5 – 18 mm, +10-40 mm CLO apart from other ancillary purposes in the mining. Waste excavated was hauled from working benches to waste dump located close top respective pits by 20t tippers.

Salient parameters of existing major quarries of Khandabandh Iron Ore Mines are as follows.

**Salient parameters of existing quarry (as on 01.04.2015)**

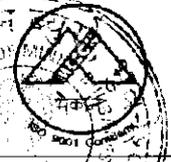
Sl. No.	Parameters	Deposit I (Quarry -1)	Deposit III (Quarry -2)	Deposit IV		Deposit V (Quarry -3)	Deposit VI (Quarry -6)
				Quarry-4	Quarry-4 (Main)		
1.	Quarry Size (L x W x D)	188 m x 138 m x 80.92 m	Quarry 2B : 216 m x 81 m x 16.88 m Quarry 2C : 241 m x 148 m x 48.76 m Quarry 2D : 90 m x 48m x 7.2m	292m x 163m x 22 m	318 m x 179m x 9.5	187 m x 133m x 26 m	201 m x 148 m x 40 m
2.	Total No. of Benches	13	Quarry 2B : 3 Quarry 2C : 10 Quarry 2D : 2	6	2	4	3
3.	Top Bench RL	642.46	Quarry 2B : 623.451mRL Quarry 2C : 627.85 mRL Quarry 2D :592.198	674.299m	651.5m	612 mRL	659.00m
4.	Bottom Bench RL	561.55	Quarry 2B : 606.563 mRL Quarry 2C : 579.79 mRL Quarry 2D : 585.029	652.291	642	584.6 mRL	589.50m
5.	Average Bench Height	4 – 9 m	Quarry 2B : 4.7 – 5.5 m Quarry 2C : 4 – 5 m Quarry 2D :3.8 – 4 m	3-8 m	3.5-6 m	6 – 7 m	5-6 m
6.	Average Bench Width	5-20 m	Quarry 2B : 6-19.8 m Quarry 2C : 6-20 m Quarry 2D : 7-10 m	6-10 m	10-30 m	18-20 m	25-30 m
7.	Average Bank Slope	35° – 49°	Quarry 2B : 46° – 75° Quarry 2C : 26° – 38° Quarry 2D : 23° – 41°	21° – 38°	70° – 75°	70° – 75°	38°-40°
8.	Average Pit Slope		Quarry 2B : 26° – 28° Quarry 2C : 27.5° – 32.3° Quarry 2D : 23° – 31°	22.5°	37.6°	45°	27.30°

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**MODIFIED MINING PLAN  
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Sl. No.	Parameters	Deposit I (Quarry -1)	Deposit III (Quarry -2)	Deposit IV		Deposit V (Quarry -3)	Deposit VI (Quarry -6)
				Quarry-4	Quarry-4 (Main)		
9	Co-ordinates	2427500N to 2428000N & 334525E to 335285E	2427417N to 2428559N & 335017E to 336264E	2425739N to 2426743N & 333398E to 334094E	2426512N to 2427289N & 333521E to 334860E	2426478N to 2427761N & 333952E to 335840E	2428061N to 2429098N & 334469E to 335325E

Details of existing subgrade dump, fines dump, CLO Stacks etc. is given below.

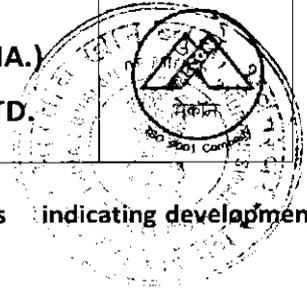
Sl. No.	Dump Type	Location	Co-ordinate	Area occupied (Ha.)	Stock Qty,	No. of terraces	Individual terrace Height, m	Total Dump Height, m	Size, L X W	RL of individual terraces (Bottom RL – Top RL)
<b>1.</b>	<b>Subgrade Dump</b>									
a	SG-1	Near Deposit I	2427600N to 2427760N & 334930E to 335160E	3.60	0.45 Mcu.m	1	16.3	16.3	355m x 85m	1 <sup>st</sup> : 565.1 – 581.4
b	SG-2	Near Deposit I	2427760N to 2427980N & 334850E to 335020E	0.608	0.07 Mcu. M	1	4	4	100m x 40m	1 <sup>st</sup> : 574.04 – 578.0
c	SG-2A	Near Deposit 2	2428360N to 2428440N & 335680E to 335760E	0.24	0.01 Mcu.m	1	7	7	60 m x 30 m	1 <sup>st</sup> – 607.84- 614.8
d	SG-3	Near Deposit 1	2427540N to 242600N & 334640E to 334930E	0.64	0.0125 Mcu. M	1	4	4	70m x50m	1 <sup>st</sup> - 575.0 – 579.0
e	SG-4	Near Deposit 3	2426240N to 2427980N & 335820E to 335980E	1.12	0.12 Mcu.m	1	10	10	150m x 80m	1 <sup>st</sup> - 575.075 – 585.15
f	SG-5	Near Deposit 4	2426620N to 2426800N & 333550E to 333770E	2.20	0.08 Mcu. M	1	8	8	190mx85m	1 <sup>st</sup> : 667.0 – 675.0
g	SG-5A	Near Deposit 4	2426300N to 2426520N & 333600E to 333750E	1.087	0.067 Mcu.m	1	15	15	170 m x 40 m	1 <sup>st</sup> : 655.13 – 670.11
<b>2</b>	<b>Lumps &amp; Fines</b>									
a	Lumps	Near WB Deposit VI	2428350N to 2428600N & 335200E to 335550E	5.782	0.009006 Mt	1	4-8 m	4-8 m	440 m x 204 m	Scattered in heaps
b	Fines				0.081905 Mt	1	4-8 m	4-8 m		

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

**D. In-situ Tentative Excavation**

The year-wise in-situ tentative excavation for the proposed plan period is given below.

**Year-wise in-situ tentative excavation for the proposed plan period**

Year	Deposit/Quarry	Total Tentative Excavation	Top Soil	OB/SB/IB	ROM (Mcu. m)		ROM:Waste
					Ore	Mineral Rejects (Subgrade)	
					M cu. m	M cu. m	
2013-14	Period already lapsed therefore no proposal has been made						
2014-15	Period already lapsed therefore no proposal has been made						
2015-16	Deposit VI	0.3172	0.0000	0.1855	0.1269	0.0047	0.71
	<b>Sub Total</b>	<b>0.3172</b>	<b>0.0000</b>	<b>0.1855</b>	<b>0.1269</b>	<b>0.0047</b>	<b>0.71</b>
2016-17	Deposit VI	0.7727	0.0000	0.5069	0.2472	0.0185	0.52
	<b>Sub Total</b>	<b>0.7727</b>	<b>0.0000</b>	<b>0.5069</b>	<b>0.2472</b>	<b>0.0185</b>	<b>0.52</b>
2017-18	Deposit V (Quarry 3)	0.5041	0.0000	0.2380	0.2460	0.0201	1.12
	Deposit I (Quarry 1)	0.3695	0.0000	0.2682	0.0982	0.0032	0.38
	Deposit VI	0.0205	0.0000	0.0000	0.0034	0.0171	453.69
	<b>Sub Total</b>	<b>0.8736</b>	<b>0.0000</b>	<b>0.5062</b>	<b>0.3441</b>	<b>0.0233</b>	<b>0.73</b>
<b>Grand Total</b>		<b>1.9635</b>	<b>0.0000</b>	<b>1.1987</b>	<b>0.7183</b>	<b>0.0466</b>	<b>0.64</b>

**Note :** Tentative tonnage of ore have been arrived by considering the following approximate bulk density and recovery factor as these data are variable and may be established on time series.

**Bulk Density , t/cu.m**

Litho Type	Bulk Density , t/cu.m
Ore (Fe%>55%)	3
Subgrade (Fe% between 45 – 55%)	2.5
Waste (Fe% less than 45%)	1.8

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**Recovery Factor**

Deposit	Recovery Factor
Deposit - I	72.38%
Deposit - II	58.02%
Deposit - III	61.53%
Deposit - IV	83.98%
Deposit - V	73.88%
Deposit - VI	74.025%

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14/9/16

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

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(Qualified Person)

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(Qualified Person)



**MODIFIED MINING PLAN  
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LESSEE: THE ODISHA MINING CORPORATION LTD.**



**i. At the end of FY 2013-14**

Period has already lapsed therefore no production proposal has been made for FY 2013 – 14. Since the mining operation is suspended due to want of forestry clearance since 05.01.2010, no production has been made from the mines during the FY 2013-14.

**ii. At the end of FY 2014-15**

Period has already lapsed therefore no production proposal has been made for FY 2014 – 15. Since the mining operation is suspended due to want of forestry clearance since 05.01.2010, no production has been made from the mines during the FY 2014-15.

**iii. At the end of FY 2015-16**

**Deposit VI**

During FY 2015-16, existing benches from 654 mRL to 666 mRL in deposit VI will be further pushed in the eastern direction. Besides three nos. of new benches at 666 mRL to 654 mRL will be developed during the FY 2015-16. During the period 0.012 Million tonnes of subgrade will be generated. Entire subgrade generated during the period has been planned to be blended with high grade ore. Around 0.1855 M cu. M waste will be generated during the period which has been proposed to be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

Pit development & production plan at the end of FY 2015-16 is shown in drawing No. MEC/Q76Q/11/16/06. The sections of this pit are shown in drawing No. MEC/Q76Q/11/16/09 to 10A.

Details of calculations of ore, sub grade and waste for the FY 2015-16 is shown in Annexure-23.

**iv. At the end of FY 2016-17**

**Deposit VI**

During FY 2016-17, benches developed i.e from 636 to 660 mRL during FY 2015-16 in deposit VI will be further pushed in the eastern direction. During the period 0.046 Million tonnes of subgrade will be generated. Entire subgrade generated during the period has been planned to be blended with high grade ore. Around 0.507 M cu. m waste will be generated during the period which has been proposed to be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

Pit development & production plan at the end of FY 2016-17 is shown in drawing No. MEC/Q76Q/11/16/07. The sections of this pit are shown in drawing No. MEC/Q76Q/11/16/09 to 10A.

Details of calculations of ore, sub grade and waste for the FY 2016-17 is shown in Annexure-24.

**v. At the end of FY 2017-18**

**Deposit V (Quarry – 3)**

During FY 2017-18, existing benches from 606 mRL to 612 mRL in deposit V will be further pushed in the north western direction. Besides six nos. of new benches at 618mRL to 648 mRL will be developed during the FY 2017-18. During the period 0.050 Million tonnes of subgrade will be generated. Entire subgrade generated during the period has been planned to be blended with high grade ore. Around 0.238 M cu. m waste will be generated during the period which has

  
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been proposed to be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

**Deposit I (Quarry – 1)**

During FY 2017-18, existing benches from 582 mRL to 642 mRL in deposit I will be further pushed in the north western direction. Besides 4 nos. of new benches at 642mRL to 666 mRL will be developed during the FY 2017-18. During the period 0.008 Million tonnes of subgrade will be generated. Entire subgrade generated during the period has been planned to be blended with high grade ore. Around 0.268 M cu. M waste will be generated during the period which has been proposed to be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

**Deposit VI**

During FY 2017-18, existing benches from 606 mRL to 612 mRL in deposit VI will be further pushed in the eastern direction. During the period no subgrade will be generated. Around 0.00005 M cu. M waste will be generated during the period which has been proposed to be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

Entire waste i.e. 0.5062 Mcu. M generated during FY 2017-18 from above three deposits will be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

Pit development & production plan at the end of FY 2017-18 is shown in drawing No. MEC/Q76Q/11/16/08. The sections of this pit are shown in drawing No. MEC/Q76Q/11/16/09 to 10A.

Details of calculations of ore, sub grade and waste for the FY 2017-18 is shown in Annexure-25.

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

Presently 0.009 million tonnes of lump & 0.082 Million tones fines have been stacked near weighbridge in Deposit VI. These lumps & fines have been proposed to be evacuated as follows.

Year	Location/Dump	Quantity to be evacuated, Million Tonnes
2015-16	Lump & Fines Stackyard, Deposit VI	0.091

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

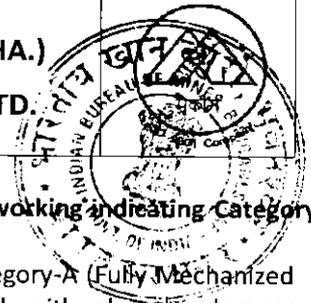
The year wise pit development plan & section for the period ending 2015-16 to 2017-18 is shown in Plate No. MEC/Q76Q/ 11/16/06 to MEC/Q76Q/ 11/16/10A respectively.

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**MODIFIED MINING PLAN  
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vii. Describe briefly giving salient features of the proposed method of working indicating Category of mine.

**Mining Method:** The Khandabandh Iron Ore Mines comes under Category-A (Fully Mechanized category) as per the IBM guidelines. Opencast mining method with shovel –dumper combination has been proposed for Khandabandh Iron Ore Mines.

**Working Regime:** Mine has been proposed to be operated in two shifts. Each shift will be of 8 hours duration. No. of working days per year will be 300 days.

**Mine Design Parameters:** The proposed height of bench is 6 m with 10 m minimum working width. Bank slope has been considered as 75°. Haul road has been planned at a gradient of 1 in 16. Inter bench ramp width has been considered as 6 m.

**Drilling & Blasting:** Drilling will be carried out using 115 mm dia. Drill with 3.0 m burden & 3.5 m spacing. Total 70 % (approx.) of planned quantity will require drilling & blasting. Holes will be charged with slurry explosives and initiated using electric delay detonators/detonating fuse/NONEL.

**Loading & transportation:** Blasted material will be loaded with hydraulic excavators (diesel powered) of bucket capacity of 0.9 – 3.0 cu.m bucket capacity in 25t capacity tipper and will be transported to proposed mobile crushing & screening plant for production of CLO & fines. Waste generated will be transported to proposed waste dump WD1.

Front end loaders & hydraulic excavators of 0.9 – 2.0 cu.m bucket capacity will be deployed for required re-handling works. The CLO & fines generated from the processing plants will be loaded by loader of 0.9-2.0 cu.m capacity & transported through 25 t tippers dumpers to the respective stockyards.

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

Sl. No.	Parameters	Deposit I (Quarry -1)	Deposit V (Quarry -3)	Deposit VI
1.	Quarry Size (L x W x D)	466 m x 405 m x 120 m	311 m x 235 m x 78 m	340 M x 240 m x 54 m
2.	Total No. of Benches	20	13	9
3	Top Bench RL	666 mRL	648 mRL	654 mRL
4	Bottom Bench RL	546 mRL	570 mRL	600 mRL
5	Average Bench Height	6 m	6 m	6
6	Average Bench Width	10 m	10-30 m	10-30 m
7	Average Bank Slope	75°	75°	75°
8	Average Pit Slope	25.2°	23.2°	27.3°

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.

Mining operation has been proposed to be confined within the broken area of Deposit I (Quarry 1) & Deposit V (Quarry 3) during the plan period. The year wise pit development plan & section for the period ending 2015-16 to 2017-18 is shown in Plate No. MEC/Q76Q/ 11/16/06 to MEC/Q76Q/ 11/16/10A respectively. The surface plan of the mine as on 01.04.2015 is shown as Plate No. MEC/Q76Q/ 11/16/05 to 5B. Inter-bench ramp has been planned to facilitate movement of equipment. Width of proposed inter bench ramp is 6.0 m laid at a gradient of 1 in 16. Approach road of 10 m width at a gradient of 1 in 16 have also been envisaged to the proposed waste & subgrade dumping sites. These approach roads & ramps along with main access road will be regularly graded &

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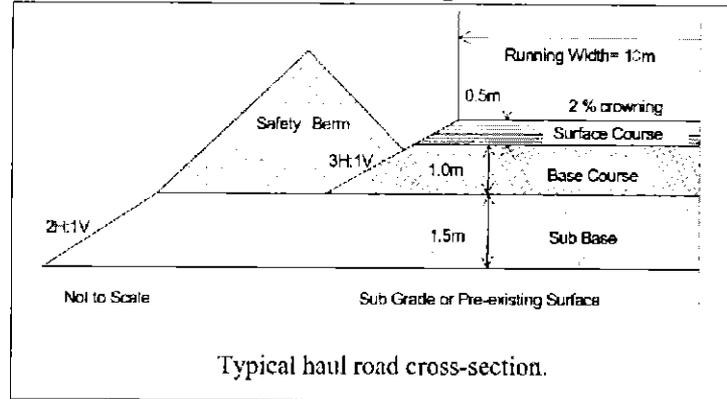
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compacted using motor graders & vibratory compactors to avoid formation of pot holes. Regularly Road surface cross-slopes should be approximately 4% to facilitate easy drainage. Site selected for waste dumping has been proved non-mineralized by drilling boreholes - i.e. borehole No. KB/III/DTH/150, KB/III/DTH/151, KB/III/DTH/154, KB/III/DTH/252, KB/III/DTH/398 to 400 & KB/III/DTH/402. The waste has been planned to be dumped within the existing broken area. Prior to commencement of dumping all statutory clearances will be made. After tree felling, retaining wall & garland drains along with settling pits will be constructed to protect the surrounding environment from wash-offs etc. Typical cross-section of haul road is given below.



- f) **Conceptual Mine planning upto the end of lease period taking into consideration the present available reserves and resources describing the excavation, recovery of ROM, Disposal of waste, backfilling of voids, reclamation and rehabilitation showing on a plan with few relevant sections.** Khandabandh Iron ore lease comes under Category – A (fully mechanized category) as per the IBM guidelines. Therefore, conceptual plan of Khandabandh Iron ore lease has been prepared on the basis of life of the deposit considering the proved existence of the mineral upto 510 mRL, 555 mRL, 516 mRL 586 mRL, 480 mRL & 595 mRL in Deposit I, II, III, IV, V & VI respectively. Conceptual mining plan has been prepared following the guidelines of IBM, keeping in view the present knowledge of the deposit, topography of the area, surface drainage pattern, mineable reserves available, mining technology and sites for waste disposal etc.

Structural studies have been taken mainly in nala cuttings where BHJ is exposed. The nallas are structurally controlled. Both E-W and N-S folding are prominent with plunging direction uniformly towards N10°E or N 10°W. Reversal of plunge is occasionally noted. The axial plane cleavages of the mega folds have acted uniformly as a prominent passage for stream flow. Folds of micro and mega scale are very common. Faults of major scale are rarely seen. Joints are numerous and developed due to competency of the rock.

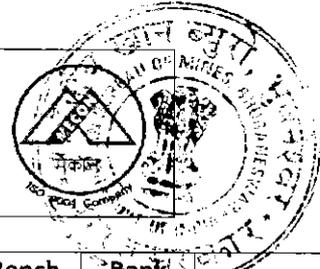
On the basis of available exploration data, the resource model of the deposit has been prepared in a mine planning software viz. Surpac. A safety barrier of 7.5 m & 10 m width all along inside the lease area and village roads has been kept as per the provisions of the statutes respectively. The ultimate pit has been designed using the following bench configurations:-

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**MODIFIED MINING PLAN  
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Deposit	Ultimate size of Pits (L x W x D)	Bench Height, m	Top RL (m)	Bottom RL (m)	Bench Width, m	Bank Slope Angle	Ultimate Pit Slope
Deposit I	611 m x 502 m x 153	6	669	516	10	75°	25°
Deposit II	447 m x 432 m x 90 m	6	642	552	10	75°	36.51°
Deposit III	829 m x 509 m x 114 m	6	630	516	10	75°	36.26°
Deposit IV & IV Main	1243 m x 611 m x 54 m	6	666	612	10	75°	39.56°
Deposit V	911 m x 805 m x 186 m	6	666	480	10	75°	32.05°
Deposit VI	346 m x 226m x 54 m	6	648	594	10	75°	31.11°

The ultimate pit configuration may change depending upon the outcome of exploration in future. Rated capacity of the mines is 1.0 million ones of Iron Ore. The ROM ore produced will be screened & sized to produce the lumps & fines fractions within the lease. The wastes generated from the Khandabandh Iron ore lease will be partly dumped in external dumps & partly backfilled in the voids created during mining.

**Life of Mine:**

Considering 0.546 Million tonne of proved category (UNFC code 111) & 20.486 Million tonne of probable category (UNFC Code 121 Cat.), the expected life of the mine at the above mentioned rated capacity will be around 22 years.

**Disposal of Sub grade mineral:**

Material containing 45-55% Fe has been considered as subgrade. A total of 1.682 million ones of subgrade will be generated upto conceptual stage. Year-wise generation of subgrade is given below.

**Table 4.1a (Sub grade generation upto Conceptual period)**

Year	Deposit/ Quarry	Subgrade Generation, Million Tonnes	Average Fe%
2015-16 to 2017-18	Deposit V (Quarry 3) & Deposit I (Quarry 1)	0.116	50.48
2018-19 to Conceptual		1.566	50.53
<b>Total</b>		<b>1.682</b>	<b>50.52</b>

Entire subgrade generated during the life of mine will be blended with high grade ore and therefore, separate stacking of subgrade is not required.

**Waste Disposal:**

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

- Site selected for waste dumping have been proved non mineralized by borehole No. KB/III/DTH/150, KB/III/DTH/151, KB/III/DTH/154, KB/III/DTH/252, KB/III/DTH/398 to 400 & KB/III/DTH/402 and are located outside the mineralized zone beyond ultimate pit limits.
- Topography features have been taken into account, particularly in the context of water drainage and availability of relatively flat ground.
- Initially the natural depression has been planned to be leveled upto adjoining ground level & then terracing will be carried out.

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The height & width of individual terrace has been considered as 10 m & 10 m respectively with a bank slope angle of 37°. A total of 24.72 Mm<sup>3</sup> of wastes will be generated from entire Khandabandh Iron ore lease upto conceptual stage. Out of which, 0.186 Mm<sup>3</sup>, 0.507 Mm<sup>3</sup> and 0.506 Mm<sup>3</sup> waste generated during year 2015-16, 2016-17 & 2017-18 will be dumped in proposed waste dump WD1 between 335400E & 2427720 N to 335700E & 2428150N at Deposit III. Balance 23.521 Mm<sup>3</sup> of waste generated from year 2018-19 to conceptual stage has been proposed to be backfilled. Out of above 23.521 Mm<sup>3</sup> waste, 4.521 Mm<sup>3</sup>, 14.67 Mm<sup>3</sup> and 4.33 Mm<sup>3</sup> waste will be backfilled in the backfill 1, backfill 2 & backfill 3 respectively. Year-wise waste generation upto end of mine life is given in table 4.2a.

**Table 4.2a (Waste generation upto Conceptual period)**

Year	Waste Generation, Mcu.m
2013-14 to 2014-15	Plan period has lapsed
2015-16 to 2017-18	1.199
2018-Conceptual Stage	23.521
<b>Total</b>	<b>24.720</b>

The manner of disposal of wastes, upto the conceptual stage is given in Table 4.2b.

**Table 4.2b (Waste management plan upto Conceptual period)**

Year	Waste Generation, M cu. M	Waste Dump Destination	Waste Dump Location	Dumped Waste Quantity, M cu. M	Base Area, Ha	Bottom RL	Top RL	No. of Terrace	Individual Terrace Height, m
2013-2015	Plan period from 2013-2015 i.e. two years have already lapsed								
2015-16 to 2017-18	1.199	WD1	Deposit III near quarry 2A between 335400E & 2427720 N to 335700E & 2428150N	1.199	5.747	600	640	4	1 <sup>st</sup> - 4 <sup>th</sup> terrace : 10m
<b>Sub total</b>	<b>1.199</b>			<b>1.199</b>	<b>5.747</b>				
2018-conceptual	23.521	Backfill 1	Deposit VI	4.521	9.96	600	660	6	1 <sup>st</sup> -6 <sup>th</sup> terrace : 10m
		Backfill 2	Deposit V	14.670	33.35	540	600	6	1st -6th terrace : 10m
		Backfill 3	Deposit III	4.330	8.52	552	602	6	1st -6th terrace : 10m
<b>Sub total</b>	<b>23.521</b>			<b>23.521</b>	<b>51.83</b>				
<b>Grand Total</b>	<b>24.720</b>			<b>24.720</b>	<b>57.58</b>				

Protective measures envisaged for dumps upto the conceptual period is given below.

Location	Garland drain		Retaining wall		Settling tank	
	Name/ No.	Length, m	Name/ No.	L x W x H, m	Name/ No.	No.
Near proposed waste dump WD1 at	GD1	405	R1	397 x 1.5 x 1.2	SP1	1
Near Stack yard area	GD4	175	R4	175 x 1.5 x 1.2	SP4	1
Near Existing Subgrade Dump SG4	GD5	240	R5	234 x 1.5 x 1.2	SP5	1
Near Existing Subgrade Dump SG5A	GD6	250	R6	250 x 1.5 x 1.2	SP6	1

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The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. A series of settling pits along with a main settling tank of 15 m length at the outlet of the garland drains will be provided to arrest the wash-off solid particles. The settling tank will be provided with three compartments each of around 5m width to arrest the suspended solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. The retaining walls will be of 1.5m height and 1.2 m width at the top and around 1.5m at the base. Typical design of proposed retaining wall, garland drain & settling pit is given in Annexure – 28.

The location of the external dump & backfilled area is marked on conceptual plan. Afforestation plan by the end of conceptual period is given in Table – 4.4. The quantity of top soil generated upto the conceptual period will be 0.36 M cu. m. Due to low self life of the top soil; it shall be used for concurrent reclamation/ rehabilitation of the backfilled voids & also for avenue plantation due to very low shelf life of the lateritic soils. The phase-wise generation of topsoil is given in table 4.3.

**(Table 4.3) Top soil generation**

Year	Top Soil Generation, Mcu.m
2015-16 to 2017-18	Nil
2018-conceptual	0.36
<b>Total</b>	<b>0.36</b>

Backfilled area will be afforested to check against wash off and guarded with retaining walls at their toes along the lower contours. Following the retaining wall a garland drain will be developed for carrying water to the natural drainage system. Settling pits have also been proposed in the drains to arrest solid particles. The backfilled area will be rehabilitated by planting species such as *Schleichera oleosa* (Kusum), *Syzygium cumini* (Jamun), *Phyllanthus emblica* (Aonla), *Caserea elliptica* (Khakra), *Lagerstroemia parviflora* (Sidha) etc. upto the conceptual period by adequate plantation at the rate of 1600 trees per hectare so as to avoid any wash off. Monitoring & care of plantation shall be carried out by company till the stage of self sustaining.

**Exploration:**

Deposits of Khandabandh Iron Ore lease has been explored by 100 m x 100 m grid and even less upto 50 m x 50 m grid spacing. However, to further ensure the occurrence of ore in unexplored area check boreholes have been proposed at 200 m x 200 m grid spacing. 26 nos. of boreholes have been proposed to be drilled in a phased manner after approval of forest diversion proposal (FDP) of the ML. The year-wise detail of the proposed boreholes to be drilled is given in para 1.0 e (i). The same will be completed under rule 27(3) of MCR 1960.

**Environmental monitoring:**

Noise, air, water and other environmental parameters will be monitored periodically to have a close check on the environmental pollution parameters. Spraying of water on haul roads, use of wet drilling techniques & prevention of vibration by utilization of minimum quantity of explosive per delay will be carried out. As reflected in the table 4.4 a total of 92123 saplings will be planted over an area of 109.90 Ha. over the external dumps & backfilled areas.

  
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<b>OMC</b>	<b>MODIFIED MINING PLAN OF KHANDABANDH IRON ORE LEASE (366.311 HA.) LESSEE: THE ODISHA MINING CORPORATION LTD.</b>	
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**Table 4.4 (Afforestation plan upto conceptual period)**

Year	Waste Dump	Waste Dump Location	Reclaimed Area, Ha.	No. of Saplings to be planted per Ha	No. of saplings to be planted
2015-16 to 2017-18	WD1	Deposit III near quarry 2A between 335400E & 2427720 N to 335700E & 2428150N	5.747	1600	9195
2018 to Conceptual	Backfill 1	Deposit VI	9.96	1600	15936
	Backfill 2	Deposit V	33.35	1600	53360
	Backfill 3	Deposit III	8.52	1600	13632
<b>Grand Total</b>			<b>57.58</b>		<b>92123</b>

The pit position at the end of conceptual period is depicted as Plate No. MEC/Q76Q/ 11/16/11 and conceptual section as Plate No. MEC/Q76Q/ 11/16/12A to 12F.

**Land use planning:**

The land use pattern at the start of the plan period, at the end of plan period and at the end of conceptual period is given in the table 4.5.

**Table 4.5 (Land use at the conceptual stage , Ha)**

Sl. No.	Particulars	Existing Land-use	Land use at the end of 2017-18	Conceptual Land use
1	Excavated Area	110.6279	110.6279	200.5192
2	Subgrade dump	14.1172	14.1172	6.9662
3	Waste dump	1.1198	5.817	0.2587
4	Mineral Storage	7.6729	7.3201	3.9991
5	Infrastructure (Workshop, administrative Building etc)	2.1080	2.1080	2.0705
6	Roads & Railways	11.8657	11.5271	3.2875
7	Mineral Processing	0.2960	0.2960	0.2960
8	Township area	1.8278	1.8278	1.8278
	<b>Total</b>	<b>149.6353</b>	<b>153.6411</b>	<b>219.2250</b>
9	Magazine(with safety zone)	15.7530	15.7530	6.9568
10	Statutory barrier	9.5287	9.5287	9.5287
11	Tenaments	2.1186	2.1186	2.1186
12	Others	189.2754	185.2696	128.4819
	<b>Grand Total</b>	<b>366.3110</b>	<b>366.3110</b>	<b>366.3110</b>

**Post Mining Land-use**

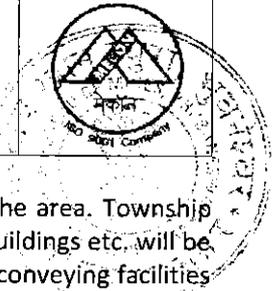
During post mining stage, the excavated mining area will be partly backfilled from the existing waste dumps prevailing over the lease at that time to restore the natural profile. The backfills will be properly graded & terraced and will be biologically reclaimed by coir-matting & plantation. Remaining mined out benches will be afforested with dense plantation. The quarry

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area will be fenced to prevent any inadvertent movement of persons into the area. Township area and builtup infrastructure such as office, workshop and administrative buildings etc. will be handed over to local people/state govt. for social & public use. Processing & conveying facilities will be de-commissioned and will be afforested by dense plantation. Total area covered under waste dumps and mineral stacking & processing will be afforested by plantation. Mine roads will be afforested and other roads within the lease will be used for public transport facilities. Plantation will be carried out 7.5 m statutory barrier. Thus, at the post mining stage the area will have partly backfilled mined out voids surrounded from all the sides by plantation and dense avenue plantation.

The post mining land use thereafter is given below:

**Post Mining Land-use**

S N	Type of land use	Area at Conceptual Stage, Ha	Post Mining Land use, Ha					Total
			Reclamation & Afforestation	Afforestation	Public Use	Water bodies	Un-utilised Land	
1	Area for Mining	200.5192	51.8300	96.9692	-	51.7200	0.0000	200.5192
2	Sub-grade storage	6.9662	-	6.9662	-	-	-	6.9662
3	Overburden dump	0.2587	0.2587	-	-	-	-	0.2587
4	Mineral storage	3.9991	-	3.9991	-	-	-	3.9991
5	Infrastructure (Office, Workshop, Admn Building, Magazine etc.)	2.0705	-	-	2.0705	-	-	2.0705
6	Roads	3.2875	-	3.2875	-	-	-	3.2875
7	Mineral separation plant (Processing & conveying incl. space for other plant facilities)	0.2960	-	0.2960	-	-	-	0.2960
8	Township area	1.8278	-	-	1.8278	-	-	1.8278
9	Magazine with Safety Zone	6.9568	-	6.9568	-	-	-	6.9568
10	Statutory Safety Barrier	9.5287	-	9.5287	-	-	-	9.5287
11	Tenaments	2.1186	-	-	-	-	2.1186	2.1186
12	Others	128.4819	-	-	-	-	128.4819	128.4819
<b>Total</b>		<b>366.3110</b>	<b>52.0887</b>	<b>128.0035</b>	<b>3.8983</b>	<b>51.7200</b>	<b>130.6005</b>	<b>366.3110</b>

**B. UNDERGROUND MINING**

Not applicable

**C. Extent of Mechanisation**

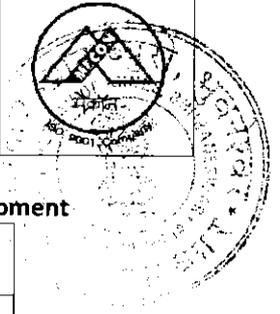
No change in the method of mining has been proposed. Mining will be carried out by opencast method. It has been planned to operate the Khandabandh Iron ore lease with the proposed fleet of mining machineries as given in table 5.4.

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**(Table 5.4) Proposed Fleet of Major HEMM & Auxiliary Mining Equipment**

Parameters	HEMM Fleet
Excavator, 0.9 – 2 cu.m	3
Excavator, 1.5-3.0 cu.m	3
Loader, 1.7cu.m	2
Tipper, 25t	19
Wagon Drill, 115 mm	3
Wheel Dozer,275HP	2
Dozer,324 KW	2
Grader,125KW	1
Explosive van	1
Service van	1
Pick up van	1
Water tanker, 12 kl	5
Diesel browser	1
Tyre Handler	1
Portable lights for face lighting	6
Tower lights	20
Tractor compressor	3
Mobile Crushing & screening unit (350 tph)	1
Cranes,5t	1
Cranes, 15 t	1

The details of the calculations for major HEMM are given in tables 5.5 to 5.8.

**(Table 5.5) Drilling Fleet Calculation**

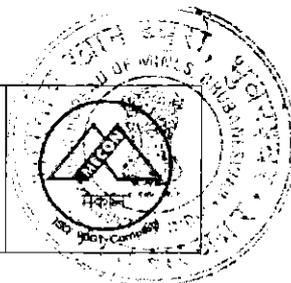
Sl.No.	Parameter	Details	Unit of Measurement
1	<b>Max. Excavation Quantity</b>	<b>2.0</b>	<b>Mt</b>
2	% of Rock Requiring Blasting	70	%
3	Total Excavation requiring blasting	1.40	Mt
4	Deployment % of Drills for drilling	100.00	%
5	Drill hole Diameter	115	mm
6	Burden	3	m
7	Spacing	3.5	m
8	Bench Height	6	m
9	Subgrade Drilling	0.6	m
10	Blast hole depth	6.6	m
11	Yield/hole	180	tonnes
12	Drill factor	27.30	tonnes/m
13	Drill rate	10.00	m/hour
14	Drill capacity/hour	273.00	t/hr
15	Availability	0.78	%
16	Utilisation	0.52	%

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Sl.No.	Parameter	Details	Unit of
17	Net Utilisation	0.41	%
18	Effective run. Hrs/ drill/ annum	3000.00	Hrs
19	Production capacity/yr./drill	0.82	Mt
20	Actual Production capacity / yr/drill (80% of theoretical)	0.66	Mt
21	Total Drills Required	3.0	Nos.
	<b>Total Drills Required (Rounded)</b>	<b>3.00</b>	Nos.

**(Table 5.6) Excavator Fleet Calculation**

Parameter	Details		Unit
	ROM Handling	Product Handling	
Maximum Handling	2.00	1.00	Mt
Bucket capacity	3	1.5	cu.m
% Deployment	100	100	
Cycle time	28	28	Sec
Bucket fill factor	0.8	0.8	Fraction
Operators efficiency factor	0.85	0.85	Fraction
Swell Factor	0.8	0.8	Fraction
Loose density	2.6	2.6	t/cu m
Theoretical mass handled per hour	546	273	t / h
Actual handling/hour	436	218	t/h
% age Availability	0.8	0.8	
% age Utilization	0.76	0.76	
Effective run. Hrs/ shovel/ annum	3600	3600	h
Handling/ annum/ shovel	1.57	0.79	Mt
Excavator Fleet Required to operate	2	2	Nos.
Total Excavator fleet required	3	3	Nos.
<b>Total Excavator fleet required (Rounded)</b>	<b>3</b>	<b>3</b>	<b>Nos.</b>
<b>Total Excavator fleet required (Rounded)</b>		<b>6</b>	<b>Nos.</b>

**(Table 5.7) Tipper Fleet Calculation**

Sl.No	Parameter	Details		Unit
		ROM Handling	Product Handling	
1	Maximum Handling	2.00	1.00	Mt
2	Capacity	25	25	t
3	% Deployment	100	100	%
4	Pay load	20	20	t
5	Speed of dumper Uphaul	20	20	km/h
6	Speed of dumper downhaul	25	25	km/h
7	Lead (Uphaul)	0.75	0.5	Km
8	Lead (downhaul)	0.75	0.5	Km
9	Lead (Level)	1.5	1	Km
10	Swings required to load a dumper	3	5	Nos.

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Sl.No	Parameter	Details		
		ROM Handling	Product Handling	Unit
11	Loading time	72	144	secs
12	Hauling time (loaded)	405	270	secs
13	Hauling time Empty)	324	216	secs
14	Positioning time etc	60	60	secs
15	Total cycle time	861	690	secs
16	Theoretical Handling/ hr./ dumper	84	104	t/h
17	Actual handling/dumper/hour (80 % of theoretical handling)	67	84	t/h
18	Availability	80	80	%
19	Utilisation	75	75	%
20	Net Utilisation	60	60	%
21	Effective run. Hrs/ dumper/ annum	3600	3600	h
22	Handling/ annum/ dumper	0.24	0.30	Mt/dumper
23	<b>Dumper Fleet Required to operate (Rounded)</b>	<b>11</b>	<b>8</b>	<b>Mt</b>
	<b>Actual Dumper Fleet Required (Rounded)</b>	<b>19</b>		<b>Nos.</b>

**(Table 5.8) Loader Fleet Calculation**

Capacity, cu.m	1.7
<b>Purpose</b>	<b>CLO/ fines handling/Oversize handling from screen</b>
Annual running hours	3000
Productivity, tph	170
Production per m/c per year, Mt	0.68
Max. handling, Mt	1.00
Loaders required to operate, Nos.	2
% Availability	75
<b>Loaders required, Nos.</b>	<b>2</b>

**D. Blasting**

- a) **Broad blasting parameters like charge per hole, blasting pattern, charge per delay, maximum number of holes blasted in a round, manner and sequence of firing, etc.**

The blast design configuration for Khandabandh iron ore mines is given below:-

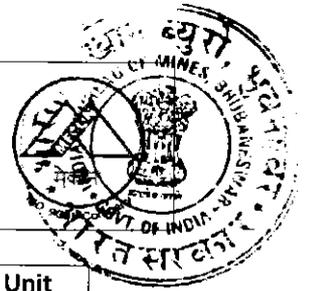
Parameters	Ore	Waste	Unit
<b>Total Excavation,</b>	<b>1</b>	<b>0.51</b>	<b>Mt</b>
% of Rock Requiring Blasting	70	70	%
Total Excavation requiring blasting, Mt	0.70	0.36	Mt
Hole Dia	115	115	mm
Burden	3	3.5	m
Spacing	3.5	4	m
Bench Height	6	6	m
Subgrade	0.6	0.6	m
Hole Depth	6.6	6.6	m
Stemming	3	3	m

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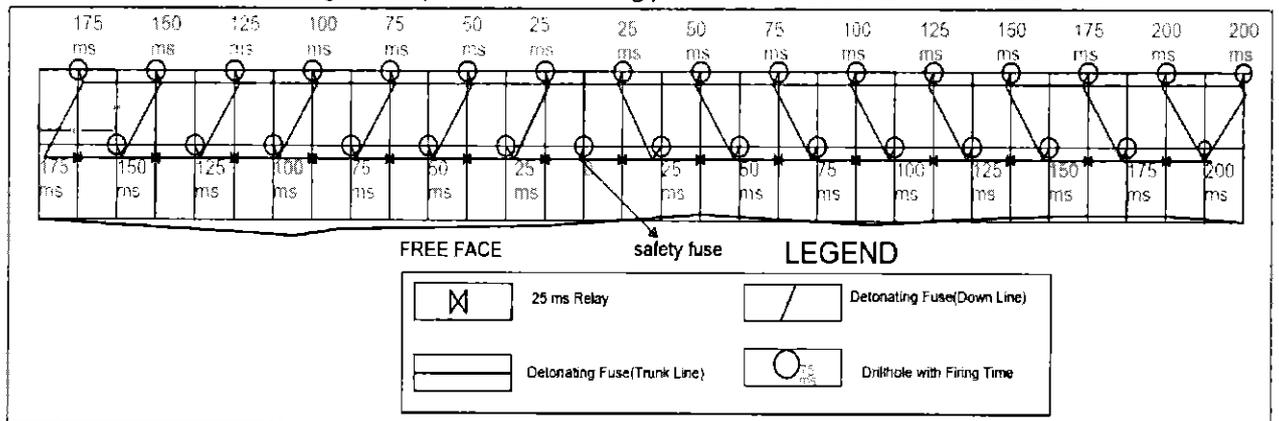


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Parameters	Ore	Waste	Unit
Charge Length	3.6	3.6	m
Explosive Density	1.1	1.1	g/cc
Loading Density, kg/m	11.4	11.4	kg/m
Total Explosive Charge/hole	41.04	41.04	kg
Rock Density	2.6	2.6	t/cu.m
Yield/Hole	163.8	218.4	tonne
Total Holes/yr	4274	1635	Nos.
Drill Factor	30.0	30.0	t/m
Total Meterage required/yr	23333	11900	m
Total no. of holes to be blasted/year	5908		Nos.
Blasting frequency/week	3	2	Nos.
No. of operating faces/round	1	1	Nos.
No. of holes/face	31	17	Nos.
No. of Row/blast	2	2	Nos.
No. of Holes/Row	15	9	Nos.
Drilling Pattern	Staggered		
Initiation System	Electric Detonator/DF/NONEL		
Firing Pattern	Wide V -Cut		
Explosive consumption/year	175385	67085	kg
Explosive consumption/week	3732	1427	kg
Explosive consumption/round	1244	714	kg
Max. Charge/delay	164.16	164.16	kg
<b>Powder Factor</b>	<b>3.99</b>	<b>5.32</b>	<b>t/kg</b>

Rock breaker will be used therefore no secondary blasting is required. It is proposed to undertake ground vibration monitoring studies by an expert agency to determine the maximum charge/delay to keep the ground vibration level within permissible limit. It is proposed to carry out controlled blasting in the quarries considering presence of hutments within leasehold.



  
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**3.0 MINE DRAINAGE**

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

Water sample monitoring stations from where monitoring was regularly carried out prior to suspension of mining operation in Khandabandh Iron Ore Mines /outside the lease area is given below.

**Water Sampling Locations**

Stn. No.	Location	Type	Significance
SW-35	Jururhi Nala near lease area	Surface water	Downstream with respect to mine lease
SW-36	U/S of Jururhi Nala from River Baitarni	Surface water	Downstream with respect to mine lease
SW-37	D/S of Jururhi Nala from River Baitarni	Surface water	Downstream with respect to mine lease
GW-54	Khandbandh Dispensary	Ground water	-
GW-57	Jarhibahal	Ground water	Downstream with respect to mine lease
GW-58	Palsha	Ground water	Downstream with respect to mine lease
GW-59	Gurda	Ground water	Downstream with respect to mine lease
GW-61	Jururhi	Ground water	Downstream with respect to mine lease

Ground water table at Khandabandh Iron ore lease varies from 544-548 mRL.

- b) **Indicate maximum and minimum depth of Workings.**

Maximum and minimum depth of Workings of existing quarry, at the end of proposed plan period and conceptual stage is given below.

Deposit	Existing Quarries		At the end of Plan period i.e. 31.03.2018	
	Topmost Bench RL	Bottommost Bench RL	Topmost Bench RL	Bottommost Bench RL
Deposit -I	642.46 mRL	561.55 mRL	664.403 mRL	561.55 mRL
Deposit -II	618.202 mRL	579.795 mRL	618.202 mRL	579.795 mRL
Deposit -III	Quarry 2B : 623.451mRL Quarry 2C : 627.85 mRL Quarry 2D :592.198 mRL	Quarry 2B : 606.563 mRL Quarry 2C : 579.79 mRL Quarry 2D : 585.029 mRL	Quarry 2B : 623.451mRL Quarry 2C : 627.85 mRL Quarry 2D :592.198 mRL	Quarry 2B : 606.563 mRL Quarry 2C : 579.79 mRL Quarry 2D : 585.029 mRL
Deposit -IV	674.299 mRL	642 mRL	674.299 mRL	642 mRL
Deposit -V	612 mRL	584.6 mRL	642 mRL	584.6 mRL
Deposit -VI	659 mRL	589.5 mRL	659 mRL	589.50 mRL

Mine workings is expected to be around 17 m above water table by the year 2017-18.

- 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 the mine is located at hilltop, rain water will flow through natural drainage system. Besides, 03 Nos. & 03 nos. of check dams have been proposed to be constructed in the FY 2016-17 & 2017-18 respectively along the streams to protect surface runoff.

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

The mining block lies at altitudes between 525 and 677 mRL. Almost the entire area is hilly. The hill slopes are moderately steep. The top of the ridge at the lease has a peak at 670 mRL. The area has dendritic pattern of drainage because of its hilly topography. The area has dendritic pattern of drainage. Because of the hilly topography, there are numerous seasonal drainage channels but only a few perennial streams / rivers (Kundra Nala, Baitarani River, Karo River). The mine lease is drained by Baitarani River. The seasonal drainage channels coming out of the lease area drain into the Baitarani River which flows at a distance of 2.8 km east of the mine lease. The average annual rainfall as recorded at IMD observatory at Keonjhar is 1269.1 mm. The Southwest monsoon lasts from mid June to mid September and the area gets more than 80% of the annual rainfall during this period. Drainage network of the area is given in figure 3.3.

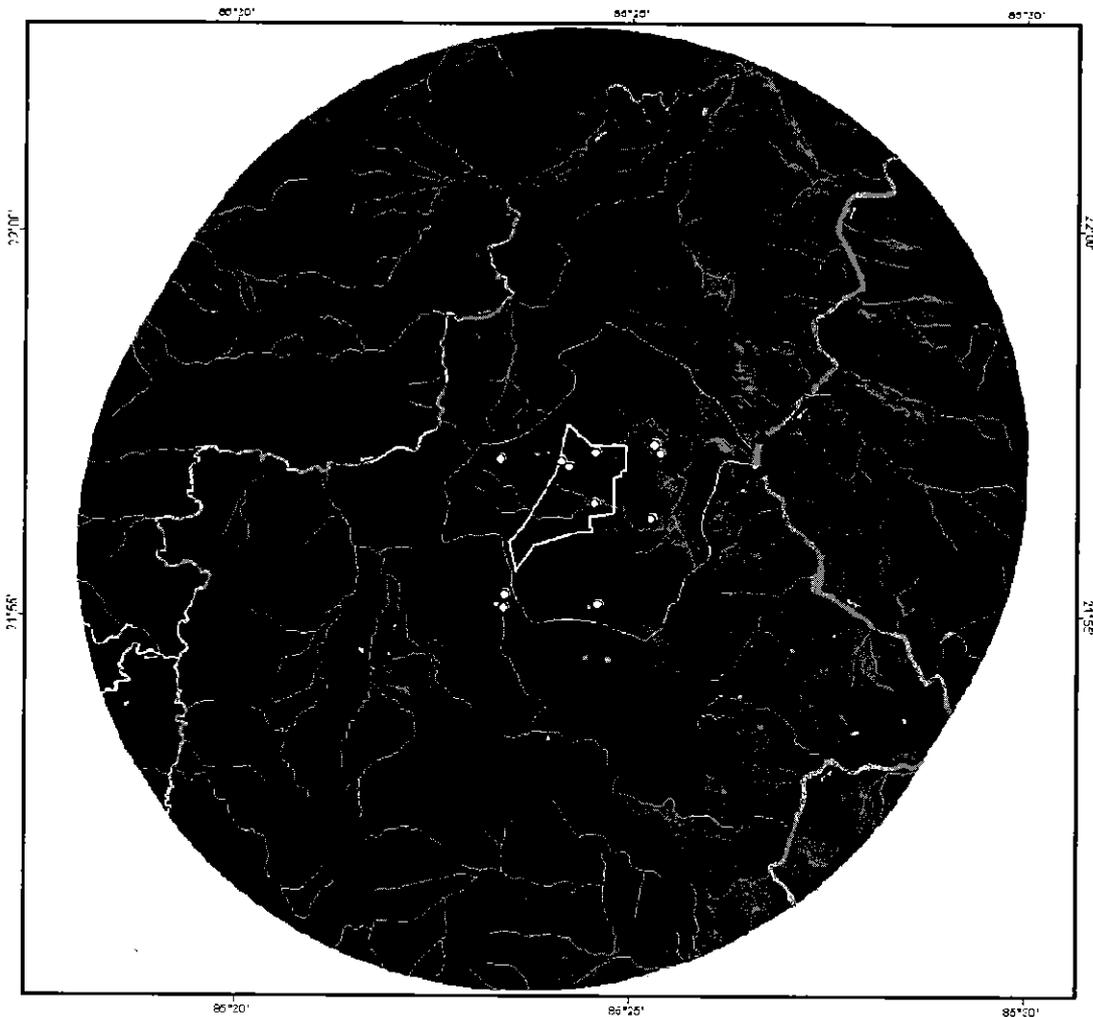


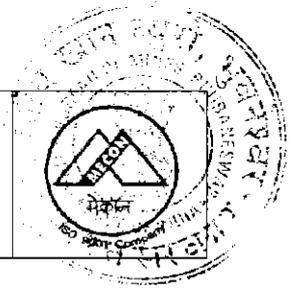
Figure :3.3 Drainage Network of the area

  
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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**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 off.

No top soil will be generated during the plan period. Overburden/Inter-burden is mostly laterite, BHJ, Lateritic Soil and shale. Year-wise subgrade generation during proposed plan period is given below.

**Year-wise Sub grade generation**

Year	Subgrade Generation, Million Tonnes	Avg. Fe%
2015-16	0.0118	49.47
2016-17	0.046	50.77
2017-18	0.058	50.56
<b>Total</b>	<b>0.1158 ~ ( 0.116)</b>	<b>50.53</b>

Entire subgrade generated during the plan period will be blended with high grade ore, therefore separate stacking of subgrade is not required.

Since entire working during the plan period is confined within the existing broken area, no top soil will be generated during the period from 2015-16 to 2017-18.

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

Year	Top Soil (Mil. cum)		Mineral Rejects (Mil.)		Sub grade (Mil. cum)	
	Reuse/ spreading from the stored qty.	Storage	Back-filling	Storage	Blending	Beneficiation
2013-14	Plan period has already lapsed					
2014-15	Plan period has already lapsed					
2015-16	Nil	Nil	Nil	0.186	0.0118	Nil
2016-17	Nil	Nil	Nil	0.507	0.046	Nil
2017-18	Nil	Nil	Nil	0.506	0.058	Nil
<b>Total</b>	<b>Nil</b>	<b>Nil</b>	<b>Nil</b>	<b>1.199</b>	<b>0.1158</b>	<b>Nil</b>

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.

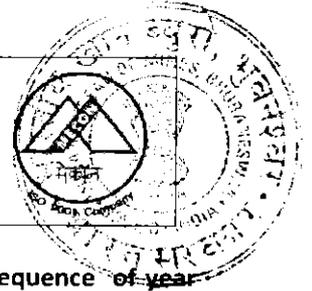
Waste dumping during the plan period has been proposed in the proposed waste dump WD1 between 335400E & 2427720 N to 335700E & 2428150N at Deposit III. Site selected for waste dumping have been proved non mineralized by borehole No. KB/III/DTH/150, KB/III/DTH/151, KB/III/DTH/154, KB/III/DTH/252, KB/III/DTH/398 to 400 & KB/III/DTH/402 and are located outside the mineralized zone beyond ultimate pit limits.

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

All the dumps will be formed by retreating method of dumping, so as to facilitate early reclamation. The height of the individual terrace will be 10 m and the maximum height of the dump will be limited to 60 m. The bank slope angle considered for designing the dump is 37 degrees. Two years of plan period i.e 2013-14 & 2014-15 has already lapsed. Year-wise generation, disposal, configuration and built up for the proposed plan period i.e. FY 2015-16 to 2017-18 is given below.

Year	Waste Generation, M cu. m	Waste Dump Destination	Waste Dump Location	Dumped Waste Quantity, M cu. m	Base Area, Ha	Bottom RL	Top RL	No. of Terrace	Individual Terrace Height, m
2015-16	0.186	WD1	Between 335400E & 2427720 N to 335700E & 2428150N at Deposit III near quarry 2A	0.186	5.747	600	606	1	1st terrace : 6m
2016-17	0.507	WD1		0.507		600	622	3	1st - 2nd terrace : 10m 3rd terrace : 2m
2017-18	0.506	WD1		0.506		600	640	4	1st - 4th terrace : 10m
<b>Total</b>	<b>1.199</b>	<b>WD1</b>		<b>1.199</b>		<b>5.747</b>	<b>600</b>	<b>640</b>	<b>4</b>

**Existing Environmental protection measures**

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

Year	Location	Garland drain		Retaining wall	
		Name/ No.	Size, L x W x H, m	Name/ No.	L x W x H, m
2011-12	Dump of Quarry 1 at Deposit I	-	-	R3	775 x 1.0 x 1.0
	Dump of Quarry 4 at Deposit IV	GD2	325 x 1.0 x 0.75	R2	541 x 1.0 x 1.0

Besides, parapet wall of 368 m length & 1.10 m height has also been constructed during FY 2012-13 along the crusher road side.

**Proposed Environmental Protection Measures**

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

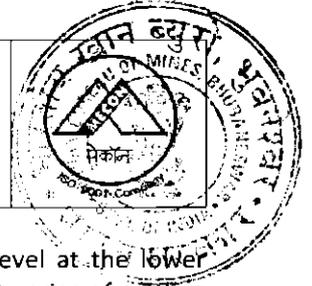
Year	Location	Garland drain		Retaining wall		Settling tank	
		Name/ No.	Length, m	Name/ No.	L x W x H, m	Name/ No.	No.
2015-16	Near proposed waste dump WD1 at	GD1	405	R1	397 x 1.5 x 1.2	SP1	1
	Near Stack yard area	GD4	175	R4	175 x 1.5 x 1.2	SP4	1
	Near Existing Subgrade Dump SG4	GD5	240	R5	234 x 1.5 x 1.2	SP5	1
	Near Existing Subgrade Dump SG5A	GD6	250	R6	250 x 1.5 x 1.2	SP6	1

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The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. A series of settling pits along with a main settling tank of 15 m length at the outlet of the garland drains will be provided to arrest the wash-off solid particles. The settling tank will be provided with three compartments each of around 5m width to arrest the suspended solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. The retaining walls will be of 1.5m height and 1.2 m width at the top and around 1.5m at the base. 05 Nos. & 03 nos. of check dams have been proposed to be constructed in the FY 2016-17 & 2017-18 respectively. Typical design of proposed retaining wall, garland drain & settling pit is given in Annexure – 28.

Besides, following protective measures must also be implemented for safe, scientific & eco-friendly mining.

Period	Protective Measures	Location of Check Dams
2016-17	Construction of 05 Nos. of Check dams	Between 335900 E to 336100E & 2428400N to 2428600N
2017-18	Construction of 03 Nos. of Check dams	Between 334500E to 335700E & 2426400N to 2427500N
Regular cleaning of existing and proposed garland drains		

Typical engineering design of a check dam is given at annexure 37.

The OB dumps will be compacted and afforestation will be carried out on the terraces as well as along the slopes after spreading a layer of top soil over it before rehabilitation.

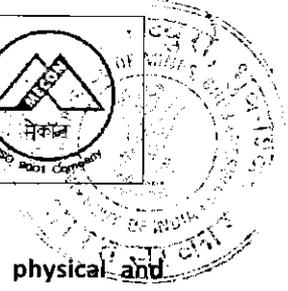
The year-wise plan & sections of the waste dumps have been shown in drawing No. MEC/Q76Q/11/16/13.

  
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**MODIFIED MINING PLAN  
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**5.0 USE OF MINERAL AND MINERAL REJECT**

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

The entire ore production including lumps and fines produced from Khandabandh lease will be consumed in neighbouring steel plants/sponge iron plants of Odisha. Quality parameters of lumps and fines as specified by the steel plants are as follows.

SN	Parameters	Lump Ore	Fines Ore
i	Fe	65.0 % (min)	64.5 % (min)
ii	SiO <sub>2</sub>	2.0 % (max)	2.0 % (max)
iii	Al <sub>2</sub> O <sub>3</sub>	2.0 % (max)	2.0 % (max)
iv	Total Gangue (Al <sub>2</sub> O <sub>3</sub> + SiO <sub>2</sub> )	4.0 % (max)	4.0 % (max)
v	Size	+10 - 40 mm (Over & under size : Max. 5% Each)	Size: - 10mm {with oversize 5% maximum and undersize 20% maximum.

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

Fe	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	P	Moisture	LOI	Size
64% to 65%	2.52%	1.48	0.046%	2.9% Maximum	3% maximum	+5 to -18 mm as well as +10 to -40 mm

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

The entire ore produced will be sold to long term buyers for use in their steel plants. Major probable long term buyers are Bhushan Steel Limited, Vandana Global Limited, Visa Steel Ltd., Gimpex Industries Ltd. & Kalinga Allied Industries.

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

The entire ore produced will be sold to long term buyers for use in their steel plants.

- d) Indicate precise physical and chemical specification stipulated by buyers

The entire ore production including lumps and fines produced from Khandabandh lease will be consumed in neighbouring steel plants of Odisha. Quality parameters of lumps and fines as specified by the long term buyers are as follows.

SN	Parameters	Lump Ore	Fines Ore
i	Fe	62.0 % (min)	60 % (min)
ii	SiO <sub>2</sub>	2.0 % (max)	2.0 % (max)
iii	Al <sub>2</sub> O <sub>3</sub>	2.0 % (max)	2.0 % (max)
iv	Total Gangue (Al <sub>2</sub> O <sub>3</sub> + SiO <sub>2</sub> )	4.0 % (max)	4.0 % (max)
v	Size	+10 - 40 mm	Size: - 10mm.
vi	Tolerance	+/- 10%	+/- 10%

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

Subgrade ore containing 45-55% Fe will be blended with high grade ore at mine site itself. ROM will be sized to the desired range suitable for its use in the steel plants by two-stage crushing & screening in the proposed mobile crushing & screening plant.

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

Subgrade ore containing 45-55% Fe will be blended with high grade ore at mine site itself. ROM will be sized to the desired range suitable for its use in the steel plants by two-stage crushing & screening in the proposed mobile crushing & screening plant. The sized material is dispatched to the long term buyers.

  
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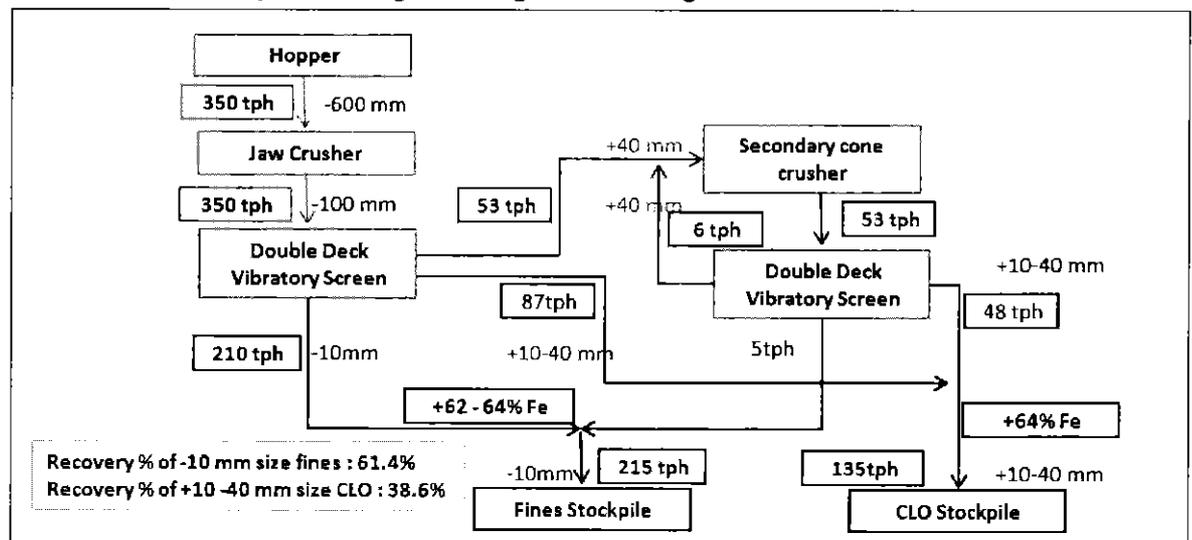
  
(Qualified Person)

**6.0 PROCESSING OF ROM AND MINERAL REJECT**

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

Presently no crushing & screening facility is available at the mines. Therefore, one 350 tph capacity mobile crushing and screening plant has been proposed from FY 2015-16. The ROM from mine will be transported by 25t tippers to the dump hopper of crushing & screening unit. ROM from dump hopper will be fed to a jaw crusher. The product (-100 mm size fraction) of jaw crusher will be fed to a double deck vibratory screen wherein, -10mm, +10-40mm and +40-100mm will be separated. +40 mm material will be carried to secondary cone crusher. product of secondary cone crusher will be subjected to screening in a double deck screen. -10 mm material from primary screen and secondary screen will be conveyed to the fines stockpile. +10-40 mm size CLO from primary screen and secondary screen will be conveyed to the CLO stockpile and +40 mm size material will be re-circulated to secondary cone crusher for further crushing. The CLO & fines generated after screening the crushed product will be loaded by loader and transported through tippers to the respective stockyard. A tentative flow sheet of proposed crushing and screening plant is given below.

**Proposed 2-Stage Crushing and Screening Facilities**



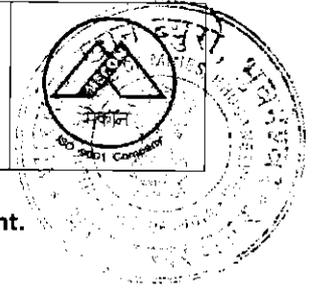
- b) Give a material balance chart with a flow sheet or schematic diagram of the processing procedure indicating feed, product, recovery, and its grade at each stage of processing. The same is given in annexure 27.
- c) Explain the disposal method for tailings or reject from the processing plant.  
Not 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

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- 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.  
Average water requirement at Khandabandh Iron Ore Mine for domestic and industrial use are to the tune of 65 m<sup>3</sup>/day and 102 m<sup>3</sup>/day respectively. Peak water requirement at Khandabandh Iron Ore Mine for domestic and industrial use are to the tune of 65 m<sup>3</sup>/day and 132 m<sup>3</sup>/day, respectively. Water balance chart indicating source, consumption & extent of recycling with average value [peak value] is given in figure 3.4.

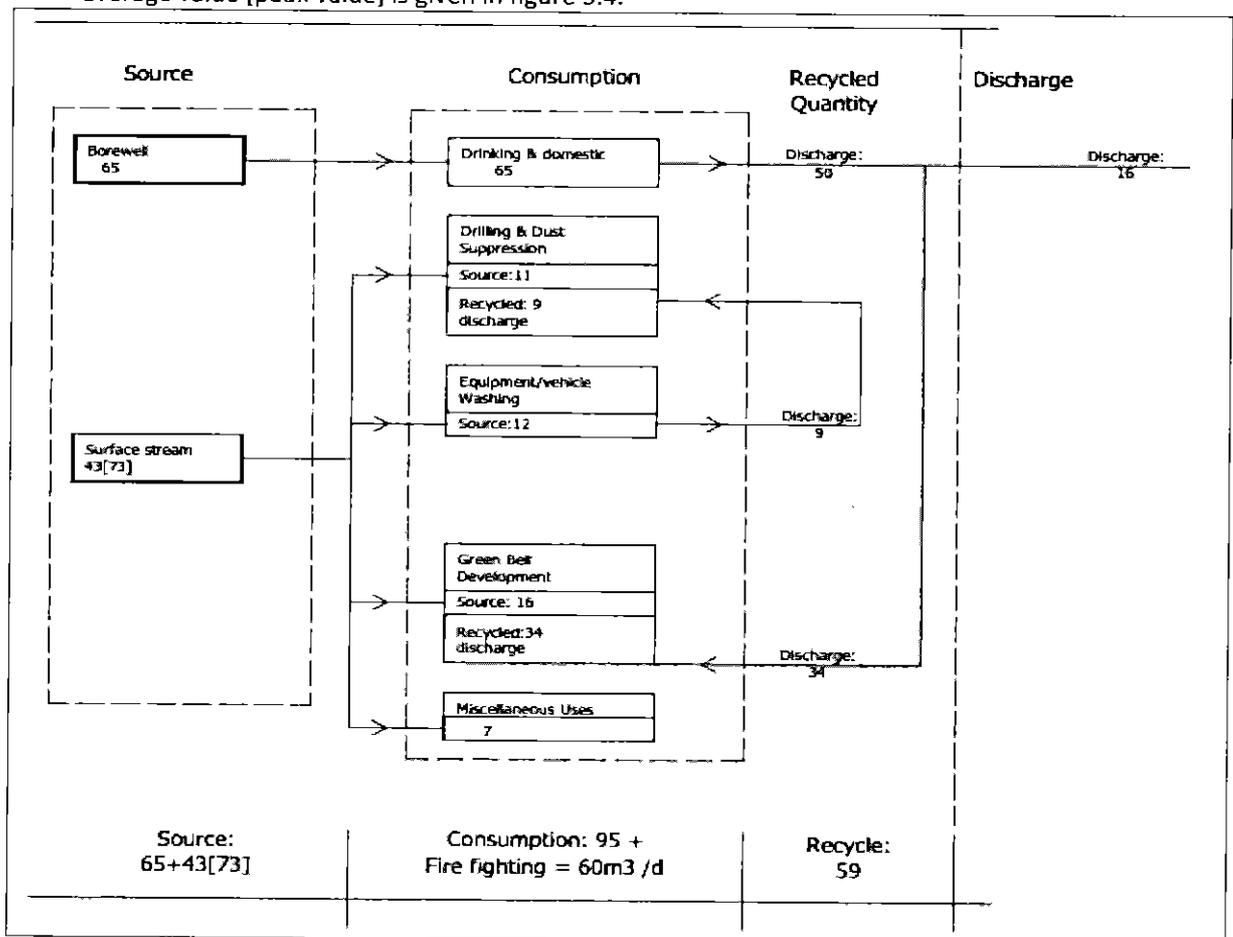


Figure 3.4 : Water balance chart indicating source, consumption & extent of recycling with average value [peak value]

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**MODIFIED MINING PLAN  
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**7.0 OTHER**

**a) Site Services**

Presently following infrastructure are available at Khandabandh Iron ore lease .

**i. Mine Office**

A mine office with survey, mining, geology, administration etc. department is located in the leasehold.

**ii. Township & Guest House**

Township and guest house is located within the lease.

**iv. Other Support Facilities**

All the statutory facilities such as canteen, first-aid centre, Dispensary, vocational training centre, school etc have been provided. To take care of the drinking water needs at different working areas, water tankers have been provided.

Power supply facilities are also available in the township & offices.

**b) Employment Potential:**

Considering the statutory requirement and requirement of various operational departments the estimated executive and non-executive manpower requirement is given in table 7.1.

**Table 7.1: Manpower Requirement**

Category	Total
Administrative	14
Highly skilled	36
Skilled	41
Semi-skilled	124
unskilled	500
<b>Total</b>	<b>715</b>

Details of statutory manpower requirement for Khandabandh Iron Ore Mines are given below.

Statutory Manpower	Nos.
Agent	1
Manager (Mines)	1
Geologist	1
Assistant Manager/Engineer	2
Surveyor	1
Electrical Supervisor	1
Foreman	2
Mining Mate	2
Shotfirer	1
<b>Total</b>	<b>12</b>

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**MODIFIED MINING PLAN  
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**8.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 (B) OF MCDR'1988**

**8.1 Environment Base line information:**

**Existing land use pattern**

The existing land use as on 01.04.2015 is given below:-

Sl. No.	Particulars	Existing Land-use
1	Excavated Area	110.6279
2	Subgrade dump	14.1172
3	Waste dump	1.1198
4	Mineral Storage	7.6729
5	Infrastructure (Workshop, administrative Building,etc)	2.1080
6	Roads & Railways	11.8657
7	Mineral Processing	0.2960
8	Township area	1.8278
	<b>Total</b>	<b>149.6353</b>
9	Magazine(with safety zone)	15.7530
10	Statutory barrier	9.5287
11	Tenaments	2.1186
12	Others	189.2754
	<b>Grand Total</b>	<b>366.3110</b>

**Water regime**

The area has dendritic pattern of drainage because of its hilly topography. The area has dendritic pattern of drainage. Because of the hilly topography, there are numerous seasonal drainage channels but only a few perennial streams / rivers (Kundra Nala, Baitarani River, Karo River). The mine lease is drained by Baitarani River. The seasonal drainage channels coming out of the lease area drain into the Baitarani River which flows at a distance of 2.8 km east of the mine lease. The average annual rainfall as recorded at IMD observatory at Keonjhar is 1269.1 mm. The Southwest monsoon lasts from mid June to mid September and the area gets more than 80% of the annual rainfall during this period.

**Quality of air, water and ambient noise level**

The same is enclosed as Annexure – 19.

**Flora and Fauna**

**Flora**

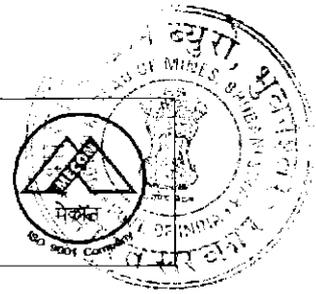
The forest in the leasehold is classified as Northern Tropical Dry Deciduous Forests. The average tree density in core zone is about 1640 trees/ha. The forest is under moderately degraded stage with tree closely spaced and height ranging from 2 to 12m and girth class ranging from 20 to more than 40 cm. Shorea robusta, is the most dominant species with Diospyros melanoxylon, Buchnanian lanzen, Schleicheria oleosa (Kusum), Syzygium cumini (Jamu), Phyllanthus emblica (Aonla), Caserea elliptica (Khakra), Lagerstroemia parviflora (Sidha) etc. as common associates.

  
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**Fauna**

Mongoose, Kuji Neola, Fox, Jackal, rats sloth bear, Cobra, krait, lizard etc. are major faunal species found in the core zone.

**Aquatic Fauna**

The area contains numerous small and large species of fish, the principal ones being Rohu.

**Climatic conditions**

The area lies in tropical region where climate is characterized by very hot summers and cool winters. Summer is typically from March to June when monthly temperature ranges from a maximum of 42°C during daytime to a minimum of 15°C at night. Winter is from November to February when the maximum temperature during day goes up to 37°C and minimum temperature at night becomes as low as 8°C.

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

**Human settlements**

Only Khandabandh, Jaroli, Jajang, Gurda & Jalahuri villages have been found in the 500 m buffer zone of the area. The details of the population of the villages in the buffer zone are given in the table below:-

Name of villages in the buffer zone	Population, Nos.
Khandabandh	1261
Jaroli	3196
Jalahuri	3986
Gurda	275

**Public buildings, places of worship and monuments**

There is no place of archaeological or religious importance within 5 km of the lease.

**Indicate any sanctuary is located in the vicinity of leasehold**

No sanctuary is located in the vicinity of leasehold

Environment plan of the mine is shown in drawing no. MEC/Q76Q/11/16/14.

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

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

The land use in stages is given below:-

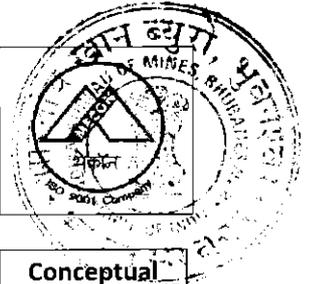
Sl. No.	Particulars	Existing Land-use	Land use at the end of 2017-18	Conceptual Land use
1	Excavated Area	110.6279	115.3251	200.5192
2	Subgrade dump	14.1172	14.1172	6.9662
3	Waste dump	1.1198	1.1198	0.2587
4	Mineral Storage	7.6729	7.3201	3.9991
5	Infrastructure (Workshop,	2.1080	2.1080	2.0705

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Sl. No.	Particulars	Existing Land-use	Land use at the end of 2017-18	Conceptual Land use
	administrative Building,etc)			
6	Roads & Railways	11.8657	11.5271	3.2875
7	Mineral Processing	0.2960	0.2960	0.2960
8	Township area	1.8278	1.8278	1.8278
	<b>Total</b>	<b>149.6353</b>	<b>153.6411</b>	<b>219.2250</b>
9	Magazine(with safety zone)	15.7530	15.7530	6.9568
10	Statutory barrier	9.5287	9.5287	9.5287
11	Tenaments	2.1186	2.1186	2.1186
12	Others	189.2754	185.2696	128.4819
	<b>Grand Total</b>	<b>366.3110</b>	<b>366.3110</b>	<b>366.3110</b>

**ii) Air quality**

Following measures are proposed for management of air quality:-

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

**iii) Water quality**

The water table will not be touched during the proposed plan period. However due to surface run offs there will be likely impact on the surface water quality. Depending upon the drainage pattern of the area where the dump area is located, retaining walls, garland drain with settling tanks will be provided. The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. A series of settling pits along with a main settling tank of 15 m length at the outlet of the garland drains will be provided to arrest the wash-off solid particles. The settling tank will be provided with three compartments each of around 5m width to arrest the suspended solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. The retaining walls will be of 1.5m height and 1.2 m width at the top and around 1.5m at the base. 05 Nos. & 03 nos. of check dams have been proposed to be constructed in the FY 2016-17 & 2017-18 respectively. Typical design of proposed retaining wall, garland drain & settling pit is given in Annexure – 28.

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

Year	Location	Garland drain		Retaining wall	
		Name/ No.	Size, L x W x H, m	Name/ No.	L x W x H, m
2011-12	Dump of Quarry 1 at Deposit I	-	-	R3	775 x 1.0 x 1.0
	Dump of Quarry 4 at Deposit IV	GD2	325 x 1.0 x 0.75	R2	541 x 1.0 x 1.0

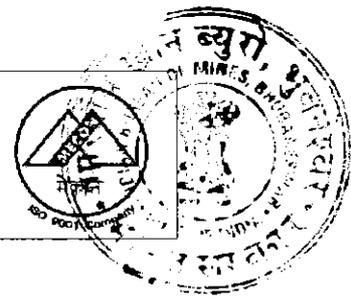
Besides, parapet wall of 368 m length & 1.10 m height has also been constructed during FY 2012-13 along the crusher road side.

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The details of the protective measures envisaged for the dumps are given below:-

Year	Location	Garland drain		Retaining wall		Settling tank	
		Name/ No.	Length, m	Name/ No.	L x W x H ,m	Name/ No.	No.
2015-16	Near proposed waste dump WD1 at	GD1	405	R1	397 x 1.5 x 1.2	SP1	1
	Near Stack yard area	GD4	175	R4	175 x 1.5 x 1.2	SP4	1
	Near Existing Subgrade Dump SG4	GD5	240	R5	234 x 1.5 x 1.2	SP5	1
	Near Existing Subgrade Dump SG5A	GD6	250	R6	250 x 1.5 x 1.2	SP6	1

**iv) Noise levels**

Due to operation of the HEMM & plant, ambient noise levels is likely to increase but the same will be managed through proper maintenance of the plant & machineries & use of personal protective equipment.

The monitoring of ambient air quality, surface water & ground water quality and noise quality will be carried out for all the four quarters of the year by the forest & environment section of OMC /External agency. The details of the monitoring stations are given in the table below:-

The results of the ambient air quality / noise quality monitoring reports prior to suspension of mining operation as enclosed in Annexure – 19 indicates that the quality parameters are within the acceptable levels.

**Location of Ambient Air Quality Monitoring Stations**

Stn. Code	Location	Distance & Direction from center of lease
A-87	Khandabandha dispensary	Core zone
A-92	Jaribahal	2.00 km SE
A-79	Chilkapata	2.25 km NNE
A-86	Khandabandha camp	2.25 km NW
A-78	Jalhari	2.50 km NE
A-93	Palsha II*	2.50 km S
A-94	Gurda	3.25 km SW
A-95	Pataberha	4.25 km WSW
A1	Near Hutment of Khandabandh Village	Core zone
A2	Near Deposit I (Quarry – 1)	Core zone
A3	Near Deposit V (Quarry – 3)	Core zone

**Location of Surface/ground Water Sampling Stations**

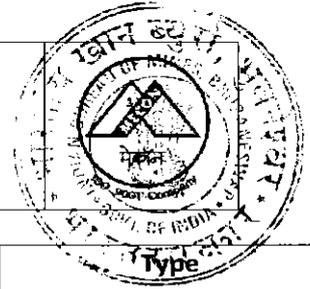
Stn. No.	Location	Type
SW-35	Jururhi Nala near lease area	Surface water
SW-36	U/S of Jururhi Nala from River Baitarni	Surface water
SW-37	D/S of Jururhi Nala from River Baitarni	Surface water
SW1	Near Lease Pillar 7 & 8 in upstream side	Surface water
SW2	Near Lease Pillar 55 in upstream side	Surface water

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Stn. No.	Location	Type
SW-35	Jururhi Nala near lease area	Surface water
SW3	Near Lease Pillar 35 & 36 in upstream side	Surface water
SW4	Downstream side of Jalahuri Nala near Lease Pillar 24	Surface water
GW-54	Khandbandh Dispensary	Ground water
GW-57	Jarhibahal	Ground water
GW-58	Palsha	Ground water
GW-59	Gurda	Ground water
GW-61	Jururhi	Ground water

**Location of Noise Monitoring Stations**

Stn. No.	Location	Core Zone /Buffer Zone
N-57	Jalhari	Buffer zone
N-66	Jarhibahal	Buffer zone
N-67	Gurda	Buffer zone
N-68	Western side of lease	Buffer zone
N-69	Khandband dispensary	Core zone
N1	Near Hutment of Khandabandh Village	Core zone
N2	Near Deposit I (Quarry – 1)	Core zone
N3	Near Deposit V (Quarry – 3)	Core zone

**v) Vibration levels (due to blasting)**

The blast induced ground vibrations will be controlled through limiting the charge per delay and use of in-hole delay by NONEL means of initiation. The blasting frequency will be limited to 3-4 times per week. It is proposed to undertake blasting studies/ground vibration monitoring studies by an expert agency to determine the maximum charge/delay to keep the ground vibration level within permissible limit.

**vi) Water regime**

It is to be noted that the existing groundwater levels are well below the ore-body floor, expectedly more than 35 m bgl. These would therefore remain unaffected by mining operations.

**vii) Acid mine drainage**

Not applicable

**viii) Surface subsidence**

Not applicable

**ix) Socio-economics**

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

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**x) Historical monuments etc.**

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

The environment management plan is shown in drawing no. MEC/Q76Q/11/16/15.

**8.3 Progressive Reclamation Plan :**

**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".**

Around 5.747 Ha area of proposed waste dump WD1 will be afforested with 9196 nos. of saplings at the end of FY 2017-18 and will be stabilized. As the ore continues upto 480 mRL, concurrent backfilling in the mined out benches is not possible during the proposed plan period.

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

No top soil will be generated during the year 2015-16 to 2017-18.

Year	Top soil generation
2015-16	Nil
2016-17	Nil
2017-18	Nil

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

Not applicable

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

Not applicable

**8.3.5 Surface subsidence mitigation measures through backfilling of mine voids or by any other means and its monitoring mechanism. The information on protective measures for reclamation and rehabilitation works year wise may be provided as per the following table.**

**Summary of year-wise proposal for item no. 8.3 for the FY 2015-16**

Items	Details	Cumulative Actual Carried out till date (Upto 01.04.2015)	Proposed
Dump management	Area afforested (ha)	NIL	NIL
	No of saplings planted	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Cost including watch and care during the year.	NIL	NIL
	Construction of Parapet walls/ Retaining wall at toe of dumps - 4 Nos. Size - 397m (L) x 1.5 (H) x 1.2 (W) Size - 175m (L) x 1.5 (H) x 1.2 (W) Size - 234m (L) x 1.5 (H) x 1.2 (W) Size - 250m (L) x 1.5 (H) x 1.2 (W)	Rs. 56.84 Lakh (Garland drain – 325 m, Crater Boulder – 1361m, Settling Pit- 2Nos., RCC Parapet wall – 368 m)	Rs. 36.96 Lakh

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Items	Details	Cumulative Actual Carried out till date (Upto 01.04.2015)	Proposed
	Construction of settling ponds, Garland drain etc. 1. Garland drain – 4 Nos. Size - 405m(L) x 1.5 m (W) x 1m (D) Size - 175m (L) x 1.5 (H) x 1 (D) Size - 240m (L) x 1.5 (H) x 1 (D) Size - 250m (L) x 1.5 (H) x 1 (D) 2. Settling Tank - 4 Nos. Size - 15 m(L) x 10 m (W)		Rs 4.30 Lakh
	Terracing of existing dumps		NIL
Management of worked out benches	Area available for rehabilitation (ha)	NIL	NIL
	Afforestation done(ha)	NIL	NIL
	No of saplings planted in the year	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Any other method of rehabilitation (specify)	NIL	NIL
	Cost including watch and care during the year	NIL	NIL
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	NIL	NIL
	Void filled by waste /tailings	NIL	NIL
	Afforestation on the backfilled area	NIL	NIL
	Rehabilitation by making water reservoir	NIL	NIL
	Any other means (specify)	NIL	NIL
Rehabilitation of waste land within lease	Area available (ha)	NA	NA
	Plantation carried out (within present retained ML area)	NIL	-
	Plantation carried out (within surrendered ML area)	NIL	-
	Check dams (within retained/ surrendered area)	NIL	-
	Method of rehabilitation	NA	NA
Others (specify)	Total no of saplings planted Inside lease area during FY 2015-16 (actual upto 01.04.2015).	2000 Nos.	500 Nos.
	Total cost including watch and care during the FY 2015-16 (actual upto 01.04.2015).	-	7500
	Total cost including ambient air quality monitoring during FY 2015-16 (actual upto 01.04.2015).	Rs. 5.80 Lakh	Rs. 12.50 Lakh
	Construction of check dam - 05 Nos.	Included in Rs. 56.84 Lakh above	Rs. 50 Lakh

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**Summary of year-wise proposal for item no. 8.3 for the FY 2016-17**

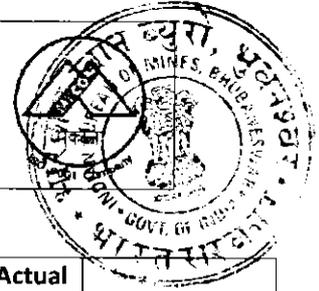
Items	Details	Cumulative Actual Carried out till date (Upto 01.04.2015)	Proposed
Dump management	Area afforested (ha)	NIL	NIL
	No of saplings planted	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Cost including watch and care during the year.	NIL	NIL
	Construction of Parapet walls/ Retaining wall at toe of dumps	Rs. 56.84 Lakh (Garland drain – 325 m, Crater Boulder – 1361m, Settling Pit- 2Nos., RCC Parapet wall – 368 m)	NIL
	Construction of settling ponds, Garland drain etc.		NIL
	Terracing of existing dumps		NIL
Management of worked out benches	Area available for rehabilitation (ha)	NIL	NIL
	Afforestation done(ha)	NIL	NIL
	No of saplings planted in the year	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Any other method of rehabilitation (specify)	NIL	NIL
	Cost including watch and care during the year	NIL	NIL
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	NIL	NIL
	Void filled by waste /tailings	NIL	NIL
	Afforestation on the backfilled area	NIL	NIL
	Rehabilitation by making water reservoir	NIL	NIL
	Any other means (specify)	NIL	NIL
Rehabilitation of waste land within lease	Area available (ha)	NA	NA
	Plantation carried out (within present retained ML area)	NIL	-
	Plantation carried out (within surrendered ML area)	NIL	-
	Check dams (within retained/ surrendered area)	NIL	-
	Method of rehabilitation	NA	NA
Others (specify)	Total no of saplings planted outside lease area during FY 2016-17 (actual upto 01.04.2015).	2000 Nos.	500 Nos.
	Total cost including watch and care during the FY 2016-17 (actual upto 01.04.2015).	-	7500
	Total cost including ambient air quality monitoring during FY 2016-17 (actual upto 01.04.2015).	Rs. 5.80 Lakh	Rs. 12.50 Lakh
	Construction of check dam - 03 Nos.	Included in Rs. 56.84 Lakh above	Rs.30 Lakh

  
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**Summary of year-wise proposal for item no. 8.3 for the FY 2017-18**

Items	Details	Cumulative Actual Carried out till date (Upto 01.04.2015)	Proposed
Dump management	Area afforested (ha)	NIL	NIL
	No of saplings planted	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Cost including watch and care during the year.	NIL	NIL
	Construction of Parapet walls/ Retaining wall at toe of dumps	Rs. 56.84 Lakh (Garland drain – 325 m, Crater Boulder – 1361m, Settling Pit- 2Nos., RCC Parapet wall – 368 m)	NIL
	Construction of settling ponds, Garland drain etc.		NIL
	Terracing of existing dumps No. of terrace - Nil Total terrace length - Nil		NIL
Management of worked out benches	Area available for rehabilitation (ha)	NIL	NIL
	Afforestation done(ha)	NIL	NIL
	No of saplings planted in the year	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Any other method of rehabilitation (specify)	NIL	NIL
	Cost including watch and care during the year	NIL	NIL
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	NIL	NIL
	Void filled by waste /tailings	NIL	NIL
	Afforestation on the backfilled area	NIL	NIL
	Rehabilitation by making water reservoir	NIL	NIL
	Any other means (specify)	NIL	NIL
Rehabilitation of waste land within lease	Area available (ha)	NA	NA
	Plantation carried out (within present retained ML area)	NIL	-
	Plantation carried out (within surrendered ML area)	NIL	-
	Check dams (within retained/ surrendered area)	NIL	-
	Method of rehabilitation	NA	NA
Others (specify)	Total no of saplings planted outside lease area during FY 2017-18 (actual upto 30.09.2014).	2000 Nos.	500 Nos.
	Total cost including watch and care during the FY 2017-18 (actual upto 01.04.2015).	-	7500
	Total cost including ambient air quality monitoring during FY 2017-18 (actual upto 01.04.2015).	Rs. 5.80 Lakh	Rs. 12.50 Lakh

  
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**Time scheduling for abandonment**

A tentative time frame for completion of jobs for mine closure operation (in months) during the FY 2015-16 to FY 2017-8 is shown in table below.

**Time scheduling for abandonment**

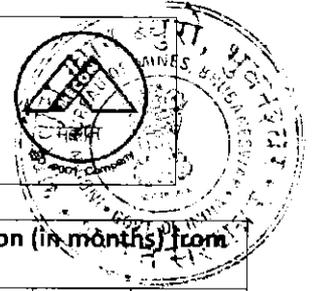
Activities	Tentative time frame for completion of jobs for mine closure operation (in months) from date of cessation.											
	Months →	1	2	3	4	5	6	7	8	9	10	11
Reclamation & Rehabilitation of mined out land.	Since the orebody continues upto 480 mRL & present mine working is to be confined within the existing broken area, simultaneous backfilling is not possible in the plan period. The waste generated from the Khandabandh iron ore mines has been proposed be dumped in external dumps											
Waste Management	A total of 1.199Mm <sup>3</sup> of waste will be generated from entire Khandabandh Iron ore lease during plan period. Out of which, 0.186 Mm <sup>3</sup> , 0.507 Mm <sup>3</sup> & 0.506 Mm <sup>3</sup> waste generated during year 2015-16, 2016-17 & 2017-18 will be dumped in proposed waste dump WD1. The manner of disposal of wastes during the plan period is given below.											
	<b>Manner of disposal of wastes</b>											
		<b>Year</b>	<b>Waste Dump Destination</b>	<b>Waste Dump Location</b>				<b>Dumped Waste Quantity, M cu. m</b>	<b>Bottom RL</b>	<b>Top RL</b>		
		2015-16	WD1	Deposit III near quarry 2A				0.186	600	606		
		2016-17	WD1	Deposit III near quarry 2A				0.507	600	622		
		2017-18	WD1	Deposit III near quarry 2A				0.506	600	640		
		<b>Total</b>	<b>WD1</b>	<b>Deposit III near quarry 2A</b>				<b>1.199</b>	<b>600</b>	<b>640</b>		
	<b>Proposed Environmental Protection Measures</b>											
	Following environmental protection measures have been proposed for dump stabilization & water quality management.											
		<b>Year</b>	<b>Location</b>	<b>Garland drain</b>		<b>Retaining wall</b>		<b>Settling tank</b>				
			<b>Name/No.</b>	<b>Length, m</b>	<b>Name/No.</b>	<b>L x W x H, m</b>	<b>Name/No.</b>	<b>No.</b>				
	2015-16	Near proposed waste dump WD1 at	GD1	405	R1	397 x 1.5 x 1.2	SP1	1				
		Near Stack yard area	GD4	175	R4	175 x 1.5 x 1.2	SP4	1				
		Near Existing Subgrade Dump SG4	GD5	240	R5	234 x 1.5 x 1.2	SP5	1				
		Near Existing Subgrade Dump SG5A	GD6	250	R6	250 x 1.5 x 1.2	SP6	1				
The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. A series of settling pits along with a main settling tank of 15 m length at the outlet of the garland drains will be provided to arrest the wash-off solid particles. The settling tank will be provided with three compartments each of around 5m width to arrest the suspended												

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Activities	Tentative time frame for completion of jobs for mine closure operation (in months) from date of cessation.												
	Months →	1	2	3	4	5	6	7	8	9	10	11	12
	solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. The retaining walls will be of 1.5m height and 1.2 m width at the top and around 1.5m at the base. 05 Nos. & 03 nos. of check dams have been proposed to be constructed in the FY 2016-17 & 2017-18 respectively.												
Decommission of infrastructure												→	→
Safety & Security	→												→
Monitoring of air & water	→												→
Disposal of mining m / c.												→	→

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

The objective of on-site disaster management plan for the mine is to be in a state of perpetual readiness through training and development to immediately control and arrest any emergency situation so as to avert a full fledged disaster and the consequence of human and property damage and in the event of a disaster still occurring, to manage the same so that the risk of the damage to life and property in minimized.

Key elements of a disaster management plan are.

- i. Risk Identification
- ii. Preventive measures for potential risks.
- iii. Defining the responsibility at different levels to tackle the hazard situation & establishing an effective communication channel for flow of information.
- iv. Action plan for handling the emergency situation i.e. on-site & off-site.
- v. establishing emergency response centres.

**i. Risk Identification**

Following risks have been identified for Khandabandh Iron Ore Mines.

1. Surface fire.
2. Failure of slope in the bench & dumps.
3. Fly rock from blasting operations
4. Possible accidents due to HEMM

**1. Code of Practice in Case of Fire at Mines**

**Source of Fire:-**

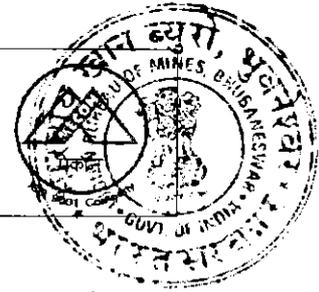
- i) HEMM
- ii) Oil & Lubricant Room.
- iii) Diesel Pump/storage area
- iv) Electrical equipment/substations

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**3. Fly rock from blasting operation**

Main reason of fly rock due to blasting is Improper blast design i.e less stemming, inadequate burden & spacing, high charge concentration, improper delay, presence of geological discontinuities such as joints, faults, muds etc.

Following measures shall be taken to prevent accident due to fly rock.

- Blasting operation shall be carried out under the supervision of assistant manager/manager (Blasting)
- Code of signaling should be strictly followed during blasting.
- Proper blast design
- Controlled blasting should be adopted.
- No person other than required for blasting shall be allowed to enter the mines during blasting.

**4. Possible accidents due to HEMM**

Following safety measures shall be taken to prevent an accident due to HEMM.

**a. General Safety Procedures During Dumper/Tipper Operation**

- Before moving the dumper/tipper, always give a warning signal. Sound the following code horn before moving the vehicle:
  - Moving forward - 2 beeps
  - Moving backward - 3 beeps
- During operation of dumper/tipper, always keep the cabin doors closed.
- During night, always use dipper while approaching an oncoming vehicle.

**b. Safety procedures during travelling of dumper/tipper**

- Operate the dumper/tipper in reverse only if there is a clear view of the area behind the vehicle or with the assistance of an authorized spotter. Give an audible warning signal before reversing a dumper/tipper.
- Where there are no separate lanes for two-way traffic, give way to the oncoming dumper/tipper cautiously.
- As far as possible, avoid turning the dumper/tipper on a slope. It may cause the machine to roll over or slip sideways.
- As far as possible, do not reverse loaded dumper/tippers on gradient.
- Before starting up or down a grade, select a transmission gear range that will ensure safe driving and provide control of the vehicle under all conditions.
- Negotiate downhill gradients in low gear so that minimum of braking is required.
- Do not shift gears or run the dumper/tipper in neutral on steep down slopes.
- Do not drive dumper/tipper over sharp stones and boulders.
- If any stone or boulder is found on the road, inform the spotter or incharge to get it removed to avoid any damage to the machine components.

**c. Safety Procedures During Operation**

- Always press the accelerator pedal gradually so as to achieve smooth acceleration.
- Do not operate the steering wheel fast. This may overturn the dumper/tipper.
- Do not brake suddenly.

  
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- Avoid fanning the treadle by partial, intermittent applications while using service brakes as this may cause reduction in air pressure level to dangerous limits. So use service brakes sparingly and only when necessary.
- Use the right gear and speed to match load conditions.
- Before engaging the transmission from neutral to forward or reverse, ensure that the engine is at idle speed. Before shifting the gear from forward to reverse or reverse to forward, apply brakes to completely stop the dumper/tipper, otherwise the transmission may get damaged.
- Shift the gears from one to five one by one, otherwise the transmission may get damaged.
- Use retarder brake sparingly as excessive use of retarder brake heats up the transmission. Retarder brake should not be applied for more than 30 seconds at a time.
- Do not use dump brakes while the dumper/tipper is in motion.
- Except in case of emergency, use parking brake only for parking the dumper/tipper.
- Never take the dumper/tipper too close to an overhang or an unsafe edge that may collapse.
- Pull into the loading area with caution. Remain at a safe distance while dumper/tipper ahead of you is being loaded.
- When approaching loading equipment, sound the audible warning signal and do not attempt to pass the loading equipment unless there is a proper audible signal in reply.
- Avoid backing over rocks at the shovel and dump areas.
- For loading, place the dumper/tipper on a level ground.
- When the dumper/tipper is being loaded, stay in the dumper/tipper cab or sufficiently far enough from dumper/tipper to avoid being struck by flying fragments.
- When the dumper/tipper is being loaded, do not take your head out of the cab window.
- Ensure that the dumper/tipper is not overloaded and the material is not loaded in such a way so as to project horizontally beyond the sides of its body.
- Do not drive nose-to-tail particularly behind a vehicle with twin rear wheels, from which a stone piece wedged between tyres may fly back into the windscreen of your vehicle. Maintain a distance of 50 feet on level ground and 100 feet on a ramp from the vehicle in front of you.
- If the lights at the crusher hopper are on (indicating that the material should not be dumped into it), do not unload the dumper/tipper.
- While raising the dumper/tipper body, release the accelerator pedal slowly just before the body reaches the desired position.
- After dumping the material, move the dumper/tipper only after completely lowering the dump body.
- Never turn front wheels, particularly on loaded dumper/tippers unless the dumper/tipper has some fore or aft movement. Such stress can literally shear the tread from the carcass.

**d. Safety Procedures During Dumping/Tipping**

The operator should take the following precautions during tipping on stockpiles and dumping of overburden:

- While doing the first tipping, it should be done at a distance of 3 meter from the edge.
- On entering a tipping/dumping area, the operator should visually check the general area of the tip, especially in the dumping area.

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- Backing visibility is available only to the driver's side of the dumper/tipper. So make sure that there are no personnel or any obstructions on the other side.
- All care should be taken regarding the positioning of the dumper/tipper's rear wheels at the tipping face. A dumper/tipper should not back up to an area that has not been visually inspected by the operator.
- If a spotter is present, follow his signals.
- Be especially careful of soft edges and cracks.
- When dumping in an area where no berm is present (e.g. construction of a new haul road where material would be laid down in layers), material should be tipped short of any edge.
- Dumper/tippers tipping over the berm should back up squarely to the berm.
- After positioning the dumper/tipper for tipping, the operator should raise the hoist only after making sure that the dumper/tipper is stationary and on a level ground, transmission is in neutral and dumping brakes are applied.
- As soon as the material has been dumped out from the dumper/tipper, release dump brake, shift transmission into 1st or 2nd forward gear and at the same time depress the accelerator pedal to move away from the dump area slowly and carefully.
- As the dumper/tipper starts moving, pull the hoist control lever all the way down to lower the dump body.
- During these operations, do not stop anywhere for unnecessary reasons and the operator must always remain in the cabin.
- If at any time the operator considers the operation unsafe, it should be immediately reported to the manager or the in charge.

**e. Safety Procedures While Parking**

- When not in use, move the dumper/tipper and park it at a proper parking place.
- While parking the dumper/tipper at the workshop or work site, do not park in a haphazard way.
- When parking the machine, park it in a safe place outside the working area or in the specified place. It should be parked on flat, firm ground where there is no danger of rock falls or landslides. Ensure that the gear is in neutral position before stopping the engine. Make sure that the dump body is in down position. Apply parking brakes. While leaving the operator's seat, switch off the engine and all the electrical accessories that are not in use, remove the ignition key and lock the cabin.
- While parking the dumper/tipper always apply parking brakes.
- Do not stop or park on a haul road unless unavoidable. If you must stop, move dumper/tipper to a safe place. If this is impossible, adequately fence the area with big enough boulders to caution other operators.
- If a disabled dumper/tipper is to be left on a haul road, apply parking brake and block the wheels securely. Adequately fence the area with big enough boulders to caution other operators.
- Never park the dumper/tipper on slopes.
- If the conditions are such that the dumper/tipper has to be parked on a slope, apply parking brakes, steer the wheels away from center and block the wheels securely.
- As far as possible, park the machine on a level ground. Correct level of lubricants is indicated only if the machine is parked on a level ground.

  
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**Fixing the Responsibility & establishing communication channel**

Following officers of the mines will be responsible for co-ordination in case of emergency situation in any part of the mine.

Person	Responsibility
Head of Department / Mine Agent	Site Controller
Mines Manager / Shift in-charge	Accident Controller / Communication Officer
Employee who gives the first information about the incident / accident	Primary Controller
P & A Department (HOD)	Liaison Officer

**Key Personnel and their responsibilities**

Site Controller:

- The head of the department / mine agent shall have an overall responsibility for controlling the incident / accident and directing the personnel.
- To prepare a full proof plan for control of accident like, slope failure, fire, fly rock, flood and other natural calamities.
- To inform statutory bodies of the State and Central Government.
- To inform communication officer about the emergency, control centre and assembly point.
- To provide all assistance and call for fire squad, security officer and other services required for removing / control of danger.
- To ensure that all necessary personnel assemble at assembly point.
- Make arrangement for medical treatment to the personnel injured seriously.

Accident Controller:

- Mines manager shall act as accident controller/ communication officer.
- Mock rehearsal of management plan prepared for accident.
- To withdraw men / machine from the affected area with priority for safety of personnel, minimize damage to the machines, environment and loss of material.
- To make a report based on the facts and figure and submit to the site controller.
- To communicate to the site in charge and make arrangement for first aid and transportation of the injured personnel.

Primary Controller:

- To inform the Accident Controller / shift in-charge from the nearest means of communication about the location and the nature of accident.
- To assist in clearing any obstruction in relief of accident.
- To carry out all instructions of accident controller.
- To provide first aid treatment and communicate to the shift in-charge.

**Emergency Control Centers**

The emergency control center is the place from where the operations to handle the emergency will be directed and coordinated. The site main controller, key personnel and the senior officers of the fire and police services will attend it. The center will be equipped to receive and transit information and directions from and to the incident controller and other areas of the works, as well as outside.

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



Emergency control centers will therefore contain the following:

- (a) In-charge of external telephone;
- (b) An adequate of internal telephones;
- (c) A plan of the works, to show:
  - (i) Areas where there are large inventories of hazardous materials, if any;
  - (ii) Sources of safety equipment;
  - (iii) The fire-fighting system.
  - (iv) Site entrance and roadways, including up-to-date information on roadworks;
  - (v) Assembly points;
  - (vi) The location of the mines in relation to the surrounding community;
- (d) Notepads, pens and pencils;
- (e) A nominal roll of employees;
- (f) A list of key personnel, with addresses, telephone numbers, etc. The emergency control center should be sited in an area of minimum risk.

**Role of the Police**

The police normally assume the overall control of an emergency, with a senior officer designated as emergency coordinating officer. Normal duties of the police during an emergency include protecting life and property and controlling traffic movements. The functions include controlling bystanders, evacuating the public, identifying the dead and dealing with casualties and informing relatives of dead or injured.

**Role of the Fire Authorities**

The control of a fire is normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site. The senior fire brigade officer may also have a similar responsibility for other events, such as explosions and toxic releases. Fire authorities having major hazard works in their area should have familiarized themselves with the location on site of all stores of flammable materials, water and foam supply points and fire-fighting equipments.

**Role of the Health authorities**

Health authorities, including doctors, surgeons, hospitals, ambulances and so on, have a vital part to play following a major accident and they should form an integral part of any emergency plan. For major fires, injuries will be the result of the effects of thermal radiation to a varying degree and the knowledge and experience to handle this in all, but extreme, cases may be generally available in most hospitals.

**Capability of Lessee:**

Following facilities are available at mine site:

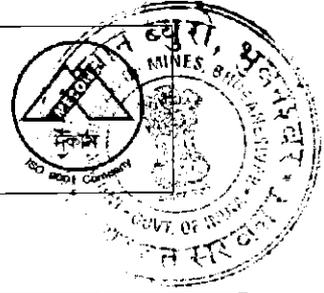
- Telephone / Mobile handsets
- Runners / Messenger
- Emergency alarm
- Fire fighting equipment and accessories with trained manpower
- Training centre
- Fire extinguishers
- Dispensary & Ambulance van
- Jeeps

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



List of contact person of mines in case of emergency is given below.

**List of contact person of mines in case of emergency**

Name	Designation & Department	Address	Contact No.
Shri Laxmi Narayan Ghana	Regional Manager	Regional Office OMC Ltd., P.O.- Barbil Via- Barbil, Dist. – Keonjhar Odisha - 758035	06767-275253
Shri Manoj Kumar Sethy	Mines Manager	OMC Ltd., Village: Khandabandh, P.O.- Joda, Taluka : Joda Dist. – Keonjhar Odisha	06767-214023 +919437883572
Shri D Manoharan	Geologist	OMC Ltd., Village: Khandabandh, P.O.- Joda, Taluka : Joda Dist. – Keonjhar Odisha	+919438021255

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

When the mine is temporarily discontinued due to any unforeseen circumstances the following care and maintenance shall be carried out:

- Notice to be served to all the concerned authority.
- Temporary fencing shall cover the mine entries.
- All access roads/openings to the pit / face shall be closed by parapet wall as per rule.
- Warning shall be displayed on the 'Notice Board' at appropriate places.
- Security personnel shall be posted at every danger point.
- No unauthorized person shall be allowed to enter into the mine without prior permission of the management.
- Environmental protection measures such as retaining walls, garland drains & settling pits shall be made all around the mine and dumps to prevent water flow towards mine for prevention of landslide/side fall and siltation etc.
- All men and machinery shall be withdrawn from the mine and shall be kept in a compound and safe place.

  
(Qualified Person)

  
(Qualified Person)



भारत सरकार  
खान मंत्रालय  
भारतीय खान ब्यूरो  
क्षेत्रीय खान नियंत्रक का कार्यालय

**BY E.MAIL / REGD. PARCEL**

Fax No. (0674) 2352490

E-mail: ro.bhubaneswar@ibm.gov.in

No. MPM/FM/14-ORI/BHU/2015-16 // 605

Plot No.149, Pokhariput,  
Bhubaneswar,  
Odisha-751 020.  
दिनांक / Date: 14.09.2016

To

Shri Vineel Krishna, IAS,  
Managing Director,  
M/s OMC Limited,  
OMC House, Bhubaneswar,  
Odisha – 751001.

Sub: Approval of Modified Mining Plan along with Progressive Mine Closure Plan under Rule-17 of MCR 2016 of Khandabandh Iron Ore Mines of M/s Odisha Mining Corporation Limited over an area of 366.311 HA in Keonjhar district of Odisha.

Ref:

- Your letter no. 15409/PMC/OMC/2015 dated 01.12.2015.
- This office letter of even no. dated 03.12.2015.
- This office letter of even no. dated 14.12.2015 addressed to the Director of Mines, Govt. of Odisha, copy endorsed to you.
- This office letter of even no. dated 02.03.2016.
- Your qualified person letter no. 11.16.Q76QSOM.IBM dated 23.03.2016.
- This office letter of even no. dated 04.05.2016.
- Your letter no. 8018/OMC/PMC/2016 dated 01.06.2016.
- This office letter of even no. dated 07.07.2016.
- Your letter no. 10675/OMC/PMC/2016 dated 20.07.2016.
- Your letter no. 12712/OMC/PMC/2016 dated 01/02.09.2016.
- Your letter no. 12844/OMC/PMC/2016 dated 07.09.2016.

Sir,

In exercise of the power delegated to me under Rule 17 (3) of Mineral Concession Rules, 2016 vide Gazette Notification No. S.O. 1857 (E) dated 18.05.2016, I hereby Approve the Modified Mining Plan including Progressive Mine Closure Plan of Khandabandh Iron Ore Mines over an area of 366.311 ha of M/s Odisha Mining Corporation Limited in Keonjhar district of Odisha State submitted under Rule 17 (3) of Mineral Concession Rules, 2016. This approval is subject to the following conditions:

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

- iv. Indian Bureau of Mines has not undertaken verification of the mining lease boundary on the ground and does not undertake any responsibility regarding correctness of the boundaries of the leasehold shown on the ground with reference to lease map & other plans furnished by the applicant / lessee.
- v. At any stage, if it is observed that the information furnished, data incorporated in the document are incorrect or misrepresent facts, the approval of the document shall be revoked with immediate effect.
- vi. If this approval conflicts with any other law or court order/ Direction under any statute, it shall be revoked immediately.
- vii. Validity of this document shall expire on the day, as per the provision of MMDR Amendment Act 2015 dated 26.03.2015 or on 31.03.2018 whichever is earlier.

**Encl:** - One copy of approved Modified Mining Plan.

भवदीय / yours faithfully,

14/9/16  
(M BISWAS)

क्षेत्रीय खान नियंत्रक / Regional Controller of Mines

Copy for kind information to:-

1. MECON Limited, RM & Mining Section, P.O. Doranda, Ranchi-834 002, Jharkhand.
2. The Director of Mines, Directorate of Mines, Government of Odisha, Heads of the Department Building, New Capital, Bhubaneswar- 751001, Odisha along with one copy of approved Modified Mining Plan by **REGISTERED PARCEL**.

(M BISWAS)

क्षेत्रीय खान नियंत्रक / Regional Controller of Mines



**MODIFIED MINING PLAN**  
**(UNDER RULE 17(3) of MCR 2016)**

**&**

**PROGRESSIVE MINE CLOSURE PLAN**

**(UNDER RULE 23(B) OF MCDR 1988)**

**VOLUME – I (TEXT)**

**IN RESPECT OF KHANDABANDH IRON ORES MINES**

**LEASE AREA: 366.311 HECTARES**

Forest Land	Area, Ha
Reserved/ Protected Forest	Nil
Village Forest	97.217
Others (DLC)	209.973
Others (SABIK)	37.999
Total Forest land area	345.189
Non Forest land area	21.122

**MINERAL: IRON ORE**

**VILLAGE: KHANDABANDH, JAROLI, JALAHARI, GURUDA, JAJANG**

**TALUKA: BARBIL, DISTRICT: KEONJHAR**

**STATE: ODISHA**

**CATEGORY : "A" FULLY MECHANISED (FM) OPENCAST MINES**

**EXECUTED LEASE PERIOD: 30.11.1963 TO 29.11.1993**

**DATE OF EXPIRY OF LEASE : 29.11.2033**

LEASE RENEWAL	APPLICATION DATE	PERIOD	EXPIRY DATE
1 <sup>st</sup> RML	09.11.1992	20 years	29.11.2013
2 <sup>nd</sup> RML	14.11.2012	20 years	29.11.2033

**PROPOSED PLAN PERIOD: 01.04.2013 TO 31.03.2018**

**LESSEE**

**M/S ODISHA MINING CORPORATION LIMITED.**

**OMC HOUSE, POST BOX NO.- 34, BHUBANESWAR - 751001,**

**ODISHA, PIN - 751001**

**PREPARED BY**

**Manmohan Nayak**

**Mining Engineer & Qualified person**

**OMC Ltd.**

**PK Bhattacharjee**

**Mining Engineer & Qualified person**

**MECON Ltd.**

**CONSENT LETTER / UNDERTAKING / CERTIFICATE FROM THE LESSEE**

01. The Modifications proposed in the approved mining plan in respect of Khandabandh Iron Ore Lease over an area of 366.311 hectares in village Khandabandh, Jaroli, Jalahari, Jajang and Guruda, in Distt. Keonjhar of Odisha state under Rule 17(3) of MCR 2016 has been prepared by following qualified persons

This is to request the Regional Controller of Mines, Indian Bureau of Mines, Bhubaneswar to make any further correspondence regarding any correction of the Modifications proposed in the approved mining plan with the said qualified person at their address given below:

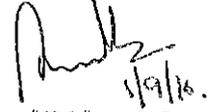
PK Bhattacharjee, BE(Min) FCC(R), Sr. Manager (Mining) Raw material & Mining Division MECON Ltd., P.O-Doranda, Ranchi – 834002 Tel.No. 0651-2483645 Fax No. 0651-2482189, 2482214 e-mail: mining@meconlimited.co.in	Manmohan Nayak, M.Tech(Mining), AMIE(Min), IM.Sc.(Geol), FCC(R) Planning Cum Monitoring Cell OMC Ltd., Bhubaneswar-751001 Tel.No. 0674 – 2377538 Fax No. 0674-2391629, 2396889, 2394772 e-mail: immcon_mine@yahoo.co.in
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We hereby undertake that all modifications / updating as made in the said Modifications proposed in the approved mining plan by the said qualified persons be deemed to have been made with our knowledge and consent and shall be acceptable on us and binding in all respects.

02. We undertake to implement CCOM's circular no. 2/2010 (addendum) regarding system of construction & maintenance of boundary pillars. The Modified Mining Plan document has been prepared adopting the lease boundary as per the authenticated lease plan and the land schedule authenticating 345.189 Ha. of forest land (307.190 Ha. as per HAL & 37.999 Ha. as per SABLIK settlement) by the Tehsildar.
03. It is certified that the Progressive Mine Closure Plan of Khandabandh Iron Ore Mine of The Odisha Mining Corporation Ltd, Odisha, Bhubaneswar over an area of 366.311 hectares complies with all statutory Rules, Regulations, Orders made by the Central or State Government, Statutory Organization, Court etc. which have been taken into consideration and wherever any specific permission is required, the Lessee will approach the concerned authorities.  
The information furnished in the Progressive Mine Closure Plan is true and correct to the best of our knowledge and records.
04. The provisions of Mines Act, Rules and Regulations made there under have been observed in the Modifications proposed in the approved mining plan over an area of 366.311 hectares in Keonjhar district of Odisha State belonging to Khandabandh Iron Ore Mine and where specific permissions are required, the Lessee will approach the DGMS. Further, standards prescribed by DGMS in respect of miners' health will be strictly implemented.
05. We do hereby undertake to complete exploration in respect of entire ML area over 366.311 Ha. of Khandabandh Iron Ore lease in time bound manner in accordance with Ministry of Mines letter No.10/75/2008-MV dated 23.12.2010.

Place : Bhubaneswar

Date :

  
19/16.

R. Vineel Krishna, IAS,  
Managing Director & Owner of the Mine



**CERTIFICATE**

The provisions of the Mineral Conservation and Development Rules 1988 have been observed in the preparation of the Modified Mining Plan for Khandabandh iron ore Lease over an area of 366.311 Ha, of M/s Odisha Mining Corporation Limited, in Villages - Khandabandh, Jaroli, Jalahari, Jajang and Guruda in Distt. Keonjhar of Odisha state and whenever specific permissions are required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

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

Place: Bhubaneswar  
Date: 2.9.2016

  
(Manmohan Nayak)  
(Mining Engineer, Qualified Person)  
OMC Limited, Bhubaneswar - 751001



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**VOLUME – I (TEXT)**

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(Qualified Person)

  
(Qualified Person)



**CERTIFICATE**

The provisions of the Mineral Conservation and Development Rules 1988 have been observed in the preparation of the Modified Mining Plan for Khandabandh Iron ore Lease over an area of 366.311 Ha, of M/s Odisha Mining Corporation Limited, in Khandabandh, Jaroli, Jalahari, Jajang and Guruda villages under Barbil Tahsil of Keonjhar district of Odisha state and whenever specific permissions are required, the applicant will approach the concerned authorities of Indian Bureau of Mines.

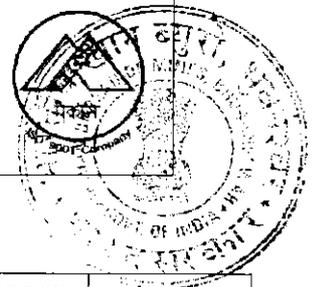
The information furnished in the Modified Mining Plan is true and correct to the best of our knowledge.

Place: Ranchi  
Date: 1.9.2016

  
**(PK Bhattacharjee)**  
**(Mining Engineer, Qualified Person)**  
**MECON Limited, Ranchi – 834002**



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**LIST OF ANNEXURES**

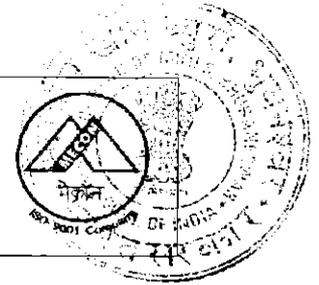
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(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



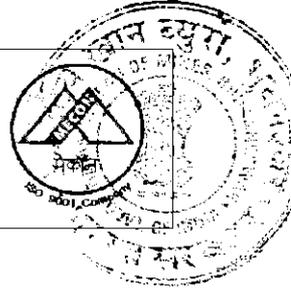
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(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**LIST OF DRAWINGS**

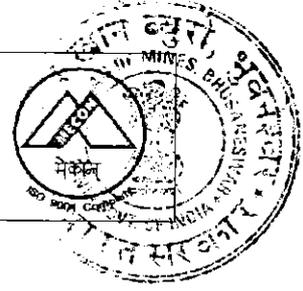
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(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**INTRODUCTION**

Khandabandh Iron ore lease is owned by M/s Odisha Mining Corporation Limited (OMC Ltd.), A Gold category Govt. of Odisha Mining PSU. Khandabandh Iron ore lease of M/s Odisha Mining Corporation is located in village Khandabandh, Jaroli, Jalahari, Jajang and Guruda under Joda PS, Barbil Tahsil and Champua subdivision of Keonjhar district of Odisha state between latitude 21°55'40.27579"N-21°57'29.90066"N & longitude 85°23'12.66888"E – 85°24'51.95389"E and is covered by survey of India toposheet no. 73 G/5.

**Status of Lease**

Lease deed for Khandabandh lease was executed on 30.11.1963 for a lease area of 366.311 Ha for a period of 30 years. Copy of lease deed for Khandabandh lease is enclosed at annexure 7. Subsequently, application for 1<sup>st</sup> RML was made on 09.11.1992. Copy of Form D & Form J for 1<sup>st</sup> RML of Khandabandh lease is given at annexure 8. Application for 2<sup>nd</sup> RML was made on 14.11.2012. Copy of Form D & Form J for 2<sup>nd</sup> RML of Khandabandh lease is given at annexure 9. As per Mineral (Mining by Govt. Company) Rules 2015, the lease is deemed to be extended till 29.11.2033.

**Status of Environment clearance**

Environment clearance for the lease has been granted by MoEF vide letter no. J-11015/1081/2007-IA.II(M) dated 15.12.2008 for a rated iron ore production capacity of 1.0 million tonnes per annum. A copy of the same is enclosed as Annexure- 15).

**Status of Forest Clearance**

DFO, Keonjhar has granted permission for conducting mining operation in 71.781 Ha of non forest land and 113.746 Ha of broken up DLC forest area vide letter no. 7565 dated 27.08.2010. Copy of cover letter of application submitted for forest diversion is given at annexure 12. The lessee has obtained permission from the office of Deputy Director of Mines, Joda for working in non forest land vide letter no 7559/Mines dated 26.12.2012. Copy of the same is enclosed as annexure 13. The lessee has also obtained permission from the office of Deputy Director of Mines, Joda for working in non forest land and DLC Broken land vide letter no 7565/Mining, Keonjhar dated 27.08.2010. Copy of the same is enclosed as annexure 14.

The process of estimation of total forest land (including sabik forest land) has been initiated. The total forest land has been assessed by the Tahsildar and the same has been forwarded to DFO, Keonjhar. Copy of the same has been enclosed as Annex.-11. Fresh application for diversion of the forest land will be accordingly submitted by OMC once the same has been authenticated by the concerned officials of the state government.

**Status of Consents from State Pollution Control Board**

Consent to operate was valid till as 31.03.2013. Consent to establish has been granted by State Pollution Control Board on 26.04.2011 for 1.0 Million tonnes of Iron ore per annum and was valid till 25.04.2012. Copy of the Consent to Establish & Consent to Operate is enclosed as annexure 16.

**Status of Surface Right**

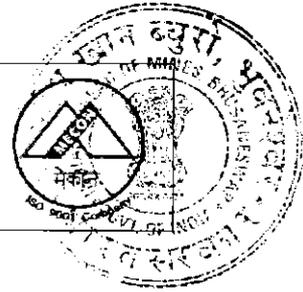
The lessee has surface right over an area of 343.606 Ha. Copy of letter of grant of surface right permission is given in annexure – 17. Copy of land schedule is given at annexure 11.

  
(Qualified Person)

**APPROVED**  
14/9/16  
क्षेत्रीय खान नियंत्रक  
REGIONAL CONTROLLER OF MINES  
भारतीय खान ब्यूरो  
INDIAN BUREAU OF MINES  
(Qualified Person)  
भुवनेश्वर/BHUBANESWAR



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**Common Boundary Working Permission**

The lessee has been also granted common boundary working permission with Jarouri Iron & Mn Mines of M/s Kalinga Mining Corporation near lease pillar 16 to 26 by DGMS vide letter no R/4768 dated 11.12.1995. Copy of the same is enclosed as annexure 36. Initial working has been carried out near pillar 23 to 26. The area has been fenced off & boundary pillars have been erected at site.

**Status of Approvals under MCDR**

Mining plan alongwith PMCP for 1<sup>st</sup> lease renewal period prepared under Rule 24A of MCR 1960 & MCDR 1988 was approved by IBM. The mining plan was valid till 2007-08. In the meantime, modification to mining plan prepared under Rule 10 of MCDR 1988 for last three years i.e. 2005-06 to 2007-08 was approved by IBM vide letter no. 314(3)/2006-MCCM(C)/MP-6 dated 23.10.2006. The modified mining plan was valid upto 31.03.2008. Scheme of Mining under rule 12 of MCDR 1988 was approved by IBM vide letter no. 314(3)/2008-MCCM(CZ)/MS-36 dated 18.06.2009. The scheme of mining was valid upto 31.03.2013.

Subsequently, modification to scheme of mining for period 2011-12 to 2012-13 was prepared under rule 10 of MCDR 1988 has been approved by IBM vide letter no. 314(3)/2011-MCCM(CZ)/MS-27 dated 11.11.2011. Copy of approval letter of modification to scheme of mining is enclosed as annexure 10. Presently mine is not working since 05.01.2010 due to want of forest clearance. IBM issued violation regarding non submission of the scheme of mining document for the period 2013-14 to 2017-18. OMC was not able to prepare the above document due to want of lease plan authenticated by competent authority of state govt. However, scheme of mining for the period 2013-14 to 2017-18 was submitted to IBM by lessee. IBM asked to submit the geo-referenced lease plan duly authenticated by competent authority of state govt. in order to comply with the requirement joint boundary survey was conducted by state Govt. & accordingly geo-referenced lease plan has been prepared by State Govt. which has been handed over to OMC vide letter no. III(A)-03/93-9830/MD dated 13.11.2015. Copy of the letter received from Director of Mines, Govt. of Odisha for handing over the authenticated DGPS map is enclosed as annexure 38. Accordingly present document is submitted for period ending upto 31.03.2018 after receipt of Geo-referenced Lease plan from the Director of Mines, Govt. of Odisha.

The ML area granted, RML applied area at different points of time in chronological order is given in the table below:-

S.No	Event with justification, if any	Remarks
1	Lease deed for Khandabandh was executed on 30.11.1963 for a lease area of 366.311Ha for a period of 30 years.	Lease Period : 30.11.1963 to 29.11.1993
2	The 1 <sup>st</sup> lease renewal application to State Govt. was made on 09.11.1992 for a period of 20 years.	1 <sup>st</sup> RML Period : 30.11.1993 to 29.11.2013
3	The 2 <sup>nd</sup> lease renewal application to State Govt. was made on 14.11.2012 for a period of 20 years.	2 <sup>nd</sup> RML Period : 30.11.2013 to 29.11.2033 as per Mineral (Mining by Govt. Company) Rules 2015

Details of last approved documents in chronological order is given below.

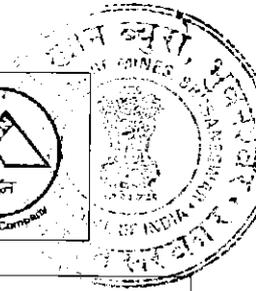
S.No	Document & Rule No.	Details of Approval	Validity period	Remarks
1.	Mining plan along with progressive mine closure plan under rule 24A & Rule 23 (B) of MCDR, 1988.	Mining Plan was approved by the Controller of Mines, Indian Bureau of Mines	Valid upto 31.03.2008	Mining Plan prepared for 1 <sup>st</sup> lease renewal period .
2.	Modification to mining plan & PMCP prepared under	Approved by IBM letter no. 314(3)/2006-MCCM(C)/MP-6	Valid upto 31.03.2008	Modification period : 2005-06 to 2007-08

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



S.No	Document & Rule No.	Details of Approval	Validity period	Remarks
	Rule 10 & Rule 23 (B) of MCDR 1988 respectively.	Nagpur dated 23.10.2006.		Reason : Due to production enhancement for last three years of scheme period.
3.	Scheme of Mining & PMCP prepared under rule 12 & 23 (B) of MCDR 1988 respectively .	Approved by IBM vide letter no. 314(3)/2008-MCCM(CZ)/MS-36 dated 18.06.2009	Valid upto 31.03.2013	Period : 31.03.2008 to 31.03.2013
4.	Modification to scheme of mining & PMCP under rule 10 & 23 (B) of MCDR 1988 respectively.	Approved by IBM vide letter no. 314(3)/2011-MCCM(CZ)/MS-27 dated 11.11.2011.	Valid upto 31.03.2013	Modification Period : 2011-12 to 2012-13 Reason : Production enhancement & or complying the violations pointed out by IBM

As per Mineral (Mining by Govt. Company) Rules 2015 the lease is deemed to be extended till 29.11.2033. Therefore, present submission is a Modified Mining Plan under 17(3) of MCR 2016 for an area of 366.311 Ha. and for the period from 01.04.2013 to 31.03.2018 along with progressive mine closure plan prepared under rule 23(B) of MCDR 1988 in the new universal format prescribed by IBM. All the annexure referred above and anywhere in this document have been enclosed as a separate volume, namely volume II (Annexure).

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**1.0 GENERAL**

**Shri Vineel R Krishna, Managing Director & Nominated Owner  
Odisha Mining Corporation Limited, Bhubaneswar.**

**a. Name of applicant/ lessee/ Rule 45 registration No.**

A list of board of directors is enclosed as Annexure – 1.  
A copy of the relevant extract from the minutes of the 416<sup>th</sup> meeting approved by Board regarding appointment of Nominated Owner of the mine is enclosed as Annex. – 2.  
A copy of photo id & address proof of the nominated owner of the mine is enclosed as Annexure – 3.  
Undertaking of Board of Directors regarding their working in other firms/company/organisation under Section 184 (1) and Rule 9(1) is given in annexure 4.  
The number of state-wise leases already held by the applicant/ applied for, indicating the type of minerals, areas, location etc is enclosed as Annexure – 6.

Registration No. of OMC Ltd. under Rule 45	IBM/4269/2011
Address	OMC House, Post Box No. 34 Bhubaneswar - 751001
District	Keonjhar
State	Odisha
Pin Code	751001
Phone	0674-2393431, 2395689, 2393389
Fax	0674-2391629, 2396889, 2394772
Gram	-
Telex	-
e-mail	info@orissamining.com

**b) Status of the applicant**

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

Certificate of incorporation is enclosed as Annex. – 5.

**c) Mineral(s) which is / are include in the prospecting license (For fresh grant)** Not applicable

**d) Mineral(s) which is / are include in the lease deed** Iron ore

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

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



f) Name of Recognised Person under rule 15(1) of MCR, 2016 or a Person employed under clause (c) of Sub rule (1) of rule 42 of MCDR, 1988 (Applicable for Scheme of Mining only) preparing Mining Plan:

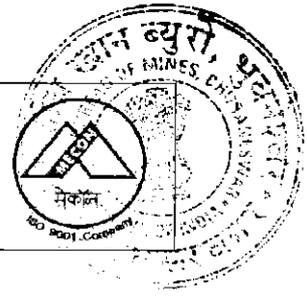
	Manmohan Nayak, Manager (Mining), Mining Engineer & Qualified person OMC Limited
	Jointly with
Name of the RQP preparing the mining plan	PK Bhattacharjee, Sr. Manager (Mining), Mining Engineer & Qualified Person MECON Limited, Ranchi
	Copy of the documentary proof of educational qualification & experience certificate of qualified persons is enclosed as Annexure – 20.
Address	OMC House, Post Box No. 34, Bhubaneswar – 751001 & MECON Limited, P.O – Doranda, Ranchi – 834002, Jharkhand
Phone	0674 – 2377538 & 0651 - 2483645
Fax	0674-2391629, 2396889, 2394772 & 0651 - 2482189, 2482214
e-mail	immcon_mine@yahoo.co.in & mining@meconlimited.co.in
Telex	-
Registration No.	NA
Date of grant / renewal	NA
Valid upto	NA

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**2.0 LOCATION AND ACCESSIBILITY**

**a) Lease Details (Existing Mine)**

Name of Mine: Khandabandh Iron ore lease (Lease Area : 366.311 Ha)

Khandabandh Iron ore lease of M/s Odisha Mining Corporation is bounded between latitude 21°55'40.27579"N to 21°57'29.90066"N & longitude 85°23'12.66888"E to 85°24'51.95389"E and is covered by survey of India toposheet no. 73 G/5.

DGPS readings of the boundary pillar co-ordinates is given below:-

**Coordinates of Lease Boundary Pillar**

Pillar No.	Coordinates		Pillar No.	Coordinates	
	Longitude	Latitude		Longitude	Latitude
1	85°23'13.30619"	21°55'40.27579"	31	85°24'40.80459"	21°56'51.31991"
2	85°23'13.11180"	21°55'52.18284"	32	85°24'39.87412"	21°56'47.12059"
3	85°23'12.86358"	21°55'58.05815"	33	85°24'39.31236"	21°56'44.42352"
4	85°23'12.66888"	21°56'05.88592"	34	85°24'38.60550"	21°56'41.32543"
5	85°23'16.81635"	21°56'11.18619"	35	85°24'36.75892"	21°56'32.90762"
6	85°23'23.46556"	21°56'20.12635"	36	85°24'35.82321"	21°56'28.58692"
7	85°23'29.88330"	21°56'28.20126"	37	85°24'35.43823"	21°56'26.86672"
8	85°23'32.39013"	21°56'31.19654"	38	85°24'30.50658"	21°56'26.86805"
9	85°23'37.53236"	21°56'38.07667"	39	85°24'23.13630"	21°56'26.86696"
10	85°23'41.89188"	21°56'43.69220"	40	85°24'12.93082"	21°56'26.86508"
11	85°23'45.49768"	21°56'48.34145"	41	85°24'10.72753"	21°56'26.86211"
12	85°23'47.05635"	21°56'53.85913"	42	85°24'10.72865"	21°56'26.27495"
13	85°23'49.91310"	21°57'03.94991"	43	85°24'10.74418"	21°56'20.32327"
14	85°23'52.39468"	21°57'12.76529"	44	85°24'10.72153"	21°56'10.65889"
15	85°23'55.59292"	21°57'24.09037"	45	85°24'06.97034"	21°56'10.65783"
16	85°23'57.25111"	21°57'29.90066"	46	85°24'03.16530"	21°56'10.65460"
17	85°24'03.19670"	21°57'21.50948"	47	85°24'00.83658"	21°56'10.66178"
18	85°24'10.94305"	21°57'18.35506"	48	85°23'57.80302"	21°56'10.69395"
19	85°24'11.95806"	21°57'17.97961"	49	85°23'55.25931"	21°56'07.73185"
20	85°24'14.55316"	21°57'16.95559"	50	85°23'51.78673"	21°56'04.77728"
21	85°24'20.94624"	21°57'14.46297"	51	85°23'50.23275"	21°56'04.84835"
22	85°24'25.34119"	21°57'12.73484"	52	85°23'47.65882"	21°56'06.20627"
23	85°24'31.65188"	21°57'12.99016"	53	85°23'41.92962"	21°56'06.52837"
24	85°24'37.90813"	21°57'13.26421"	54	85°23'36.09474"	21°56'07.18207"
25	85°24'47.46136"	21°57'13.62503"	55	85°23'31.78817"	21°56'05.69143"
26	85°24'51.01641"	21°57'13.76590"	56	85°23'27.66798"	21°56'04.25456"
27	85°24'51.51488"	21°57'03.88004"	57	85°23'26.17620"	21°56'03.47264"
28	85°24'51.95389"	21°56'54.92122"	58	85°23'24.71997"	21°56'00.95219"
29	85°24'45.86016"	21°56'54.67076"	59	85°23'21.18060"	21°55'55.66431"
30	85°24'43.20871"	21°56'51.00238"	60	85°23'18.58586"	21°55'51.50094"

Lat/long of any boundary point.

Date of grant of lease: 30.11.1963

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



Period/Expiry Date

Details	Date of Application	Period	Expiry Date
Lease Deed Execution	30.11.1963	30 years from 30.11.1963	29.11.1993
1 <sup>st</sup> RML	09.11.1992	20 years from 30.11.1993	29.11.2013
2 <sup>nd</sup> RML	14.11.2012	20 years from 30.11.2013 as per Mineral (Mining by Govt. Company) Rules 2015	29.11.2033

Name of lease holder M/s Odisha Mining Corporation Limited  
 Address OMC House, Post Box No. 34  
 Bhubaneswar – 751001, Odisha  
 Tel. 0674-2393431, 2395689, 2393389  
 Fax 0674-2391629, 2396889, 2394772  
 e-mail immcon\_mine@yahoo.co.in, info@orissamining.com  
 Mobile +919437260607

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

Forest (Specify)	Area, Ha	Non Forest (Specify)	Area, Ha
Reserved/ Protected Forest	Nil	Waste Land	21.122
Village Forest	97.217	Grazing Land	
Others (DLC)	209.973	Agriculture Land	
Others (SABIK)	37.999	Others i.e. Hutments etc. (Specify)	
<b>Total</b>	<b>345.189</b>	<b>Total</b>	<b>21.122</b>

Total lease area / applied area 366.311 Ha  
 District & State District : Keonjhar, State : Odisha  
 Taluka At & P.O. : Joda  
 Village Khandabandh, Jaroli, Jajang, Jalahari and Gurda.

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

Precise area plan (Geo-referenced lease map) of Khandabandh Iron Ore lease is shown in plate no MEC/Q76Q/11/16/02. Authenticated original lease plan of Khandabandh Iron Ore lease is shown in plate no MEC/Q76Q/11/16/02A

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

The approaches to the mine are as follows:

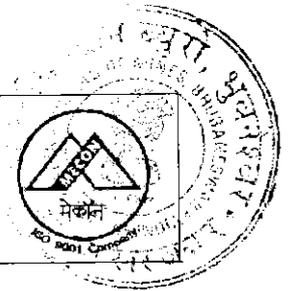
Rail	:	The nearest Railway station is Banspani (on Padapahar – Barajamda – Gua branch line of South Eastern Railway) at a distance of about 7 km from the mine lease.
Road	:	Khandabandha mine lease area is well connected with Joda town (at a distance of 9.5 km on northern side) through a State road, which passes close to the leasehold and links with NH-215 linking Rourkela and Panikoili.
Air strips	:	Bhubaneswar (Odisha) at a distance of 500 km

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**Toposheet No. with latitude & longitude of all corner boundary point/pillar**

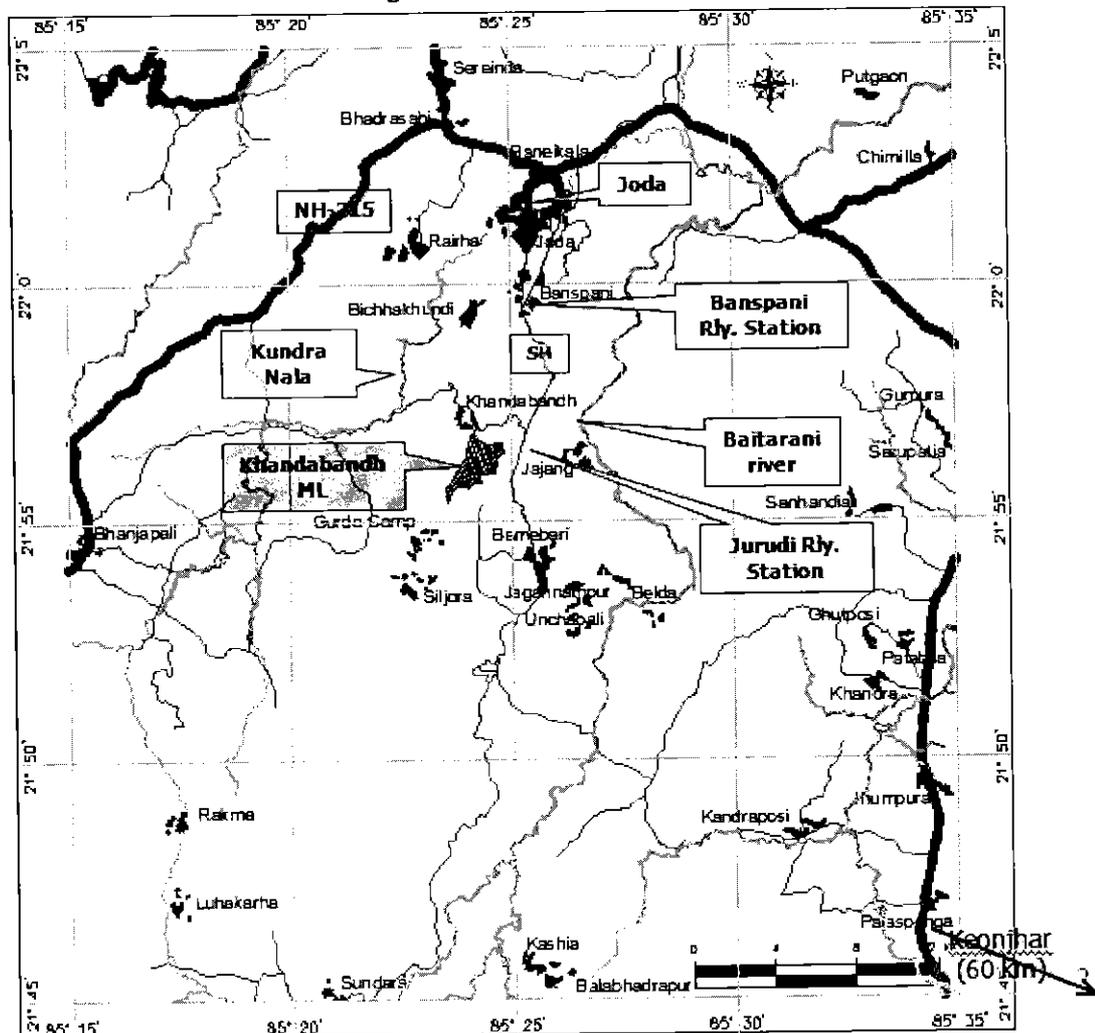
Khandabandh Iron ore lease of M/s Odisha Mining Corporation is bounded between latitude  $21^{\circ}55'40.27579''N$  to  $21^{\circ}57'29.90066''N$  & longitude  $85^{\circ}23'12.66888''E$  to  $85^{\circ}24'51.95389''E$  and is covered by survey of India toposheet no. 73 G/5.

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

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

General location map of lease area showing access routes is given below.

**Figure 1 : General location map**



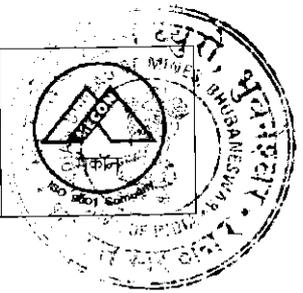
The same has been shown in the key plan as Drg. No. MEC/Q76Q/11/16/01.

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



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

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

Scheme of Mining for period 2008-09 to 20012-13 prepared under rule 12 of MCDR 1988 was approved by IBM vide letter no. 314(3)/2008-MCCM(CZ)/MS-36 dated 18.06.2009. The scheme of mining was valid upto 31.03.2013.

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

Modification to scheme of mining for period 2011-12 to 2012-13 was prepared under rule 10 of MCDR 1988 has been approved by IBM vide letter no. 314(3)/2011-MCCM(CZ)/MS-27 dated 11.11.2011. Copy of approval letter of modification to scheme of mining is enclosed as annexure 10.

**Reason for Modification :**

A few violations under provisions of MCDR 1988 was pointed out by a task force team comprising of IBM official, Mining officer Joda & DMG, Govt. of Odisha during their visit to mines on 05.05.2010. Accordingly, RCOM, Bhubaneswar issued orders of suspension of mining operation vide letter no. H/11021/2/2010/BBS dated 25.08.2010. For revocation of the suspension order issued for violation of rule 13 (1), last approved scheme of mining was modified.

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

Review of proposals made in the last approved Scheme of Mining & Modified Scheme of Mining and actual achievement for the last scheme period w.e.f 2008-09 to 2012-13 for khandabandh Iron Ore Mines is given below.

**i. Exploration:**

**Review of exploration in Iron Ore Deposit:**

Year	Planned Exploration	Actual Exploration	Reasons for Deviation
2008-09	Nil	Nil	No deviation
2009-10	50 Nos	11 Nos.	Due to non-availability of Forest clearance
2010-11	50 Nos.	193 Nos.	Additional drilling to delineate ore bearing zones
2011-12	50 Nos	28 Nos.	Due to non-availability of Forest clearance
2012-13	40 Nos.	Nil	Due to non-availability of Forest clearance
<b>Total</b>	<b>190 Nos.</b>	<b>232 Nos.</b>	

Actual exploration is in 22.10% excess of planned exploration.

**ii. Mine Development and Exploitation**

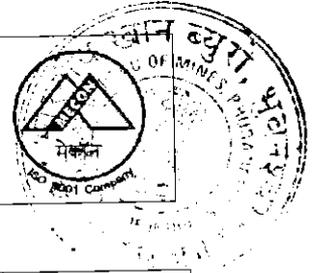
The achievement position as against the target in respect of ore, sub grade & waste are given below:

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**Overall Targets for Iron Ore and Waste removal**

Year	Ore, Million tonnes		Sub grade, Million cubic meters		Waste, Million cubic meters	
	Planned	Actual	Planned	Actual	Planned	Actual
2008-09*	-	0.120338	-	0.002006	-	0.026742
2009-10	0.998694	0.086479	0.016645	-	0.607315	0.027757
2010-11	1.00242	-	0.016707	-	0.726496	-
2011-12	0.99963	-	0.01666	-	0.483265	-
2012-13	0.9963	-	0.01675	-	0.739000	-
<b>Total</b>	<b>3.997044</b>	<b>0.206817</b>	<b>0.066762</b>	<b>0.002006</b>	<b>2.556076</b>	<b>0.054499</b>

\* By the time the scheme of mining was submitted the year was passed. Therefore proposal for remaining four years i.e. 2009-10 to 2012-13 was made on the Scheme of Mining.

The actual production of ore, sub grade & waste against their planned figures are 5.17%, 3% & 2.1% respectively, over the last five years of the scheme period. Operation in the mine has been suspended due to want of forest clearance since 05.01.2010 therefore planned ore, waste & subgrade production could not be achieved.

iii. **Afforestation:**

iv. **Land Reclamation and Rehabilitation:**

There was no proposal to reclaim the mined out area during the last approved mining scheme period in the years 2008-09 to 2010-11.

Year	Afforestation, No. of Saplings	
	Planned	Actual
2008-09	1600	-
2009-10	1600	-
2010-11	1600	2000
2011-12	1000	-
2012-13	1000	-
<b>Total</b>	<b>6800</b>	<b>2000</b>

Actual afforestation is 29.41% of the planned figures. The mine is not in operation since 2010, the planned afforestation could not be achieved.

v. **Waste dump management:**

A total of 0.054499 million cubic meters of waste was generated against the planned figure of 2.556076 million cubic meters during last scheme period. The generated wastes which was around 2.1% of the planned figure, was dumped in the planned areas only.

3.4 **Give status of compliance of violations pointed out by IBM**

The violations pointed out during the last 5 years and their compliance status as submitted to IBM by OMC has been enclosed as Annexure – 21.

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



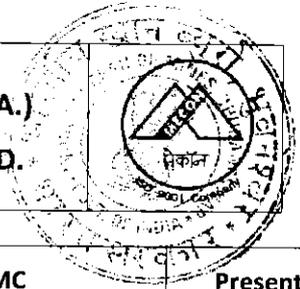
Rule No.	Nature of violation observed by IBM	Compliance by OMC	Present Status
13(1)	<p>1. Modification to approved scheme of mining was approved vide letter dated 11.11.2011 and is having proposals valid up to 31.03.2012. Scheme of mining for remaining lease period up to 29.11.2013 has not been submitted so far to the Regional Controller of Mines, Bhubaneswar 120 days before the expiry of earlier approved proposals.</p>	<p>The mining scheme (010.04.13 to 29.11.13) of Khandabandh Iron Ore Mines has been awarded to M/s Earth &amp; Environment, Bhubaneswar on 18.10.2012. In this connection, we wish to make the following submission for your kind consideration. The mining operation has been stopped w.e.f 05.01.2010 for want of forest clearance. The preparation of this mining scheme had to be done by following our prevalent process of inviting tenders from consultant firms. Since OMC Ltd. is public sector company of Govt. of Odisha, we lost time due to the procedures of tendering and awarding of work to the consultant. The consultant M/s Earth &amp; Environment was awarded the work on 18.12.2012. Mining scheme will be submitted shortly.</p>	<p>Assignment of preparation of Modified Mining plan has been awarded to M/s MECON Ltd. Draft modified mining plan has been submitted at IBM Bhubaneswar &amp; is under process of scrutiny/finalization.</p>
	<p>2. Mining operations are not being carried out in accordance with the modification to the approved scheme of mining letter no. 314(3)/2011 MCCM(CZ)/MS/33 dated 11.11.2011 to the extent indicated below:</p> <ul style="list-style-type: none"> <li>It was proposed to explore 47 no. of bore hole during the year 2011-2012 &amp; 43 no. of bore holes during the year 2012-2013 against which only 30 no. of bore holes were carried out so far.</li> </ul>	<p>The balance bore hole could not be done due to forest restriction.</p>	<p>Presently mine is not operational.</p> <p>The balance bore hole has not been drilled.</p>
Rule 27(4)	<p>Surface plans maintained updated under the provision of Rule 28 of MCDR, 1988 at the site, is not matching with actual field conditions in respect of sub grade ore stocks exists in the lease area.</p>	<p>IBM Notified vide letter no. T-5031/CGBM/2007 dtd. 16.10.2009 related to threshold value of cut off grade 45% Fe to stack the material separately. The mine has been closed since 5.1.2010 due to non availability of forest clearance. In the short span of this time period, we are unable to keep the materials separately. However, action has been taken to analyze and specify the grade wise stock of sub grade ore and waste material through an out side analytical agency M/s Inspectorate Griffith India (Pvt.) Ltd. After getting analysis report, it will be shown in the</p>	<p>Analysis has been done for different stocks &amp; updated surface plan has been submitted alongwith the present submitted document.</p>

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
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LESSEE: THE ODISHA MINING CORPORATION LTD.**



Rule No.	Nature of violation observed by IBM	Compliance by OMC	Present Status
		surface plan and will be submitted to your good office within 3 months.	
33(2)	In deposit – VI, Retaining wall along bottom periphery of ore stock yard and dump yard has not been maintained effectively to prevent wash off ore and waste material there from.	Tender action has been initiated for construction of retaining wall along bottom periphery of ore stock yard and dump yard to prevent wash off of ore and waste material.	Boulder walls have been constructed around the bottom of periphery of ore stock yard. Retaining wall construction has not been started.
45(1) (b) (i)	A whole time Mining Engineering having 10 (ten) years of professional experience has not been employed as per the provision of amended Rule.	Mining operation of Khandabandh iron ore mines has been stopped since 05.01.2010 due to want of forest clearance. However Sri M.K Sethi with Degree in Mining Engineering is posted at Khandabandh as Mining Engineer having 5 years of professional experience. After resumption of mining operation, a Mining Engineer having more than 10 years experience will be posted.	Sri M.K Sethi with Degree in Mining Engineering is posted at Khandabandh as Mining Engineer having 8 years of professional experience.

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

The mining operation is under suspension with effect from 05.01.2010 due to want of forest clearance.

**3.6 In case the MP/SOM is submitted under rules 9 and 10 of the MCDR'88 or under rule 17(3) of the MCR'2016 for approval of modification, specify reason and justification for modification under these rules:**

Present Modification of Mining Plan is submitted under rule 17(3) of MCR 2016.

**Reason**

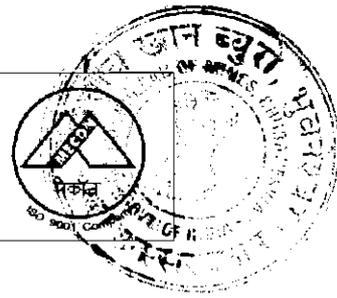
As per Mineral (Mining by Govt. Company) Rules 2015 the lease is deemed to be extended till 29.11.2033. Therefore, present submission is a Modified Mining Plan under 17(3) of MCR 2016 for an area of 366.311 Ha. and for the period from 01.04.2013 to 31.03.2018 along with progressive mine closure plan prepared under rule 23(B) of MCDR 1988 in the new universal format prescribed by IBM.

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
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**PART – A**

**1.0 GEOLOGY AND EXPLORATION**

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

**i. Physiography & Drainage**

The lease area is a part of the Bonai Synclinorium and is characterised by hilly topography. Within the mine lease, there are three prominent relict mounds having R.L.s at 657 m, 677 m and 674 m in north, west and south-west of the area respectively. The mining block lies at altitudes between 525 and 677 mRL. Almost the entire area is hilly. The hill slopes are moderately steep. In this area there are a few peaks exceeding 700 mRL, the highest being at 797 mRL at 6 km south-west of the lease area.

The area has dendritic pattern of drainage. Because of the hilly topography, there are numerous seasonal drainage channels but only a few perennial streams / rivers (Kundra Nala, Baitarani River, Karo River). The mine lease is drained by Baitarani River. The seasonal drainage channels coming out of the lease area drain into the Baitarani River which flows at a distance of 2.8 km east of the mine lease.

**ii. Vegetation**

The forest in the leasehold is classified as Northern Tropical Dry Deciduous Forests. The average tree density in core zone is about 1640 trees/ha. The forest is under moderately degraded stage with tree closely spaced and height ranging from 2 to 12m and girth class ranging from 20 to more than 40 cm. Shorea robusta, is the most dominant species with Diospyros melanoxylon, Buchnanian lanzen, Schleicheria oleosa (Kusum), Syzygium cumini (Jamu), Phyllanthus emblica (Aonla), Casarea elliptica (Khakra), Lagerstroemia parviflora (Sidha) etc. as common associates.

Mongoose, Kuji Neola, Fox, Jackal, rats sloth bear, Cobra, krait, lizard etc. are major faunal species found in the area.

**iii. Climate & Rainfall of the Lease Area**

The lease area lies in tropical region where climate is characterised by very hot summers and cool winters. Summer is typically from March to June when monthly temperature ranges from a maximum of 42°C during daytime to a minimum of 15°C at night. Winter is from November to February when the maximum temperature during day goes up to 37°C and minimum temperature at night becomes as low as 8°C.

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

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

**Regional Geology**

Jamda – Koira Valley Synclinorium is one of the principal Banded Iron Formations (BIF) encircling the Singhbhum Granite Complex. This formation contains an isolated deposit at Gandhamardan hill which lies southeast of Jamda – Koira valley deposit popularly known as famous horse shoe shaped Singhbhum Bonai Iron Ore Synclinorium. Khandabandha mining

  
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**MODIFIED MINING PLAN  
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**Regional Structure**

The horse-shoe shaped iron ore deposit form a northerly plunging synclinorium. The hill ranges broadly delineate the folded limbs of the synclinorium. Superimpositions of several phases of deformation in the area have results a complex fold system.

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

**Local Geology**

**Lithology**

Khandabandh ML area being the north-western continuation, the nature of the ore body and its structural dispositions being the closure part of the famous iron ore synclinorium. The horse shoe shaped iron ore deposits form a northerly plunging synclinorium. The hill ranges broadly delineate the folded limbs of the synclinorium. Superimpositions of several phases of deformation in the area have resulted in a complex fold system. Litho units encountered in the leasehold are :

- Laterite,
- Lateritic Iron Ore,
- Ferruginous Shale
- Banded Iron Formation which hosts the Iron ore (Mostly soft laminated & hard laminated ore and variegated shale.

**Laterite**

The formation is encountered in all the five deposits of this lease hold area with an average 2 m of capping. The northern part of the leasehold area is highly lateritised.

**Lateritic Iron Ore**

The lateritic iron ore is a low grade iron ore which always occurs in association with Goethite and Limonite. This is well exposed in the Quarry-4 and also encountered in few boreholes at Deposit-IV & V.

**Ferruginous Shale**

Ferruginous shale is an accumulation of fine grained sediments which is rich in iron. It typically exhibits a reddish hue if ferric iron is present or a green tint if the iron is ferrous. Dark grey or black shale, however, often results from the presence of significant amount of organic matter. In this lease hold area, the reddish yellow ferruginous shale occurs almost in all the deposits and the paddy plain. The shale occurring to the west of the lease hold area is ferruginous in nature and bears a gradational contact with iron ore bodies at places. During the course of exploration, most of the drill holes have encountered the shale with an average thickness of 3.00 m to 13.00 m followed by iron ore.

**Banded Iron Formation (BIF)**

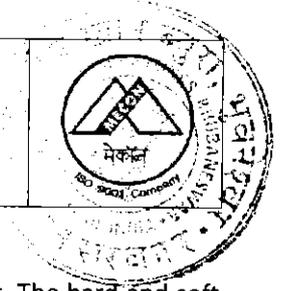
This formation is the most widely occurring formation around the area occupying topographically higher elevations. Because of the folded structures, BHJ has been observed in the crest of the mounts at places especially in the West and Central-West part of the lease hold area i.e. Deposit No. I and also in the North-Central Part called Deposit No.VI trending NE-SW and dipping variably at moderate angle of 20° to 70°.

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**MODIFIED MINING PLAN  
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Iron ore bodies overlie the BHJ in the east and ferruginous shale in the West. The hard and soft laminated ore are widely developed in the Deposit-I, IV, V & VI, fringing the BHJ and ferruginous shale members. Sometimes BHJ occur as undigested patches within iron ore. As revealed by the borehole data, hard massive/laminated ore is abundant in Quarry-4 and the soft friable ore (SLO) is abundant in Deposit-V (Quarry-3) & Deposit-VI. Floats of iron ore is well exposed in the North-Eastern side of the Quarry-1.

**Local Structure:**

***Deposit -I (Quarry -1)***

The deposit -I mostly comprises of hard massive ore with fines & micro laminations. Pockets of laterite associated floats of iron ore has been marked in both north & south part of the deposit. Soft laminated ore & blue dust is also exposed in the quarry benches from 2427850 N to 2427950 N. General strike trend of foliation is NW-SE dipping mostly NE at an angle of 18° to 70°. Two major sets of joints are deciphered in the deposit in direction NE-SW (vertical) and NNW-SSE (vertical).

***Deposit -II***

It is located in the north eastern part of the lease. Mostly hard massive & laminated ore occurs in this deposit. The general trend of ore body is NW-SE dipping 30° easterly to SW.

***Deposit - III (Quarry -5)***

It is located in south of deposit-II. Mostly occurrence of hard massive, soft laminated & blue dust have been found in the deposit -III. The general trend of ore body is NE-SW with moderate dip of 20° to 25° towards NW.

***Deposit - IV***

Deposit -IV is located in the southern part of the lease. The general trend of ore body is N-S with moderate dip of 10° to 25° towards west. Soft laminated ore & massive ore is also exposed in the quarry benches from 2426350 N to 2426450 N. Hard massive ore is clearly exposed in the floor as well as southern sidewall of quarry. Two sets of joints have been observed in the deposit with minor anticlinal folds in NE part of the quarry.

***Deposit -V (Quarry -3)***

The deposit mostly comprises of soft laminated ore & blue dust. Iron ore floats are also marked in both eastern and western side of the deposit. The general trend of ore body is NW-SE with moderate dip of 20° to 26° towards north east. No structures have been marked in the deposit.

***Deposit - VI***

This deposit is located in the North western part of the lease. The quarry is well exposed with soft laminated ore with hard boulder undigested BHJ. The deposit is highly folded with anti-synclorium pattern of fold. The general trend of ore body is NE-SW with a dip of 25° to 28° towards north west.

**A. (i) Name of prospecting /exploration agency :**

1. M/s Odisha Mining Corporation Ltd.
2. M/s MAPL, Asansol

  
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(Qualified Person)



**MODIFIED MINING PLAN  
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LESSEE: THE ODISHA MINING CORPORATION LTD.**



**(ii) Address**

1. Geology Division, M/s Odisha Mining Corporation Ltd.  
OMC House, Post Box No. 34  
Bhubaneswar – 751001
2. M/s Mining Associates Pvt. Limited (MAPL),  
Atwal Nagar, S.B. Gorai Road,  
Asansol – 713-301 West Bengal.

**(iii) E mail addresses and phone no.**

1. M/s Odisha Mining Corporation  
E-mail: info@orissamining.com, Tel. : (0674) 2393431, 2395689, 2393389
2. M/s Mining Associates Pvt. Limited (MAPL)  
E-mail : rajesh.bansal@miningassociates.co.in, Tel : (0341) 2220757, 2220758, 2205765

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

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

**Geological Mapping**

Out of the total lease area of 366.311 Ha, 108.02 Ha area & 130.35 Ha area has been geologically mapped at an scale of 1 : 500 and 1 : 1000 respectively. Besides, 12.25 Ha area of deposit V has also been mapped at an scale of 1 : 1500. Details of deposit-wise Geological mapping of carried out at Khandabandh Iron Ore Lease is given below.

Deposit/ Quarry	Area Covered by Geological Mapping, Ha			Total
	Scale of Mapping			
	1:500	1:1000	1:1500	
Deposit I	48.75	12.25	-	61.00
Deposit II	3	4	-	7.00
Deposit III	5	21	-	26.00
Deposit IV	42.02	23.8	-	65.82
Deposit V	3	65.5	12.25	80.75
Deposit VI	6.25	3.8	-	10.05
<b>Total</b>	<b>108.02</b>	<b>130.35</b>	<b>12.25</b>	<b>250.62</b>

Topographical map of Khandabandh Iron Ore Lease has been prepared at 5 m contour interval.

- ii) Number of boreholes indicating type (Core/RC/DTH), diameter, spacing, inclination, Collar level, depth etc with standard borehole logs duly marking on geological plan/sections.**  
All the deposits of Khandabandh Iron Ore Lease has been explored by Geology division of OMC Ltd. & M/s MAPL at less than 100 m x 100 m grid interval A total of 781 nos. of exploratory boreholes with a total meterage of 25521.29 m has been drilled at Khandabandh Iron Ore Lease.

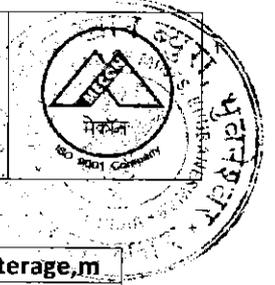
**A summary of the exploration carried out for G1 areas indicating mapping, pitting, drilling (No./ spacing), sample drawn/ analyzed etc, existing pit data, grade variation, thickness for Khandabandh Iron Ore Lease is given in the table below:**

  
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**MODIFIED MINING PLAN  
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**Details of year-wise core drilling already carried out**

Year	Deposit/Quarry	No. of Bore Holes	Total Meterage,m
Cumulative till March'2004		78	1895.44
2004-05	Nil	Nil	Nil
2005-06	Deposit-IV	11	476.6
	Deposit-III	10	380.25
	Deposit-VI	9	184.3
	<b>Sub total</b>	<b>30</b>	<b>1041.15</b>
2006-07	Deposit-IV	21	1014.2
	Deposit-V	11	620.4
	<b>Sub total</b>	<b>32</b>	<b>1634.6</b>
2007-08	Nil	Nil	Nil
2008-09	Nil	Nil	Nil
2009-10	Deposit-V	11	558.65
	<b>Sub total</b>	<b>11</b>	<b>558.65</b>
2010-11	Deposit-I	31	1087.8
	Deposit-III	55	2474.4
	Deposit-IV Main	17	601.9
	Deposit-V	58	2063.9
	Quarry-5 (Dep-V)	12	519.3
	Deposit-VI	20	495.05
	<b>Sub total</b>	<b>193</b>	<b>7242.35</b>
2011-12	Deposit-I	16	844
	Deposit-III	Partly 1 Hole	34.5
	Deposit-V	6	866.7
	Deposit-VI	6	65
	<b>Sub total</b>	<b>28</b>	<b>1810.2</b>
2012-13	Nil	Nil	Nil
	<b>Total</b>	<b>294</b>	<b>12286.95</b>
<b>Grand Total (Cumulative till March'2013)</b>		<b>372</b>	<b>14182.39</b>

**Details of year-wise DTH drilling already carried out**

Year	Deposit/Quarry	No. of Bore Holes	Total Meterage,m
Cumulative till March 2004		<b>207</b>	<b>6084.00</b>
2004-05	Deposit-I	55	1440.00
	Deposit-III	28	718.00
	Deposit-IV	42	1277.00
	Deposit-V	37	1060.00
	Deposit-VI	20	505.00
		<b>Sub Total</b>	<b>182</b>
2005-06	Nil	Nil	Nil
2006-07	Deposit-II	10	396.00
	Deposit-III	10	370.00
	<b>Sub Total</b>	<b>20</b>	<b>766.00</b>
2007-08 To 2012-13	Nil	Nil	Nil
	<b>Grand Total</b>	<b>202</b>	<b>5766.00</b>
<b>Cumulative achievement</b>		<b>409</b>	<b>11850.00</b>

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**MODIFIED MINING PLAN  
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Summary of Core & DTH Drilling						
Deposit/ Quarry	Grid	No. of Boreholes	Meterage	Depth From/ to	Grade From/ to, Fe%	Level of Exploration
All Deposits (Cumulative upto March 2004)	Less than 100 m x 100 m	285	7979.44	0.6/99.20	5.32/69.16	G1
Deposit I	Less than 100 m x 100 m	102	3371.8	2.3/90.0	23.83/69.11	G1
Deposit II	Less than 100 m x 100 m	10	396	0.6/51.1	18.8/69.12	G1
Deposit III	Less than 100 m x 100 m	103	3942.65	9.5/99.2	5.32/69.16	G1
Deposit IV	Less than 100 m x 100 m	91	2893.1	1.2/86.3	6.72/68.1	G1
Deposit V	Less than 100 m x 100 m	135	5688.95	3.6/47.15	33.51/69.06	G1
Deposit VI	Less than 100 m x 100 m	55	1249.35	3.6/42	38.35/69.06	G1
<b>Total</b>	<b>Less than 100 m x 100 m</b>	<b>781</b>	<b>25521.29</b>	<b>0.6/99.20</b>	<b>5.32/69.16</b>	<b>G1</b>

All the above boreholes have been shown in the geological plan. Forest permission for drilling boreholes in forest area is given at annexure 29. Form J for permission of drilling boreholes and Form K indicating details of already drilled boreholes have been given at annexure 30 & 31 respectively. A summary of the exploration already carried out in the Khandabandh Iron Ore Lease is given below.

**Status of Exploration as per UNFC**

Sl. No.	Name of the Mineral	Name of the Lessee	Name of the Lease	Status of Working	Non Forest Area, Ha	Forest Area, Ha	Total Area, Ha
A	B	C	D	E	F	G	H=F+G
1	Iron Ore	M/s Odisha Mining Corporation Ltd.	Khandabandh Iron Ore Lease	Working Mines but presently working has been suspended	71.781	294.530	366.311

Deposit	Lease Area explored as per UNFC Norms, Ha				Balance area to be explored	Remarks/Comments
	G1 Level	G2 Level	G3 Level	Non Mineralised area	Total	
	I	J	K	L	O= M + N	
Deposit -I	34.78474	NIL	NIL	NIL	17.67266	
Deposit -II	15.47394	NIL	NIL	NIL	4.868298	
Deposit -III	14.01683	NIL	NIL	35.6916	29.93979	
Deposit -IV	54.61704	NIL	NIL	NIL	26.40891	
Deposit -V	58.7126	NIL	NIL	NIL	26.85855	
Deposit -VI	21.31235	NIL	NIL	NIL	25.95369	
<b>Total</b>	<b>198.9175</b>	<b>NIL</b>	<b>NIL</b>	<b>35.6916</b>	<b>131.7019</b>	

iii) Details of samples analysis indicating type of sample (surface/sub-surface from pits/trenches/borehole etc) Complete chemical analysis for entire strata for all radicals may be undertaken for selected samples from a NABL accredited Laboratory or Government

(Qualified Person)

(Qualified Person)



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laboratory or equivalent. Entire mineralized area may be analyzed meter wise with 10% of check samples. (At least for 10% of total samples may be analyzed in accordance to BIS and reports from NABL accredited/other government laboratory).

Sampling and analysis of core samples generated during the course of drilling had been done to know the Fe, Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub> & other constituents required to assess the quality of ore and waste. Samples were drawn at every one meter inside ore zone and representative samples were also analyzed in non ore bearing litho units. The analysis was carried out by SUPCO. A total of 6829 nos of samples from core boreholes, 2200 nos. of samples from DTH boreholes and 46 nos. of grab samples (incl. 6 nos. from quarry faces) leading to a total 9075 nos. of samples have been analyzed so far. Copy of the NABL tests report is given in annexure 17B.

**iv) Expenditure incurred in various prospecting operations.**

The expenses incurred in the exploration, analysis of exploration data carried out during the last 5 years is around 13.2106 crores INR. Copy of the work order for exploration is given at annexure 32. Payment details to exploration agency has been given at annexure 33.

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

The surface plan of the leasehold area is enclosed as Drg. No. MEC/Q76Q/11/16/05 to 5B. However, the mine has permission to prepare the drawing in a scale of 1: 4000.

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

The geological plan of the leasehold area showing all the above features is enclosed as Drg. No. MEC/Q76Q/11/16/03 to 3G. The lessee has permission to prepare the drawing in a scale of 1: 4000.

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

The geological sections of the leasehold area showing all the above features is enclosed as Drg. No. MEC/Q76Q/11/16/04A to 4G.

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

In order to explore the possibility of occurrence of more ore in the unexplored area of south-western side of the lease, 15 no .of boreholes have been proposed in the phased manner after approval of forest diversion proposal (FDP) of the ML. Subsequently upon proving the existence of ore in this area further drilling at 200 m x 200 m grid will be carried out to enhance the confidence level of resources. Following exploration proposal will be undertaken after approval of FDP of the ML.

  
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Year	BHID	Proposed borehole location		Proposed Depth, m	Purpose
		Easting	Northing		
2016-17	PBH/01	334600	2426900	30	To ascertain the existence of ore in unexplored area of Deposit IV
	PBH/02	334700	2426900	30	
	PBH/03	334800	2426900	30	
	PBH/04	334800	2426800	30	
	PBH/05	334700	2426800	30	
	PBH/06	334600	2426800	30	
	PBH/07	334800	2426700	30	
	PBH/08	334700	2426700	30	
	PBH/09	334600	2426700	30	
	PBH/10	334500	2426700	30	
	PBH/11	334500	2428200	30	To prove the existence of extension of deposit I in NW side
	PBH/12	334600	2428200	30	
	PBH/13	334500	2428100	30	
	PBH/14	334600	2428100	30	
	PBH/15	334500	2428000	30	
<b>Subtotal</b>		<b>15 Nos.</b>		<b>450 m</b>	
2017-18	PBH/16	335100	2428300	30	To ascertain the existence of ore in unexplored area in Deposit VI
	PBH/17	335200	2428300	30	
	PBH/18	335100	2428200	30	
	PBH/19	335200	2428200	30	To ascertain the existence of ore in unexplored area in Deposit II
	PBH/20	335300	2428200	30	
	PBH/21	335300	2428100	30	To ascertain the existence of ore in unexplored area in Deposit III
	PBH/22	335500	2427500	30	
	PBH/23	335700	2427500	30	To ascertain the existence of ore in unexplored area in Deposit V
	PBH/24	335700	2427300	30	
	PBH/25	335500	2427300	30	
PBH/26	335300	2427300	30		
<b>Subtotal</b>		<b>11 Nos.</b>		<b>330 m</b>	
<b>Total</b>		<b>26 Nos.</b>		<b>780 m</b>	

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

**Reserve/Resource as per last approved Modified Scheme of Mining**

Summary of the reserves/resources (As on 01.04.2011) as per approved modification to the last approved scheme of mining is given below.

Classification	Code	Quantity, Million Tonnes	Grade
Total Mineral Resources (A + B)		12.349	+58%Fe
		1.000	45-58% Fe

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



Classification	Code	Quantity Million Tonnes	Grade
<b>A. Mineral Reserves</b>			
1. Proved Mineral Reserves	121	8.229	+58% Fe
		0.586	45-58% Fe
2. Probable Mineral Reserves	122	2.591	+58% Fe
		0.414	45-58% Fe
<b>Total Mineral Reserve (A)</b>		<b>11.82</b>	<b>+45 Fe</b>
<b>B. Remaining Resources</b>			
1. Feasibility Mineral Resources (Difference between Proved Geological & Proved Mineable)	222	0.131	+58% Fe
2. Pre-feasibility Mineral Resources (Difference between Probable Geological & Probable Mineable)	222	-	-
3. Measured Mineral Resources	331	-	-
4. Indicated Mineral Resources	332	1.389	+58% Fe
5. Inferred Mineral Resources	333	-	-
6. Reconnaissance Mineral Resources (Difference between Possible Geological & Possible Mineable)	334	0.009	+58% Fe

**Depletion of Reserve :**

Since mining operation in the lease has been suspended since 05.01.2010, no production has been carried out from the lease.

**Re-assessment of Reserve/Resources**

A total of 781 nos. of boreholes have been drilled in Khandabandh Iron Ore Lease as on 31.03.2012. In the resource/reserve estimates of last approved modification to approved scheme of mining a total of 559 nos. of boreholes drilled till 2009-10 (incl. 10 Nos. of additional boreholes drilled during 2009-10) has been considered. However, 222 nos. of additional boreholes were drilled during 2009-10 to 2011-12 (Excl. 10 Nos. of additional boreholes drilled during 2009-10 which was earlier considered for reserve estimation).

Besides, cut-off grade for saleable ore was 58% Fe in last approved modification to approved scheme of mining.

Therefore, re-assessment of resource/reserves have been carried out considering all the 781 nos. of boreholes drilled till 2011-12 as per the revised threshold value of 45% Fe prescribed by IBM and considering ore containing 55% Fe as saleable ore.

Following input data have been considered for re-assessment of resources/reserve

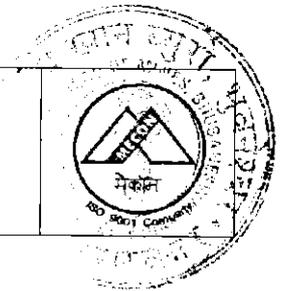
1. Updated surface plan with current pit positions & face mapping data provided by OMC.
2. Exploration data of 781 Nos. of boreholes incl. Assay, litho collar & survey data.
3. Statutory Barrier of 7.5 m along mining lease boundary and 10 m along village roads.
4. The threshold value considered as per the IBM guidelines is 45% Fe.

  
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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
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**Methodology**

**C. Preparation of Database**

Four basic files namely collar, survey, assay and litho files are required in Comma Separated Value (CSV) format for further processing by SURPAC Software. Litho codes used for database preparation is given below.

**Litho Codes Used for Database Preparation**

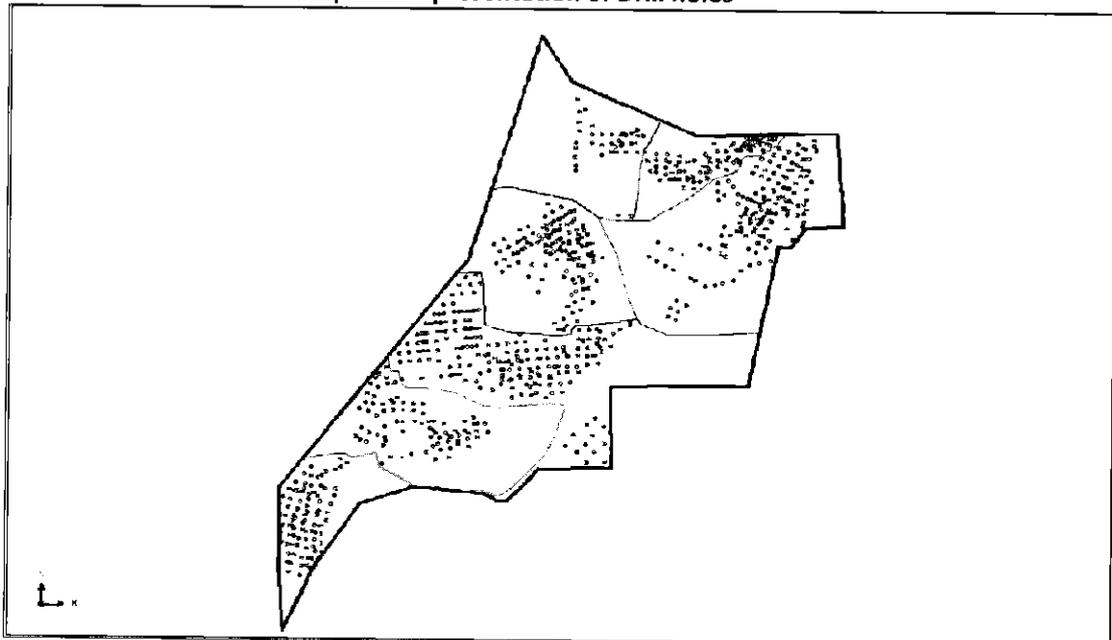
Litho Type	Litho code
Ore (Fe%>55%)	1
Subgrade (Fe% between 45 – 55%)	2
Waste (Fe% less than 45%)	3

**(ii) Delineation of Ore Geometry and Construction of Ore Body**

**Preparation of Transverse Sections**

Boreholes were displayed in SURPAC graphics window alongwith litho, Fe%, SiO<sub>2</sub>% & Al<sub>2</sub>O<sub>3</sub>%. 18,19,22,13,17,16 & 10 nos. Of transverse sections at 50 m interval were extracted from in the strike direction for Deposit I, II, III, IV, IV(Main), V & VI respectively. The envelopes of ore, subgrade and waste were delineated at each section considering the continuity of Fe content, mineralisation, lithology and other geological features. Lateral influence of 20-25 m from the last boreholes has been considered during preparation of sections depending upon ore thickness.

**Graphical representation of Drill holes**



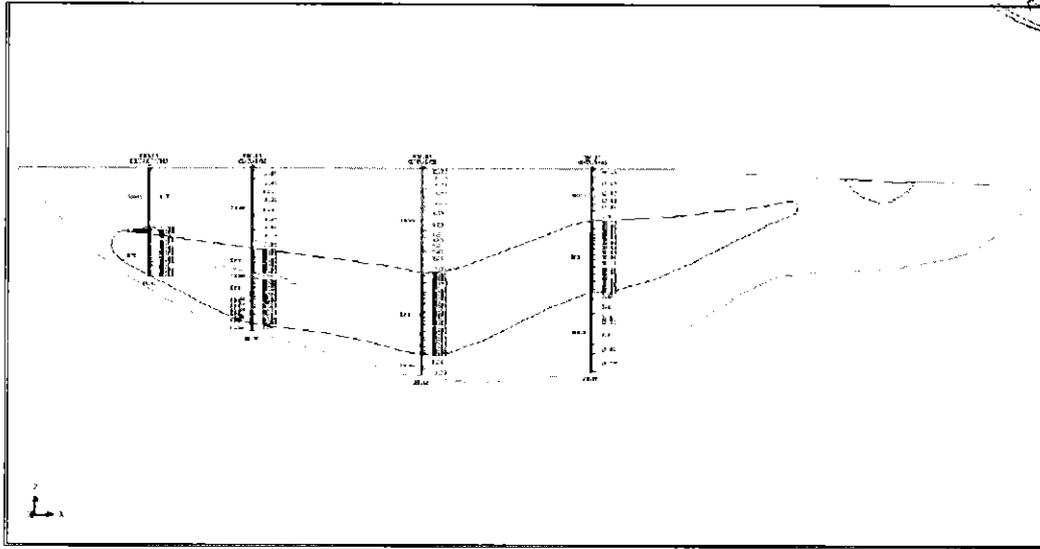
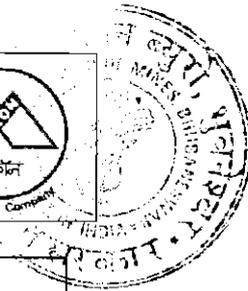
**Typical Transverse Section with Delineated Envelopes**

  
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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
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**Preparation of Digital Terrain Model (DTM) of Surface Topography**

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

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



  
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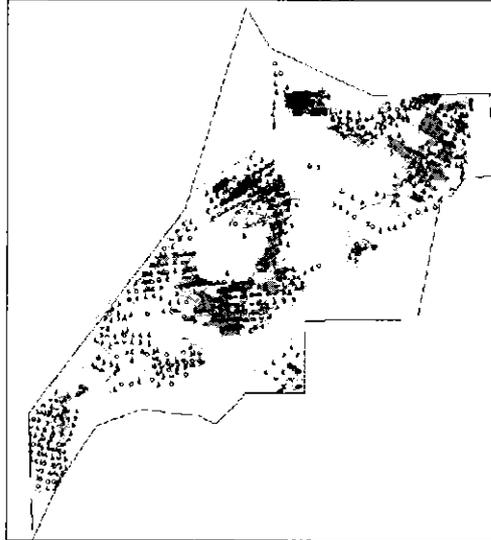
  
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3-D Solid Modeling of Ore Body

The litho-wise envelopes of the respective transverse cross sections have been connected/joined to form litho-wise solid ore body models. Ore type-wise 3-D solid model of Khandabandh Iron Ore Lease is presented in the figure below:-

**Litho-wise three dimensional solid model**



**(iii) Geo-statistical analysis (Variogram modeling)**

The continuity of mineralization in different directions can be well judged through analysis of variograms. In addition, the range of influence of sample in different directions can be deciphered. A variogram is evaluated with respect to sill, range and nugget effect. The variogram function is defined as follows.

$$\Gamma(h) = \frac{1}{2n} \sum [z(x+h) - z(x)]^2$$

Where, n = Number of sample pairs at distance 'h'

$\gamma(h)$  = Variogram value at distance 'h'

Z(x) = Assay value at point x

Z(x+h) = Assay value at point x+h

The  $\gamma(h)$  is calculated for different distance pair 'h' and is plotted against distance pair. As the distance pair increases the  $\gamma(h)$  value also increases and levels off after certain distance pair. The distance pair at which the  $\gamma(h)$  value levels off is known as 'Range' beyond which samples become statistically independent without any correlation. This distance provides an idea of range of influence of a particular sampling point. The value of  $\gamma(h)$  at which the graph levels off is known as 'sill'. This value is related to the theoretical variance of the data set. 'Nugget' is the value of  $\gamma(h)$  at zero distance pair. The inherent variability of the data is represented by nugget. The deposit with zero or very low nugget effect possesses uniform grade distribution.

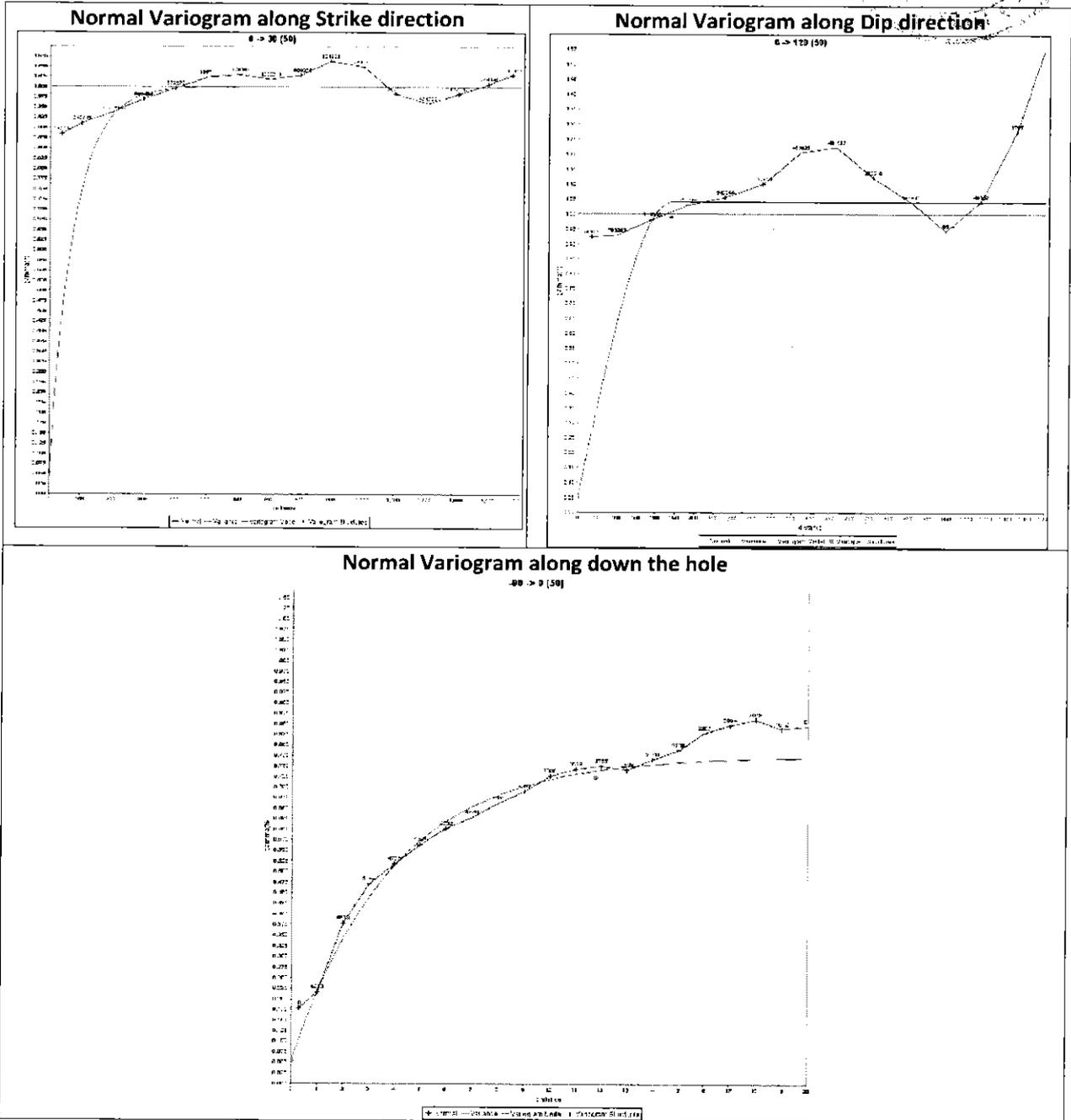
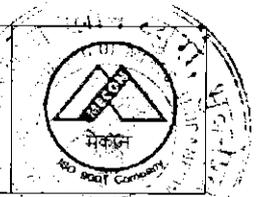
Variogram modeling has been carried out for determining the spatial variability of mineralisation & grade distribution in different directions. In order to ascertain the variability of entire deposit of Khandabandh Iron Ore Lease, composites of all the samples of 1 m length were extracted & the normal variograms of composited assay data have been developed along strike & dip direction of the deposit and also along borehole depth. The fitted Variogram model along strike, dip and along the borehole direction of the deposit is given below. The variogram model parameter and results of variogram modeling for above three directions is also given below.

  
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**MODIFIED MINING PLAN  
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**Variogram model parameters in three orthogonal directions**

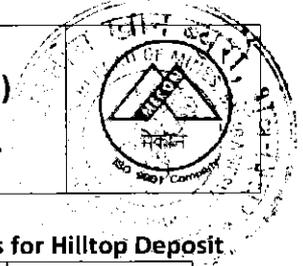
Sl. No.	Direction	Azimuth	Plunge	Spread	Lag	Maximum Distance
1	Along Dip Direction	120	0	50	100 m	1500 m
2	Along Strike direction	30	0	50	100 m	1500 m
3	Along Borehole depth	0	-90	50	1 m	20 m

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**MODIFIED MINING PLAN  
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**Results of variogram modeling in three orthogonal directions for Hilltop Deposit.**

Sl. No.	Direction	Nugget	Sill	Range
1	Along Dip Direction	0.0524	0.989375	229.499
2	Along Strike direction	0.0524	0.9492	233.349
3	Along Borehole depth	0.0524	0.722786	11.780

Block model estimation parameters derived from Variogram Modeling

A summary of the ore type-wise estimation parameters alongwith the anisotropy ratio utilized for block model estimation is given below.

**Litho-wise Block Model estimation parameters**

Litho Type	Bearing of Major Axis	Anisotropy Factor		No. of Samples		Max Search Dist. Major axis	Max. Vert. Search distance
		Semi-major	minor	Min	Max		
Ore	30	1	5	3	15	100	10
Subgrade	30	1	2	3	15	100	10
Waste	30	1	1	3	15	100	10

**(iv) Block Modeling**

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

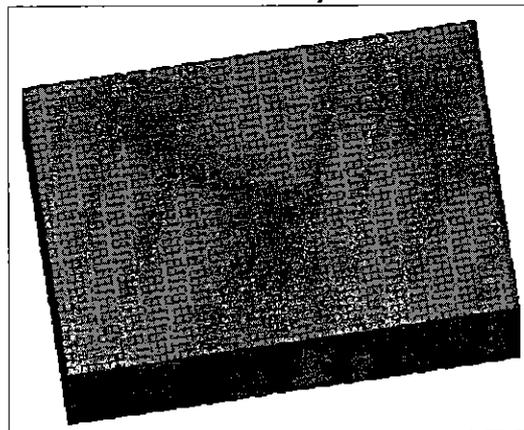
- Selection of Block Size

Considering the accuracy desired, borehole spacing and mining constraints, a unit block of 5 m x 5m x 1 m have been selected for grade estimation.

- Development of Block Model

In order to cover the entire extent of Khandabandh Iron Ore Lease in three dimensions, a dummy block model with unit block sizes as indicated above have been generated. An unconstrained dummy block model is shown in the figure below:-

**Unconstrained dummy block model**

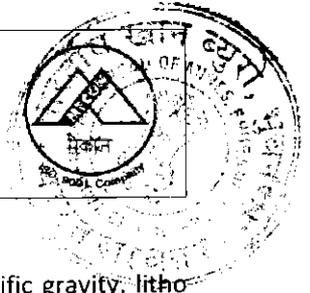


  
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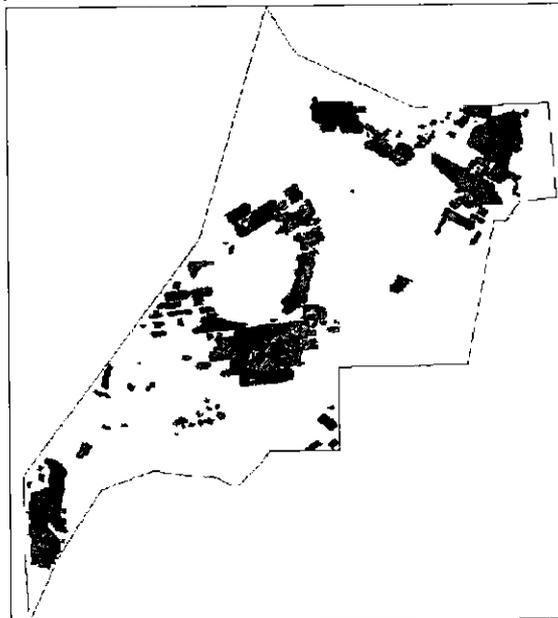


**MODIFIED MINING PLAN  
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- Addition of Attributes  
Attributes are the properties of individual block such as Fe, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, specific gravity, litho code, recovery % etc. These attributes were added in the dummy block model using suitable technique.
- Application of Constraints  
Constraints are the logical combination of spatial operators and objects such as DTM of surface contour, solid model of ore zone, block etc. With which the block model can be enveloped/ intersected with respect to inside/ outside and above/ below their spatial position. *The block model developed for Khandabandh Iron Ore Lease has been constrained with the surface DTM with updated pit positions, mining lease boundary, statutory safety barriers as well as litho type-wise 3-D solid models as developed and discussed in the preceding paragraphs.* In this way, the blocks have been enveloped within ore zone boundary and surface topography for the purpose of grade interpolation and reserves estimation. Constrained block model of Khandabandh Iron Ore Lease is give below.

**Constrained block model of Khandabandh Iron Ore Lease**



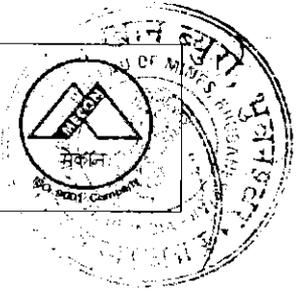
- Block model estimation  
Block model estimation parameters such as anisotropic ratio, search distances etc. Were derived from the results of variogram analysis discussed in previous para. Khandabandh Iron Ore Lease is uniform in mineralisation. It is not erratic in behaviour. The coefficient of variation of grades in all the ores are low in the range of 0.03 – 0.093 indicating uniform grade distribution and the deposit has also been explored at almost uniform grid of 100 m x 100 both along dip and strike direction, the globally accepted technique of Inverse Square Distance (ISD) method has been used for ore reserve estimation for different litho types. The parameters for reserve estimation have been derived from the statistical and geo-statistical analysis done previously. A search ellipsoid as indicated below has been used to select samples for assigning grade to the blocks. The axial parameters and its search orientation were derived from the results of geo-statistical analysis.

  
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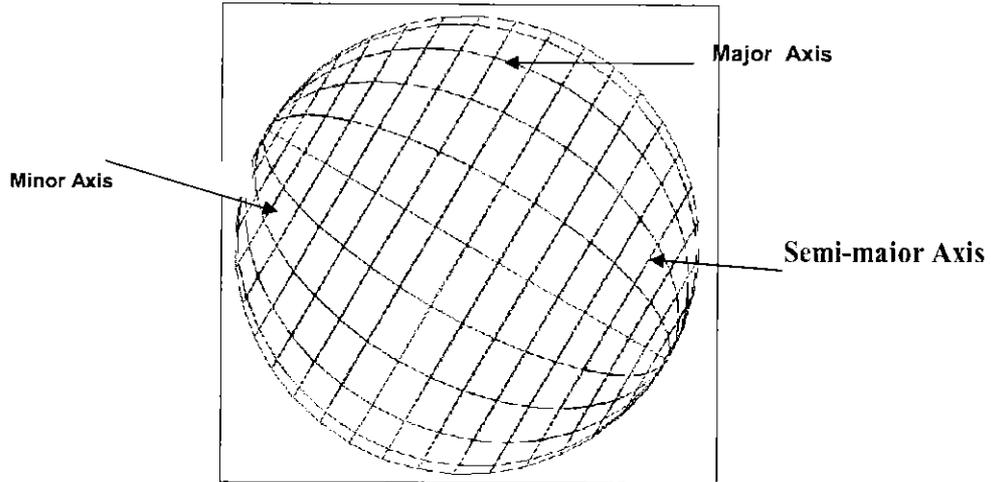
  
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**MODIFIED MINING PLAN  
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Ellipsoid Visualiser



- 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.

The section wise resources established by geological x-section method for different deposit at 45% Fe cut off is given below.

**Resources established by cross-section method (As on 01.04.2015)**

**Deposit I**

Section No	Cross-sectional Area, Sq. m	Length of Influence	Volume, cu. m	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
1D1	1444.0	50	72201.7	2.94	0.212
1D2	4899.2	50	244961.1	2.98	0.729
1D3	8056.0	50	402798.4	2.97	1.197
1D4	4235.5	30	127065.6	2.99	0.380
1D5	3149.1	30	94473.4	2.95	0.278
1D6	5478.0	25	136950.9	2.97	0.406
1D7	4480.3	26	116486.8	3.00	0.349
1D8	2041.8	14	28584.7	2.90	0.083
1D9	1300.7	24	31216.0	3.00	0.094
1D10	983.2	18	17697.3	3.00	0.053
1D11	1567.1	42	65816.2	2.84	0.187
1D12	1887.3	28	52845.4	3.00	0.159
1D13	2114.1	50	105703.0	2.92	0.309
1D14	2421.6	48	116237.1	2.95	0.343
1D15	2686.4	48	128948.4	2.95	0.381

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**MODIFIED MINING PLAN  
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Section No	Cross-sectional Area, Sq. m	Length of Influence	Volume, cu. m	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
1D16	2824.1	50	141206.6	2.90	0.410
1D17	2025.4	40	81016.3	2.81	0.228
1D18	1385.9	42	58208.0	3.00	0.175
<b>Total</b>	<b>52979.7</b>		<b>2022416.7</b>		<b>5.973</b>
<b>Recovery factor for Deposit - I</b>					<b>72.38%</b>
<b>Total balance recoverable geological resource of Deposit - I</b>					<b>4.32</b>

**Deposit II**

Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. M	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
2D1	408.8736	24	9813.0	3.00	0.029
2D2	1438.8132	30	43164.4	3.00	0.129
2D3	3961.256	20	79225.1	2.99	0.237
2D4	1078.647	24	25887.5	2.99	0.077
2D5	104.9004	24	2517.6	2.96	0.007
2D6	271.044	26	7047.1	2.95	0.021
2D7	38.083	40	1523.3	2.50	0.004
2D8	46.7422	22	1028.3	2.50	0.003
2D9	271.4374	36	9771.7	2.80	0.027
2D10	130.129	20	2602.6	2.83	0.007
2D11	171.8186	34	5841.8	2.54	0.015
2D12	331.7938	24	7963.1	2.98	0.024
2D13	333.2834	24	7998.8	2.93	0.023
2D14	275.4938	24	6611.9	2.94	0.019
2D15	493.3048	25	12332.6	2.95	0.036
2D16	677.0734	22	14895.6	2.99	0.045
2D17	629.6979	24	15112.7	2.72	0.041
2D18	3146.4193	44	138442.4	2.77	0.384
2D19	1968.3052	46	90542.0	2.99	0.270
<b>Total</b>	<b>15777.116</b>		<b>482321.7</b>		<b>1.400</b>
<b>Recovery factor for Deposit - II</b>					<b>58.02%</b>
<b>Total balance recoverable geological resource of Deposit -II</b>					<b>0.812</b>

**Deposit III**

Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. M	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
3D1	62.9	50	3146.1	3.00	0.009
3D2	1863.9	50	93196.1	2.98	0.278
3D3	2140.4	45	96318.3	2.99	0.288
3D4	2729.7	50	136484.2	2.98	0.407
3D5	2544.2	40	101769.3	3.00	0.305
3D6	4111.9	40	164476.4	2.97	0.489

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**MODIFIED MINING PLAN  
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Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. M	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
3D7	7459.4	35	261079.2	2.95	0.770
3D8	1991.7	30	59751.5	2.82	0.168
3D9	2139.2	30	64177.0	2.75	0.176
3D10	3259.4	40	130375.7	2.99	0.390
3D11	4107.6	35	143767.3	2.98	0.429
3D12	929.2	30	27875.0	3.00	0.084
3D13	489.8	40	19590.9	2.99	0.059
3D14	635.0	35	22224.1	2.97	0.066
3D15	777.8	30	23335.5	3.00	0.070
3D16	7488.1	45	336964.6	3.00	1.010
3D17	10.7	50	536.5	3.00	0.002
3D18	0.0	45	-	-	-
3D19	0.0	72.5	-	-	0.000
3D20	115.8	30	3473.7	3.00	0.010
3D21	141.8	25	3545.6	3.00	0.011
3D22	-	-	-	-	-
<b>Total</b>	<b>42741.1</b>		<b>1692087.2</b>		<b>5.020</b>
<b>Recovery factor for Deposit - III</b>					<b>61.53%</b>
<b>Total balance recoverable geological resource of Deposit -III</b>					<b>3.089</b>

**Deposit IV**

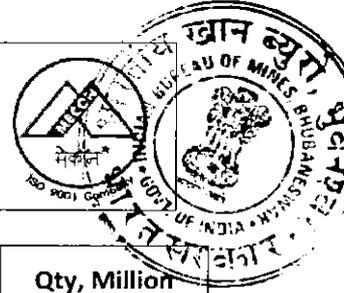
Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. m	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
4D1	1062.0611	50	53103.1	2.90	0.154
4D2	2926.7755	50	146338.8	2.98	0.436
4D3	3382.1084	50	169105.4	2.97	0.502
4D4	3700.6166	50	185030.8	2.91	0.539
4D5	3939.7094	50	196985.5	3.00	0.590
4D6	3981.9653	50	199098.3	2.97	0.592
4D7	3155.6974	50	157784.9	3.00	0.473
4D8	2614.5934	50	130729.7	2.96	0.388
4D9	886.859	40	35474.4	2.95	0.105
4D10	1075.2557	40	43010.2	2.99	0.129
4D11	864.5508	40	34582.0	2.99	0.103
4D12	620.0196	40	24800.8	2.98	0.074
4D13	-	-	-	-	-
4D14	49.413	25	1235.3	3.00	0.004
4D15	93.1434	40	3725.7	3.00	0.011
4D16	202.8644	35	7100.3	3.00	0.021
4D17	109.721	35	3840.2	2.50	0.010
4D18	51.8091	20	1036.2	2.76	0.003
4D19	-	-	-	-	-
4D20	412.6026	35	14441.1	2.64	0.038
4D21	358.273	30	10748.2	3.00	0.032

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MODIFIED MINING PLAN  
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Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. m	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
4D22	723.924	30	21717.7	2.75	0.060
4D23	227.432	25	5685.8	2.98	0.017
4D24	318.1404	30	9544.2	2.73	0.026
4D25	361.1756	30	10835.3	3.00	0.033
4D26	126.0576	30	3781.7	3.00	0.011
4D27	41.0507	40	1642.0	3.00	0.005
4D28	350.8924	35	12281.2	2.98	0.037
4D29	34.8468	35	1219.6	3.00	0.004
4D30	145.2688	40	5810.8	3.00	0.017
<b>Total</b>	<b>29025.9809</b>		<b>1490689.2</b>		<b>4.414</b>
<b>Recovery factor for Deposit - IV</b>					<b>83.98%</b>
<b>Total balance recoverable geological resource of Deposit -IV</b>					<b>3.707</b>

Deposit V

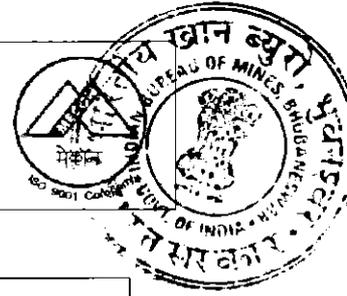
Section No	Cross-sectional Area, Sq. m	Length of Influence, m	Volume, cu. M	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
5D1	7514.586	50	375729.28	2.96	1.111
5D2	12046.78	50	602339.24	2.93	1.767
5D3	18015.9	50	900795.20	3.00	2.699
5D4	14684.63	50	734231.61	2.96	2.171
5D5	14153.85	40	566153.80	2.96	1.675
5D6	11329.59	35	396535.74	2.95	1.172
5D7	6756.462	35	236476.18	2.95	0.697
5D8	1693.59	20	33871.80	2.94	0.099
5D9	1871.638	40	74865.54	2.94	0.220
5D10	2652.772	45	119374.73	2.75	0.329
5D11	1734.8	40	69392.02	2.88	0.200
5D12	2108.045	40	84321.79	2.95	0.249
5D13	143.5402	40	5741.61	3.00	0.017
5D14	47.9192	35	1677.17	2.85	0.005
5D15	610.7916	35	21377.71	2.82	0.060
5D16	0	21	-	-	-
<b>Total</b>	<b>95364.9</b>		<b>4222883.41</b>		<b>12.472</b>
<b>Recovery factor for Deposit - V</b>					<b>73.88%</b>
<b>Total balance recoverable geological resource of Deposit -V</b>					<b>9.214</b>

  
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**MODIFIED MINING PLAN  
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LESSEE: THE ODISHA MINING CORPORATION LTD.**



**Deposit VI**

Section No	Cross-sectional Area, Sq. m	Length of Influence	Volume, cu. m	Sectional Tonnage Factor, t/cu.m	Qty, Million Tonnes
6D1	0	32.5	0.0	0.00	0.000
6D2	0	32.5	0.0	0.00	0.000
6D3	0	12	0.0	0.00	0.000
6D4	407.484	50	20374.2	3.00	0.061
6D5	514.6115	50	25730.6	2.94	0.076
6D6	1861.5009	50	93075.0	3.00	0.279
6D7	3799.1705	50	189958.5	3.00	0.570
6D8	3013.7542	50	150687.7	2.97	0.447
6D9	1476.7203	41	60545.5	0.00	0.000
6D10	2200.8323	50	110041.6	2.50	0.275
6D11	3257.048	50	162852.4	2.50	0.407
<b>Total</b>	<b>16531.122</b>		<b>813265.6</b>		<b>2.115</b>
<b>Recovery factor for Deposit - VI</b>					<b>74.03%</b>
<b>Total balance recoverable geological resource of Deposit -VI</b>					<b>1.566</b>

**Slice Plan Method**

Deposit-wise resources established by slice plan method using SURPAC software is given below.

**Resources established by slice plan method as on 01.04.2015**

Deposit /Quarry	Slice RL, mRL	Qty, Million Tonnes	Fe%
Deposit I	666.0 -> 672.0	0.0003	49.32
	660.0 -> 666.0	0.003	51.54
	654.0 -> 660.0	0.017	58.84
	648.0 -> 654.0	0.032	59.46
	642.0 -> 648.0	0.062	61.98
	636.0 -> 642.0	0.088	62.92
	630.0 -> 636.0	0.079	62.55
	624.0 -> 630.0	0.077	62.33
	618.0 -> 624.0	0.078	63.74
	612.0 -> 618.0	0.060	63.46
	606.0 -> 612.0	0.081	62.43
	600.0 -> 606.0	0.096	62.69
	594.0 -> 600.0	0.107	64.13
	588.0 -> 594.0	0.137	63.68
	582.0 -> 588.0	0.212	63.58
	576.0 -> 582.0	0.389	62.26
	570.0 -> 576.0	0.588	62.47
	564.0 -> 570.0	0.488	62.02
558.0 -> 564.0	0.445	62.11	
552.0 -> 558.0	0.432	63.16	

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



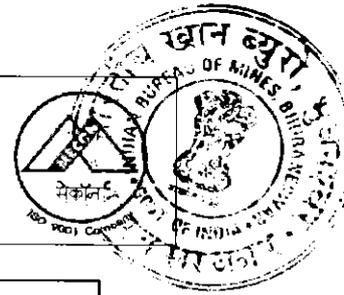
Deposit /Quarry	Slice RL, mRL	Qty, Million Tonnes	Fe%
	546.0 -> 552.0	0.405	63.12
	540.0 -> 546.0	0.356	62.82
	534.0 -> 540.0	0.226	63.06
	528.0 -> 534.0	0.144	62.85
	522.0 -> 528.0	0.071	61.53
	516.0 -> 522.0	0.030	60.58
	510.0 -> 516.0	0.012	55.16
	504.0 -> 510.0	0.012	49.87
	498.0 -> 504.0	0.009	52.2
	492.0 -> 498.0	0.003	51.79
<b>Sub Total</b>		<b>4.738</b>	<b>62.58</b>
<b>Recovery Factor</b>		<b>72.38%</b>	
<b>Total balance recoverable geological resource of Deposit -I</b>		<b>3.429</b>	<b>62.58</b>
Deposit II	642.0 -> 648.0	0.002	65.3
	636.0 -> 642.0	0.013	62.83
	630.0 -> 636.0	0.035	58.98
	624.0 -> 630.0	0.096	59.24
	618.0 -> 624.0	0.148	58.84
	612.0 -> 618.0	0.195	59.93
	606.0 -> 612.0	0.206	60.65
	600.0 -> 606.0	0.132	60.77
	594.0 -> 600.0	0.093	61.44
	588.0 -> 594.0	0.067	61.08
	582.0 -> 588.0	0.138	64.18
	576.0 -> 582.0	0.132	64.89
	570.0 -> 576.0	0.065	63.3
	564.0 -> 570.0	0.025	61.73
558.0 -> 564.0	0.011	58.83	
552.0 -> 558.0	0.002	58.41	
<b>Sub Total</b>		<b>1.359</b>	<b>61.22</b>
<b>Recovery factor for Deposit - II</b>		<b>58.02%</b>	
<b>Total balance recoverable geological resource of Deposit -II</b>		<b>0.788</b>	<b>61.22</b>
Deposit III	630.0 -> 636.0	0.001	51.5
	624.0 -> 630.0	0.122	60.68
	618.0 -> 624.0	0.555	62.37
	612.0 -> 618.0	0.658	61.64
	606.0 -> 612.0	0.432	60.82
	600.0 -> 606.0	0.384	61.24
	594.0 -> 600.0	0.445	61.44
	588.0 -> 594.0	0.419	61.77
	582.0 -> 588.0	0.400	62.97
	576.0 -> 582.0	0.378	62.78
570.0 -> 576.0	0.261	62.65	

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**MODIFIED MINING PLAN  
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Deposit /Quarry	Slice RL, mRL	Qty, Million Tonnes	Fe%
	564.0 -> 570.0	0.239	62.73
	558.0 -> 564.0	0.198	63.13
	552.0 -> 558.0	0.178	63.16
	546.0 -> 552.0	0.162	62.36
	540.0 -> 546.0	0.136	63.91
	534.0 -> 540.0	0.134	65.26
	528.0 -> 534.0	0.118	64.99
	522.0 -> 528.0	0.082	64.87
	516.0 -> 522.0	0.023	64.07
	510.0 -> 516.0	0.000	64.4
<b>Sub Total</b>		<b>5.326</b>	<b>62.28</b>
<b>Recovery factor for Deposit - III</b>		<b>61.53%</b>	<b>3.277</b>
<b>Total balance recoverable geological resource of Deposit -III</b>		<b>3.277</b>	<b>62.28</b>
Deposit IV & IV Main	666.0 -> 672.0	0.031	63.27
	660.0 -> 666.0	0.024	49.39
	654.0 -> 660.0	0.172	56.03
	648.0 -> 654.0	0.619	60.98
	642.0 -> 648.0	1.012	61.93
	636.0 -> 642.0	0.956	62.36
	630.0 -> 636.0	0.724	62.88
	624.0 -> 630.0	0.441	63.2
	618.0 -> 624.0	0.205	63.89
	612.0 -> 618.0	0.078	64.22
	606.0 -> 612.0	0.035	65.91
	600.0 -> 606.0	0.023	66.08
	594.0 -> 600.0	0.014	65.74
	588.0 -> 594.0	0.006	65.03
582.0 -> 588.0	0.0002	61.93	
<b>Sub Total</b>		<b>4.340</b>	<b>62.09</b>
<b>Recovery factor for Deposit – IV &amp; IV Main</b>		<b>83.98%</b>	
<b>Total balance recoverable geological resource of Deposit - IV&amp; IV Main</b>		<b>3.644</b>	<b>62.09</b>
Deposit V	678.0 -> 684.0	0.011	58.19
	672.0 -> 678.0	0.068	57.09
	666.0 -> 672.0	0.158	58.65
	660.0 -> 666.0	0.246	59.41
	654.0 -> 660.0	0.261	59.81
	648.0 -> 654.0	0.212	58.66
	642.0 -> 648.0	0.204	61.05
	636.0 -> 642.0	0.279	62.65
	630.0 -> 636.0	0.315	63.53
	624.0 -> 630.0	0.341	64.53
618.0 -> 624.0	0.314	63.81	

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



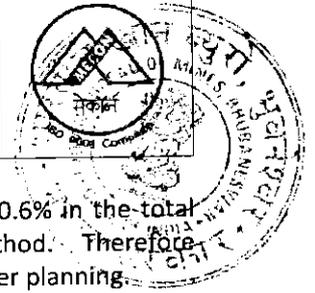
Deposit /Quarry	Slice RL, mRL	Qty, Million Tonnes	Fe%
	612.0 -> 618.0	0.298	62.68
	606.0 -> 612.0	0.329	62.7
	600.0 -> 606.0	0.356	63.15
	594.0 -> 600.0	0.410	62.29
	588.0 -> 594.0	0.461	62.03
	582.0 -> 588.0	0.563	62.2
	576.0 -> 582.0	0.696	62.07
	570.0 -> 576.0	0.762	62
	564.0 -> 570.0	0.934	62.16
	558.0 -> 564.0	0.752	62.99
	552.0 -> 558.0	0.653	63.12
	546.0 -> 552.0	0.639	63.26
	540.0 -> 546.0	0.644	62.46
	534.0 -> 540.0	0.660	62.89
	528.0 -> 534.0	0.651	62.82
	522.0 -> 528.0	0.626	63.21
	516.0 -> 522.0	0.569	63.54
	510.0 -> 516.0	0.472	63.29
	504.0 -> 510.0	0.367	63.29
	498.0 -> 504.0	0.263	62.19
	492.0 -> 498.0	0.173	61.41
	486.0 -> 492.0	0.071	61.51
	480.0 -> 486.0	0.006	62.68
<b>Sub Total</b>		<b>13.768</b>	<b>62.49</b>
<b>Recovery factor for Deposit – V</b>		<b>73.88%</b>	
<b>Total balance recoverable geological resource of Deposit -V</b>		<b>10.172</b>	<b>62.49</b>
Deposit VI	660.0 -> 666.0	0.000	63.27
	654.0 -> 660.0	0.059	63.55
	648.0 -> 654.0	0.152	62.14
	642.0 -> 648.0	0.199	60.63
	636.0 -> 642.0	0.182	60.97
	630.0 -> 636.0	0.191	61
	624.0 -> 630.0	0.211	60.24
	618.0 -> 624.0	0.220	60.35
	612.0 -> 618.0	0.203	61.15
	606.0 -> 612.0	0.170	62.21
	600.0 -> 606.0	0.107	62.13
	594.0 -> 600.0	0.012	54.33
588.0 -> 594.0	0.001	46.22	
<b>Sub Total</b>		<b>1.707</b>	<b>61.12</b>
<b>Recovery factor for Deposit – VI</b>		<b>74.03%</b>	
<b>Total balance recoverable geological resource of Deposit -VI</b>		<b>1.264</b>	
<b>Grand Total</b>		<b>22.574</b>	<b>62.28</b>

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**MODIFIED MINING PLAN  
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LESSEE: THE ODISHA MINING CORPORATION LTD.**



It is vividly indicated from the above tables that there is a variation of only 0.6% in the total resource established by cross-section method and slice plan method. Therefore reserve/resource estimated by slice plan method has been considered for further planning.

The detailed calculation of the Slice-wise reserves/ resources established at 45% Fe cut off for Khandabandh iron ore mines as on 01.04.2015 is given in Annexure 22.

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

**Justification of UNFC classification**

- 1. Measured mineral resources (331)**  
All the deposits have been drilled at a grid spacing of 100 m x 100 m or even less. Geological mapping has been done at 1 : 500/1:1000. Topographical map of the area has been prepared at 5 m contour interval. Chemical analysis of borehole samples alongwith grab samples have been carried out. Therefore entire Reserve/resource has been categorized under 331 category of UNFC.
- 2. Proved Mineral Reserves (111)**  
The mine was in operation since 30.11.1963. Feasibility study has been carried out incl. equipment selection, processing, EIA/EMP Studies, economic evaluation and mine plans/scheme of mining have been approved by statutory authority, the reserve falling within the surface right area of non forest land has been considered as Proved Mineral Reserves (111).
- 3. Probable Mineral Reserves (121)**  
Although the mine was in operation since 30.11.1963, feasibility study has been carried out incl. equipment selection, processing, economic evaluation and mine plans/scheme of mining have been approved by statutory authority but the mine is not having forest clearance therefore, the reserve falling within forest land has been considered as Probable Mineral Reserves (121).
- 4. Feasibility Mineral Resources (211)**  
The part of mineral resources within the non forest surface right area which is economical but has been blocked in statutory barriers & ultimate pit slopes has been considered as Feasibility Mineral Resources (211).
- 5. Pre-Feasibility Mineral Resources (221)**  
The part of mineral resource falling outside the non forest surface right area, which is has been blocked in statutory barriers & ultimate pit slopes or which is not economical due to grade constraints has been considered as Pre-Feasibility Mineral Resources (221).

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

(As on 01.0.4.2015)		
Level of Exploration	Resource, Million Tonnes	Avg. Grade, Fe%
Detailed Exploration (G1)	22.574	62.28%
<b>Total</b>	<b>22.574</b>	<b>62.28%</b>

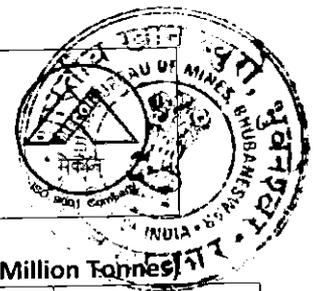
The reserves established as per the standard norm of UNFC is given in the table below:-

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



(In Million Tonnes)

Deposit/ Quarry	Resources type	Total tonnage cut-off (+45%	Non-Saleable grade (45% - 55% Fe)	Saleable grade (+55% Fe)
Deposit I	Measured mineral resources (331)	3.429 (62.58% Fe)	0.214 (50.71% Fe)	3.216 (63.37% Fe)
Deposit II	Measured mineral resources (331)	0.788 (61.22% Fe)	0.090 (51.82% Fe)	0.698 (62.44% Fe)
Deposit III	Measured mineral resources (331)	3.277 (62.28% Fe)	0.194 (50.63% Fe)	3.083 (63.01% Fe)
Deposit IV & IV (Main)	Measured mineral resources (331)	3.644 (62.09% Fe)	0.180 (49.09% Fe)	3.464 (62.76% Fe)
Deposit V	Measured mineral resources (331)	10.171 (62.49% Fe)	0.517 (50.25% Fe)	9.654 (63.14% Fe)
Deposit VI	Measured mineral resources (331)	1.264 (61.12% Fe)	0.061 (50.24% Fe)	9.654 (61.67% Fe)
<b>Total</b>		<b>22.574</b> <b>(62.28% Fe)</b>	<b>1.256</b> <b>(50.39% Fe)</b>	<b>21.318</b> <b>(62.99% Fe)</b>

**Note :** Fe % indicated in the brackets are average Fe %.

The Measured / Indicated resources under different classes of land are given below:

Deposit/ Quarry	Resources type	Total tonnage	Non Forest land	Forest land	
				Already Diverted	All remaining forest land applied for diversion
(in Million Tonnes)					
Deposit I	Measured mineral resources (331)	3.429 (62.58% Fe)	0.193 (62.19% Fe)	-	3.236 (60.60% Fe)
Deposit II	Measured mineral resources (331)	0.788 (61.22% Fe)	0.009 (57.34% Fe)	-	0.779 (61.73% Fe)
Deposit III	Measured mineral resources (331)	3.277 (62.28% Fe)	-	-	3.277 (62.28% Fe)
Deposit IV & IV Main	Measured mineral resources (331)	3.644 (62.09% Fe)	0.767 (60.99% Fe)	-	2.877 (62.25% Fe)
Deposit V	Measured mineral resources (331)	10.171 (62.49% Fe)	-	-	10.171 (62.49% Fe)
Deposit VI	Measured mineral resources (331)	1.264 (61.12% Fe)	0.015 (61.14% Fe)	-	1.249 (49.76% Fe)
<b>Total</b>		<b>22.574</b> <b>(62.28% Fe)</b>	<b>0.984</b> <b>(60.99% Fe)</b>	-	<b>21.590</b> <b>(62.46% Fe)</b>

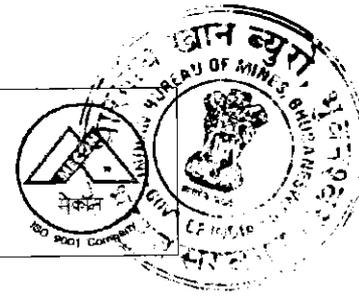
**Note:** Fe % indicated in the brackets are average Fe %.

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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



The Measured / Indicated resources under mineable and non-mineable portions are:-

Deposit/ Quarry	Resources Type	Total tonnage	Mineable	Stat. barrie rs	Blocked/Non-mineable					Total
					Non forest Land	Already diverted forest land	All remaining forest land applied for diversion	Grade constr aints	Others	
(in Million Tonnes)										
Deposit I	Measured mineral resources (331)	3.429	3.109	-	0.178	-	0.112	0.031	-	0.321
Deposit II	Measured mineral resources (331)	0.788	0.722	0.014	0.002	-	0.039	0.011	-	0.067
Deposit III	Measured mineral resources (331)	3.277	3.214	-	0.000	-	0.059	0.003	-	0.063
Deposit IV & IV Main	Measured mineral resources (331)	3.644	2.591	0.065	0.409	-	0.530	0.050	-	1.054
Deposit V	Measured mineral resources (331)	10.171	10.139	-	0.000	-	0.019	0.013	-	0.032
Deposit VI	Measured mineral resources (331)	1.264	1.257	0.004	0.000	-	-	0.003	-	0.006
<b>Total</b>		<b>22.574</b>	<b>21.032</b>	<b>0.083</b>	<b>0.589</b>	<b>-</b>	<b>0.760</b>	<b>0.110</b>	<b>-</b>	<b>1.542</b>

Feasibility Study was then carried out as enclosed in Annexure – 26 and the reserves/ resources classified thereafter for the Khandabandh iron ore deposit is given below:-

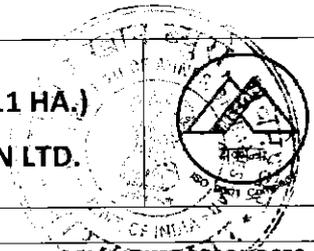
Deposit / Quarry	RESERVES				REMAINING RESOURCES				
	Economic (Mineable) Reserves	Qty.	Break-up land wise		Potentially Economic (Non- mineable)	Qty.	Constraints wise quantities		Remaining Measured Resources
			(in Million Tonnes)				(in Million Tonnes)		
Deposit I	Proved (111)	0.002	0.000	Diverted forest land	Feasibility Mineral Resources (211)	0.037	0.034	Ultimate pit limit	Nil
			0.002	Non-forest land			0.000	Lease barrier	
			0.000	All remaining forest land applied for diversion			0.003	Low grade part	
Deposit I	Probable (121)	3.107	0.000	Diverted forest land	Pre- Feasibility Mineral Resources (221)	0.283	0.256	Ultimate pit limit	Nil
			0.000	Non-forest land			0.000	Lease barrier	
			3.107	All remaining forest land applied for diversion			0.027	Low grade part	
Deposit II	Proved (111)	0.007	0.000	Diverted forest land	Feasibility Mineral Resources (211)	0.006	0.002	Ultimate pit limit	Nil
			0.007	Non-forest land			0.000	Lease barrier	
			0.000	All remaining forest land applied for diversion			0.004	Low grade part	
Deposit II	Probable (121)	0.715	0.000	Diverted forest land	Feasibility Mineral Resources (221)	0.060	0.039	Ultimate pit limit	Nil
			0.000	Non-forest land			0.014	Lease barrier	
			0.715	All remaining forest			0.007	Low grade	

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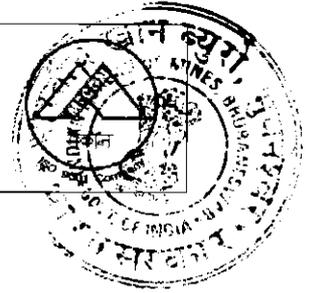
Deposit / Quarry	RESERVES				REMAINING RESOURCES				
	Economic (Mineable) Reserves	Qty.	Break-up land wise		Potentially Economic (Non-mineable)	Qty.	Constraints wise quantities		Remaining Measured Resources
			(in Million Tonnes)				(in Million Tonnes)		
				land applied for diversion			part		
Deposit III	Probable (121)	3.214	0.000	Diverted forest land	Feasibility Mineral Resources (221)	0.063	0.059	Ultimate pit limit	Nil
			0.000	Non-forest land			0.000	Lease barrier	
			3.214	All remaining forest land applied for diversion			0.004	Low grade part	
Deposit IV & IV Main	Proved (111)	0.505	0.000	Diverted forest land	Feasibility Mineral Resources (211)	0.146	0.141	Ultimate pit limit	Nil
			0.505	Non-forest land			0.000	Lease barrier	
			0.000	All remaining forest land applied for diversion			0.005	Low grade part	
Deposit IV	Probable (121)	2.086	0.000	Diverted forest land	Feasibility Mineral Resources (221)	0.908	0.798	Ultimate pit limit	Nil
			0.000	Non-forest land			0.065	Lease barrier	
			2.086	All remaining forest land applied for diversion			0.045	Low grade part	
Deposit V	Probable (121)	10.139	0.000	Diverted forest land	Feasibility Mineral Resources (221)	0.032	0.019	Ultimate pit limit	Nil
			0.000	Non-forest land			0.000	Lease barrier	
			10.139	All remaining forest land applied for diversion			0.013	Low grade part	
Deposit VI	Proved (111)	0.031	0.000	Diverted forest land	Feasibility Mineral Resources (211)	0.000	0.000	Ultimate pit limit	Nil
			0.031	Non-forest land			0.000	Lease barrier	
			0.000	All remaining forest land applied for diversion			0.000	Low grade part	
Deposit VI	Probable (121)	1.226	0.000	Diverted forest land	Feasibility Mineral Resources (221)	0.006	0.000	Ultimate pit limit	Nil
			0.000	Non-forest land			0.004	Lease barrier	
			1.226	All remaining forest land applied for diversion			0.002	Low grade part	

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**MODIFIED MINING PLAN  
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**Category wise updated reserve with grade**

Category wise updated reserves with grade are given in table 3.6.

**(Table 3.6) Reserves as per UNFC classification (as on 1.04.2015)**

Sl. No	Reserve Category (UNFC Classification)	Deposit/Quarry	Qty. in Million Tonnes	Grade (Fe%)
1	Proved Mineral Reserves (111)	Deposit I	0.002	65.52%
		Deposit II	0.007	58.00%
		Deposit IV	0.505	60.76%
		Deposit VI	0.031	61.19%
		<b>Total</b>	<b>0.546</b>	<b>60.87%</b>
2	Probable Mineral Reserves (121)	Deposit I	3.107	62.63%
		Deposit II	0.715	61.49%
		Deposit III	3.214	62.28%
		Deposit IV	2.086	62.92%
		Deposit V	10.139	62.50%
		Deposit VI	1.2259	61.19%
		<b>Total</b>	<b>20.486</b>	<b>62.46%</b>
<b>Total Mineral Reserves (1 +2)</b>			<b>21.032</b>	<b>62.29%</b>
3	Probable Mineral Reserves (122)	NIL	NIL	NA
4	Feasibility Mineral Resource (211)	Deposit I	0.037	+45%
		Deposit II	0.006	+45%
		Deposit IV	0.146	+45%
		Deposit VI	0.000	+45%
		<b>Total</b>	<b>0.189</b>	<b>+45%</b>
5	Pre Feasibility Mineral Resource (221)	Deposit I	0.283	+45%
		Deposit II	0.061	+45%
		Deposit III	0.063	+45%
		Deposit IV	0.908	+45%
		Deposit V	0.032	+45%
		Deposit VI	0.006	+45%
<b>Total</b>		<b>1.353</b>	<b>+45%</b>	
6	Feasibility Mineral Resource (222)	NIL	NIL	NA
7	Remaining measured resource (331)	NIL	NIL	NA
8	Indicated Resource (332)	NIL	NIL	NA
9	Inferred Resource (333)	NIL	NIL	NA
10	Reconnaissance Resource (334)	NIL	NIL	NA
<b>Total Mineral Resources (3+4+5+6+7+8+9+10)</b>			<b>1.542</b>	<b>+45%</b>
<b>Grand Total (1 to 10)</b>			<b>22.574</b>	<b>(62.28% Fe)</b>

  
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A summary of updated reserves/resource as on 01.04.2015 as per UNFC Category is given below.

**Summary of updated reserves/resource as on 01.04.2015**

Reserves			Resources		
UNFC Category	Reserve, Million tonne	Fe%	UNFC Category	Resource, Million tonne	Fe%
111	0.546	60.87%	211	0.189	+45%
121	20.486	62.46%	221	1.353	+45%
<b>Total</b>	<b>21.032</b>	<b>62.29%</b>	<b>Total</b>	<b>1.542</b>	<b>+45%</b>
<b>Grand Total</b>	<b>22.574 Million Tonnes</b>				

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

Following recovery factors have been considered for different deposits based on the analysis report of OMC.

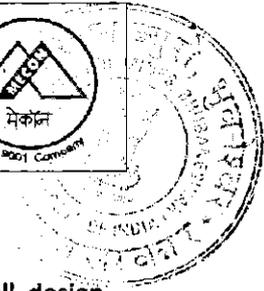
Deposit	Recovery Factor
Deposit - I	72.38%
Deposit - II	58.02%
Deposit - III	61.53%
Deposit - IV	83.98%
Deposit - V	73.88%
Deposit - VI	74.025%

  
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**MODIFIED MINING PLAN  
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**2.0 MINING**

**A. OPEN CAST MINING:**

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

**Minning Method :** The Khandabandh Iron ore Mines comes under Category-A (Fully Mechanized category) as per the IBM guidelines. Prior to suspension of mining operation, the deposit was worked by opencast mining method.

**Bench Configuration:** Presently average height of bench is 6.0m whereas, width of bench has been maintained at 6-10m. Bank slope angle varies from 65° – 75°. Approach road to different deposits of the lease has been maintained at 1 in 16 gradient.

**Drilling & Blasting:** Presently the mine is not operational due to suspension orders issued by RCOM, IBM for violation of rules of MCDR 1988. Prior to suspension deep hole drilling & blasting was used to break the Ore & waste. Drilling was being carried out using 115 mm dia. Drill machines with 3.0 m burden & 3.5 m spacing. Holes were charged with ANFO/slurry explosives and initiated using electric detonator/detonating fuse.

**Loading & Transportation:** Blasted material were loaded into 20 t capacity tippers using 0.9 m<sup>3</sup> which in turn was transported to mobile crushing & screening unit for further size reduction & screening. Manual labours are also being deployed for sorting & sizing of lump to +5 – 18 mm, +10-40 mm CLO apart from other ancillary purposes in the mining. Waste excavated was hauled from working benches to waste dump located close top respective pits by 20t tippers.

Salient parameters of existing major quarries of Khandabandh Iron Ore Mines are as follows.

**Salient parameters of existing quarry (as on 01.04.2015)**

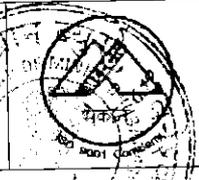
Sl. No.	Parameters	Deposit I (Quarry -1)	Deposit III (Quarry -2)	Deposit IV		Deposit V (Quarry -3)	Deposit VI (Quarry -6)
				Quarry-4	Quarry-4 (Main)		
1.	Quarry Size (L x W x D)	188 m x 138 m x 80.92 m	Quarry 2B : 216 m x 81 m x 16.88 m Quarry 2C : 241 m x 148 m x 48.76 m Quarry 2D : 90 m x 48m x 7.2m	292m x 163m x 22 m	318 m x 179m x 9.5	187 m x 133m x 26 m	201 m x 148 m x 40 m
2.	Total No. of Benches	13	Quarry 2B : 3 Quarry 2C : 10 Quarry 2D : 2	6	2	4	3
3	Top Bench RL	642.46	Quarry 2B : 623.451mRL Quarry 2C : 627.85 mRL Quarry 2D : 592.198	674.299m	651.5m	612 mRL	659.00m
4	Bottom Bench RL	561.55	Quarry 2B : 606.563 mRL Quarry 2C : 579.79 mRL Quarry 2D : 585.029	652.291	642	584.6 mRL	589.50m
5	Average Bench Height	4 – 9 m	Quarry 2B : 4.7 – 5.5 m Quarry 2C : 4 – 5 m Quarry 2D : 3.8 – 4 m	3-8 m	3.5-6 m	6 – 7 m	5-6 m
6	Average Bench Width	5-20 m	Quarry 2B : 6-19.8 m Quarry 2C : 6-20 m Quarry 2D : 7-10 m	6-10 m	10-30 m	18-20 m	25-30 m
7	Average Bank Slope	35° – 49°	Quarry 2B : 46° – 75° Quarry 2C : 26° – 38° Quarry 2D : 23° – 41°	21° – 38°	70° – 75°	70° – 75°	38°-40°
8	Average Pit Slope		Quarry 2B : 26° – 28° Quarry 2C : 27.5° – 32.3° Quarry 2D : 23° – 31°	22.5°	37.6°	45°	27.30°

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Sl. No.	Parameters	Deposit I (Quarry -1)	Deposit III (Quarry -2)	Deposit IV		Deposit V (Quarry -3)	Deposit VI (Quarry -6)
				Quarry-4	Quarry-4 (Main)		
9	Co-ordinates	2427500N to 2428000N & 334525E to 335285E	2427417N to 2428559N & 335017E to 336264E	2425739N to 2426743N & 333398E to 334094E	2426512N to 2427289N & 333521E to 334860E	2426478N to 2427761N & 333952E to 335840E	2428061N to 2429098N & 334469E to 335325E

Details of existing subgrade dump, fines dump, CLO Stacks etc. is given below.

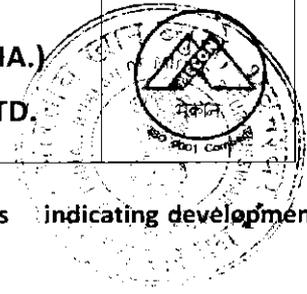
Sl. No.	Dump Type	Location	Co-ordinate	Area occupied (Ha.)	Stock Qty,	No. of terraces	Individual terrace Height, m	Total Dump Height, m	Size, L X W	RL of individual terraces (Bottom RL - Top RL)	
<b>1.</b>	<b>Subgrade Dump</b>										
a	SG-1	Near Deposit I	2427600N to 2427760N & 334930E to 335160E	3.60	0.45 Mcu.m	1	16.3	16.3	355m x 85m	1 <sup>st</sup> : 565.1 - 581.4	
b	SG-2	Near Deposit I	2427760N to 2427980N & 334850E to 335020E	0.608	0.07 Mcu. M	1	4	4	100m x 40m	1 <sup>st</sup> : 574.04 - 578.0	
c	SG-2A	Near Deposit 2	2428360N to 2428440N & 335680E to 335760E	0.24	0.01 Mcu.m	1	7	7	60 m x 30 m	1 <sup>st</sup> - 607.84- 614.8	
d	SG-3	Near Deposit 1	2427540N to 242600N & 334640E to 334930E	0.64	0.0125 Mcu. M	1	4	4	70m x50m	1 <sup>st</sup> - 575.0 - 579.0	
e	SG-4	Near Deposit 3	2426240N to 2427980N & 335820E to 335980E	1.12	0.12 Mcu.m	1	10	10	150m x 80m	1 <sup>st</sup> - 575.075 - 585.15	
f	SG-5	Near Deposit 4	2426620N to 2426800N & 333550E to 333770E	2.20	0.08 Mcu. M	1	8	8	190mx85m	1 <sup>st</sup> : 667.0 - 675.0	
g	SG-5A	Near Deposit 4	2426300N to 2426520N & 333600E to 333750E	1.087	0.067 Mcu.m	1	15	15	170 m x 40 m	1 <sup>st</sup> : 655.13 - 670.11	
<b>2</b>	<b>Lumps &amp; Fines</b>										
a	Lumps	Near WB Deposit VI	2428350N to 2428600N & 335200E to 335550E	5.782	0.009006 Mt	1	4-8 m	4-8 m	440 m x 204 m	Scattered in heaps	
b	Fines				0.081905 Mt	1	4-8 m	4-8 m			

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

**D. In-situ Tentative Excavation**

The year-wise in-situ tentative excavation for the proposed plan period is given below.

**Year-wise in-situ tentative excavation for the proposed plan period**

Year	Deposit/Quarry	Total Tentative Excavation	Top Soil	OB/SB/IB	ROM (Mcu. m)		ROM:Waste cu. m : cu. m
					Ore	Mineral Rejects (Subgrade)	
					M cu. m	M cu. m	
2013-14	Period already lapsed therefore no proposal has been made						
2014-15	Period already lapsed therefore no proposal has been made						
2015-16	Deposit VI	0.3172	0.0000	0.1855	0.1269	0.0047	0.71
	<b>Sub Total</b>	<b>0.3172</b>	<b>0.0000</b>	<b>0.1855</b>	<b>0.1269</b>	<b>0.0047</b>	<b>0.71</b>
2016-17	Deposit VI	0.7727	0.0000	0.5069	0.2472	0.0185	0.52
	<b>Sub Total</b>	<b>0.7727</b>	<b>0.0000</b>	<b>0.5069</b>	<b>0.2472</b>	<b>0.0185</b>	<b>0.52</b>
2017-18	Deposit V (Quarry 3)	0.5041	0.0000	0.2380	0.2460	0.0201	1.12
	Deposit I (Quarry 1)	0.3695	0.0000	0.2682	0.0982	0.0032	0.38
	Deposit VI	0.0205	0.0000	0.0000	0.0034	0.0171	453.69
	<b>Sub Total</b>	<b>0.8736</b>	<b>0.0000</b>	<b>0.5062</b>	<b>0.3441</b>	<b>0.0233</b>	<b>0.73</b>
<b>Grand Total</b>		<b>1.9635</b>	<b>0.0000</b>	<b>1.1987</b>	<b>0.7183</b>	<b>0.0466</b>	<b>0.64</b>

Note : Tentative tonnage of ore have been arrived by considering the following approximate bulk density and recovery factor as these data are variable and may be established on time series.

**Bulk Density , t/cu.m**

Litho Type	Bulk Density , t/cu.m
Ore (Fe%>55%)	3
Subgrade (Fe% between 45 – 55%)	2.5
Waste (Fe% less than 45%)	1.8

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**Recovery Factor**

Deposit	Recovery Factor
Deposit - I	72.38%
Deposit - II	58.02%
Deposit - III	61.53%
Deposit - IV	83.98%
Deposit - V	73.88%
Deposit - VI	74.025%

14/9/16

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

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(Qualified Person)



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**i. At the end of FY 2013-14**

Period has already lapsed therefore no production proposal has been made for FY 2013 – 14. Since the mining operation is suspended due to want of forestry clearance since 05.01.2010, no production has been made from the mines during the FY 2013-14.

**ii. At the end of FY 2014-15**

Period has already lapsed therefore no production proposal has been made for FY 2014 – 15. Since the mining operation is suspended due to want of forestry clearance since 05.01.2010, no production has been made from the mines during the FY 2014-15.

**iii. At the end of FY 2015-16**

**Deposit VI**

During FY 2015-16, existing benches from 654 mRL to 666 mRL in deposit VI will be further pushed in the eastern direction. Besides three nos. of new benches at 666 mRL to 654 mRL will be developed during the FY 2015-16. During the period 0.012 Million tonnes of subgrade will be generated. Entire subgrade generated during the period has been planned to be blended with high grade ore. Around 0.1855 M cu. M waste will be generated during the period which has been proposed to be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

Pit development & production plan at the end of FY 2015-16 is shown in drawing No. MEC/Q76Q/11/16/06. The sections of this pit are shown in drawing No. MEC/Q76Q/11/16/09 to 10A.

Details of calculations of ore, sub grade and waste for the FY 2015-16 is shown in Annexure-23.

**iv. At the end of FY 2016-17**

**Deposit VI**

During FY 2016-17, benches developed i.e from 636 to 660 mRL during FY 2015-16 in deposit VI will be further pushed in the eastern direction. During the period 0.046 Million tonnes of subgrade will be generated. Entire subgrade generated during the period has been planned to be blended with high grade ore. Around 0.507 M cu. m waste will be generated during the period which has been proposed to be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

Pit development & production plan at the end of FY 2016-17 is shown in drawing No. MEC/Q76Q/11/16/07. The sections of this pit are shown in drawing No. MEC/Q76Q/11/16/09 to 10A.

Details of calculations of ore, sub grade and waste for the FY 2016-17 is shown in Annexure-24.

**v. At the end of FY 2017-18**

**Deposit V (Quarry – 3)**

During FY 2017-18, existing benches from 606 mRL to 612 mRL in deposit V will be further pushed in the north western direction. Besides six nos. of new benches at 618mRL to 648 mRL will be developed during the FY 2017-18. During the period 0.050 Million tonnes of subgrade will be generated. Entire subgrade generated during the period has been planned to be blended with high grade ore. Around 0.238 M cu. m waste will be generated during the period which has

  
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been proposed to be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

**Deposit I (Quarry – 1)**

During FY 2017-18, existing benches from 582 mRL to 642 mRL in deposit I will be further pushed in the north western direction. Besides 4 nos. of new benches at 642mRL to 666 mRL will be developed during the FY 2017-18. During the period 0.008 Million tonnes of subgrade will be generated. Entire subgrade generated during the period has been planned to be blended with high grade ore. Around 0.268 M cu. M waste will be generated during the period which has been proposed to be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

**Deposit VI**

During FY 2017-18, existing benches from 606 mRL to 612 mRL in deposit VI will be further pushed in the eastern direction. During the period no subgrade will be generated. Around 0.00005 M cu. M waste will be generated during the period which has been proposed to be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

Entire waste i.e. 0.5062 M cu. M generated during FY 2017-18 from above three deposits will be dumped in waste dump WD1 proposed between 335400E & 2427720 N to 335700E & 2428150N at Deposit III.

Pit development & production plan at the end of FY 2017-18 is shown in drawing No. MEC/Q76Q/11/16/08. The sections of this pit are shown in drawing No. MEC/Q76Q/11/16/09 to 10A.

Details of calculations of ore, sub grade and waste for the FY 2017-18 is shown in Annexure-25.

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

Presently 0.009 million tonnes of lump & 0.082 Million tones fines have been stacked near weighbridge in Deposit VI. These lumps & fines have been proposed to be evacuated as follows.

Year	Location/Dump	Quantity to be evacuated, Million Tonnes
2015-16	Lump & Fines Stackyard, Deposit VI	0.091

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

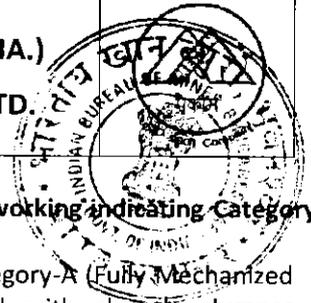
The year wise pit development plan & section for the period ending 2015-16 to 2017-18 is shown in Plate No. MEC/Q76Q/ 11/16/06 to MEC/Q76Q/ 11/16/10A respectively.

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

**Mining Method:** The Khandabandh Iron Ore Mines comes under Category-A (Fully Mechanized category) as per the IBM guidelines. Opencast mining method with shovel –dumper combination has been proposed for Khandabandh Iron Ore Mines.

**Working Regime:** Mine has been proposed to be operated in two shifts. Each shift will be of 8 hours duration. No. of working days per year will be 300 days.

**Mine Design Parameters:** The proposed height of bench is 6 m with 10 m minimum working width. Bank slope has been considered as 75°. Haul road has been planned at a gradient of 1 in 16. Inter bench ramp width has been considered as 6 m.

**Drilling & Blasting:** Drilling will be carried out using 115 mm dia. Drill with 3.0 m burden & 3.5 m spacing. Total 70 % (approx.) of planned quantity will require drilling & blasting. Holes will be charged with slurry explosives and initiated using electric delay detonators/detonating fuse/NONEL.

**Loading & transportation:** Blasted material will be loaded with hydraulic excavators (diesel powered) of bucket capacity of 0.9 – 3.0 cu.m bucket capacity in 25t capacity tipper and will be transported to proposed mobile crushing & screening plant for production of CLO & fines. Waste generated will be transported to proposed waste dump WD1.

Front end loaders & hydraulic excavators of 0.9 – 2.0 cu.m bucket capacity will be deployed for required re-handling works. The CLO & fines generated from the processing plants will be loaded by loader of 0.9-2.0 cu.m capacity & transported through 25 t tippers dumpers to the respective stockyards.

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

Sl. No.	Parameters	Deposit I (Quarry -1)	Deposit V (Quarry -3)	Deposit VI
1.	Quarry Size (L x W x D)	466 m x 405 m x 120 m	311 m x 235 m x 78 m	340 M x 240 m x 54 m
2.	Total No. of Benches	20	13	9
3	Top Bench RL	666 mRL	648 mRL	654 mRL
4	Bottom Bench RL	546 mRL	570 mRL	600 mRL
5	Average Bench Height	6 m	6 m	6
6	Average Bench Width	10 m	10-30 m	10-30 m
7	Average Bank Slope	75°	75°	75°
8	Average Pit Slope	25.2°	23.2°	27.3°

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.

Mining operation has been proposed to be confined within the broken area of Deposit I (Quarry 1) & Deposit V (Quarry 3) during the plan period. The year wise pit development plan & section for the period ending 2015-16 to 2017-18 is shown in Plate No. MEC/Q76Q/ 11/16/06 to MEC/Q76Q/ 11/16/10A respectively. The surface plan of the mine as on 01.04.2015 is shown as Plate No. MEC/Q76Q/ 11/16/05 to 5B. Inter-bench ramp has been planned to facilitate movement of equipment. Width of proposed inter bench ramp is 6.0 m laid at a gradient of 1 in 16. Approach road of 10 m width at a gradient of 1 in 16 have also been envisaged to the proposed waste & subgrade dumping sites. These approach roads & ramps along with main access road will be regularly graded &

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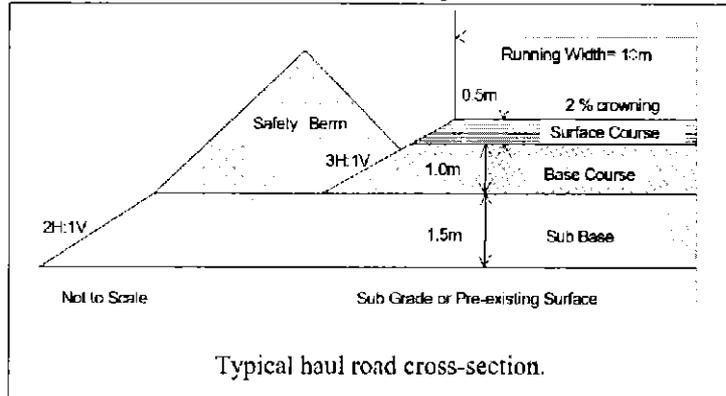
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compacted using motor graders & vibratory compactors to avoid formation of pot holes. Regularly Road surface cross-slopes should be approximately 4% to facilitate easy drainage. Site selected for waste dumping has been proved non-mineralized by drilling boreholes i.e. borehole No. KB/III/DTH/150, KB/III/DTH/151, KB/III/DTH/154, KB/III/DTH/252, KB/III/DTH/398 to 400 & KB/III/DTH/402. The waste has been planned to be dumped within the existing broken area. Prior to commencement of dumping all statutory clearances will be made. After tree felling, retaining wall & garland drains along with settling pits will be constructed to protect the surrounding environment from wash-offs etc. Typical cross-section of haul road is given below.



- f) **Conceptual Mine planning upto the end of lease period taking into consideration the present available reserves and resources describing the excavation, recovery of ROM, Disposal of waste, backfilling of voids, reclamation and rehabilitation showing on a plan with few relevant sections.** Khandabandh Iron ore lease comes under Category – A (fully mechanized category) as per the IBM guidelines. Therefore, conceptual plan of Khandabandh Iron ore lease has been prepared on the basis of life of the deposit considering the proved existence of the mineral upto 510 mRL, 555 mRL, 516 mRL, 586 mRL, 480 mRL & 595 mRL in Deposit I, II, III, IV, V & VI respectively. Conceptual mining plan has been prepared following the guidelines of IBM, keeping in view the present knowledge of the deposit, topography of the area, surface drainage pattern, mineable reserves available, mining technology and sites for waste disposal etc.

Structural studies have been taken mainly in nala cuttings where BHI is exposed. The nallas are structurally controlled. Both E-W and N-S folding are prominent with plunging direction uniformly towards N10°E or N 10°W. Reversal of plunge is occasionally noted. The axial plane cleavages of the mega folds have acted uniformly as a prominent passage for stream flow. Folds of micro and mega scale are very common. Faults of major scale are rarely seen. Joints are numerous and developed due to competency of the rock.

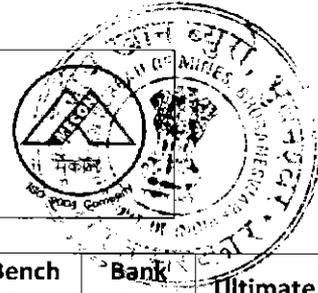
On the basis of available exploration data, the resource model of the deposit has been prepared in a mine planning software viz. Surpac. A safety barrier of 7.5 m & 10 m width all along inside the lease area and village roads has been kept as per the provisions of the statutes respectively. The ultimate pit has been designed using the following bench configurations:-

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Deposit	Ultimate size of Pits (L x W x D)	Bench Height, m	Top RL (m)	Bottom RL (m)	Bench Width, m	Bank Slope Angle	Ultimate Pit Slope
Deposit I	611 m x 502 m x 153	6	669	516	10	75 <sup>0</sup>	25 <sup>0</sup>
Deposit II	447 m x 432 m x 90 m	6	642	552	10	75 <sup>0</sup>	36.51 <sup>0</sup>
Deposit III	829 m x 509 m x 114 m	6	630	516	10	75 <sup>0</sup>	36.26 <sup>0</sup>
Deposit IV & IV Main	1243 m x 611 m x 54 m	6	666	612	10	75 <sup>0</sup>	39.56 <sup>0</sup>
Deposit V	911 m x 805 m x 186 m	6	666	480	10	75 <sup>0</sup>	32.05 <sup>0</sup>
Deposit VI	346 m x 226m x 54 m	6	648	594	10	75 <sup>0</sup>	31.11 <sup>0</sup>

The ultimate pit configuration may change depending upon the outcome of exploration in future. Rated capacity of the mines is 1.0 million ones of Iron Ore. The ROM ore produced will be screened & sized to produce the lumps & fines fractions within the lease. The wastes generated from the Khandabandh Iron ore lease will be partly dumped in external dumps & partly backfilled in the voids created during mining.

**Life of Mine:**

Considering 0.546 Million tonne of proved category (UNFC code 111) & 20.486 Million tonne of probable category (UNFC Code 121 Cat.), the expected life of the mine at the above mentioned rated capacity will be around 22 years.

**Disposal of Sub grade mineral:**

Material containing 45-55% Fe has been considered as subgrade. A total of 1.682 million ones of subgrade will be generated upto conceptual stage. Year-wise generation of subgrade is given below.

**Table 4.1a (Sub grade generation upto Conceptual period)**

Year	Deposit/ Quarry	Subgrade Generation, Million Tonnes	Average Fe%
2015-16 to 2017-18	Deposit V (Quarry 3) & Deposit I (Quarry 1)	0.116	50.48
2018-19 to Conceptual		1.566	50.53
<b>Total</b>		<b>1.682</b>	<b>50.52</b>

Entire subgrade generated during the life of mine will be blended with high grade ore and therefore, separate stacking of subgrade is not required.

**Waste Disposal:**

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

- Site selected for waste dumping have been proved non mineralized by borehole No. KB/III/DTH/150, KB/III/DTH/151, KB/III/DTH/154, KB/III/DTH/252, KB/III/DTH/398 to 400 & KB/III/DTH/402 and are located outside the mineralized zone beyond ultimate pit limits.
- Topography features have been taken into account, particularly in the context of water drainage and availability of relatively flat ground.
- Initially the natural depression has been planned to be leveled upto adjoining ground level & then terracing will be carried out.

  
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The height & width of individual terrace has been considered as 10 m & 10 m respectively with a bank slope angle of 37°. A total of 24.72 Mm<sup>3</sup> of wastes will be generated from entire Khandabandh Iron ore lease upto conceptual stage. Out of which, 0.186 Mm<sup>3</sup>, 0.507 Mm<sup>3</sup> and 0.506 Mm<sup>3</sup> waste generated during year 2015-16, 2016-17 & 2017-18 will be dumped in proposed waste dump WD1 between 335400E & 2427720 N to 335700E & 2428150N at Deposit III. Balance 23.521 Mm<sup>3</sup> of waste generated from year 2018-19 to conceptual stage has been proposed to be backfilled. Out of above 23.521 Mm<sup>3</sup> waste, 4.521 Mm<sup>3</sup>, 14.67 Mm<sup>3</sup> and 4.33 Mm<sup>3</sup> waste will be backfilled in the backfill 1, backfill 2 & backfill 3 respectively. Year-wise waste generation upto end of mine life is given in table 4.2a.

**Table 4.2a (Waste generation upto Conceptual period)**

Year	Waste Generation, Mcu.m
2013-14 to 2014-15	Plan period has lapsed
2015-16 to 2017-18	1.199
2018-Conceptual Stage	23.521
<b>Total</b>	<b>24.720</b>

The manner of disposal of wastes, upto the conceptual stage is given in Table 4.2b.

**Table 4.2b (Waste management plan upto Conceptual period)**

Year	Waste Generation, M cu. M	Waste Dump Destination	Waste Dump Location	Dumped Waste Quantity, M cu. M	Base Area, Ha	Bottom RL	Top RL	No. of Terrace	Individual Terrace Height, m
2013-2015	Plan period from 2013-2015 i.e. two years have already lapsed								
2015-16 to 2017-18	1.199	WD1	Deposit III near quarry 2A between 335400E & 2427720 N to 335700E & 2428150N	1.199	5.747	600	640	4	1 <sup>st</sup> - 4 <sup>th</sup> terrace : 10m
<b>Sub total</b>	<b>1.199</b>			<b>1.199</b>	<b>5.747</b>				
2018-conceptual	23.521	Backfill 1	Deposit VI	4.521	9.96	600	660	6	1 <sup>st</sup> -6 <sup>th</sup> terrace : 10m
		Backfill 2	Deposit V	14.670	33.35	540	600	6	1st -6th terrace : 10m
		Backfill 3	Deposit III	4.330	8.52	552	602	6	1st -6th terrace : 10m
<b>Sub total</b>	<b>23.521</b>			<b>23.521</b>	<b>51.83</b>				
<b>Grand Total</b>	<b>24.720</b>			<b>24.720</b>	<b>57.58</b>				

Protective measures envisaged for dumps upto the conceptual period is given below.

Location	Garland drain		Retaining wall		Settling tank	
	Name/No.	Length, m	Name/No.	L x W x H, m	Name/No.	No.
Near proposed waste dump WD1 at	GD1	405	R1	397 x 1.5 x 1.2	SP1	1
Near Stack yard area	GD4	175	R4	175 x 1.5 x 1.2	SP4	1
Near Existing Subgrade Dump SG4	GD5	240	R5	234 x 1.5 x 1.2	SP5	1
Near Existing Subgrade Dump SG5A	GD6	250	R6	250 x 1.5 x 1.2	SP6	1

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The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. A series of settling pits along with a main settling tank of 15 m length at the outlet of the garland drains will be provided to arrest the wash-off solid particles. The settling tank will be provided with three compartments each of around 5m width to arrest the suspended solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. The retaining walls will be of 1.5m height and 1.2 m width at the top and around 1.5m at the base. Typical design of proposed retaining wall, garland drain & settling pit is given in Annexure – 28.

The location of the external dump & backfilled area is marked on conceptual plan. Afforestation plan by the end of conceptual period is given in Table – 4.4. The quantity of top soil generated upto the conceptual period will be 0.36 M cu. m. Due to low self life of the top soil; it shall be used for concurrent reclamation/ rehabilitation of the backfilled voids & also for avenue plantation due to very low shelf life of the lateritic soils. The phase-wise generation of topsoil is given in table 4.3.

**(Table 4.3) Top soil generation**

Year	Top Soil Generation, Mcu.m
2015-16 to 2017-18	Nil
2018-conceptual	0.36
<b>Total</b>	<b>0.36</b>

Backfilled area will be afforested to check against wash off and guarded with retaining walls at their toes along the lower contours. Following the retaining wall a garland drain will be developed for carrying water to the natural drainage system. Settling pits have also been proposed in the drains to arrest solid particles. The backfilled area will be rehabilitated by planting species such as *Schleichera oleosa* (Kusum), *Syzygium cumini* (Jamun), *Phyllanthus emblica* (Aonla), *Caserea elliptica* (Khakra), *Lagerstroemia parviflora* (Sidha) etc. upto the conceptual period by adequate plantation at the rate of 1600 trees per hectare so as to avoid any wash off. Monitoring & care of plantation shall be carried out by company till the stage of self sustaining.

**Exploration:**

Deposits of Khandabandh Iron Ore lease has been explored by 100 m x 100 m grid and even less upto 50 m x 50 m grid spacing. However, to further ensure the occurrence of ore in unexplored area check boreholes have been proposed at 200 m x 200 m grid spacing. 26 nos. of boreholes have been proposed to be drilled in a phased manner after approval of forest diversion proposal (FDP) of the ML. The year-wise detail of the proposed boreholes to be drilled is given in para 1.0 e (i). The same will be completed under rule 27(3) of MCR 1960.

**Environmental monitoring:**

Noise, air, water and other environmental parameters will be monitored periodically to have a close check on the environmental pollution parameters. Spraying of water on haul roads, use of wet drilling techniques & prevention of vibration by utilization of minimum quantity of explosive per delay will be carried out. As reflected in the table 4.4 a total of 92123 saplings will be planted over an area of 109.90 Ha. over the external dumps & backfilled areas.

  
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**Table 4.4 (Afforestation plan upto conceptual period)**

Year	Waste Dump	Waste Dump Location	Reclaimed Area, Ha.	No. of Saplings to be planted per Ha	No. of saplings to be planted
2015-16 to 2017-18	WD1	Deposit III near quarry 2A between 335400E & 2427720 N to 335700E & 2428150N	5.747	1600	9195
2018 to Conceptual	Backfill 1	Deposit VI	9.96	1600	15936
	Backfill 2	Deposit V	33.35	1600	53360
	Backfill 3	Deposit III	8.52	1600	13632
<b>Grand Total</b>			<b>57.58</b>		<b>92123</b>

The pit position at the end of conceptual period is depicted as Plate No. MEC/Q76Q/ 11/16/11 and conceptual section as Plate No. MEC/Q76Q/ 11/16/12A to 12F.

**Land use planning:**

The land use pattern at the start of the plan period, at the end of plan period and at the end of conceptual period is given in the table 4.5.

**Table 4.5 (Land use at the conceptual stage , Ha)**

Sl. No.	Particulars	Existing Land-use	Land use at the end of 2017-18	Conceptual Land use
1	Excavated Area	110.6279	110.6279	200.5192
2	Subgrade dump	14.1172	14.1172	6.9662
3	Waste dump	1.1198	5.817	0.2587
4	Mineral Storage	7.6729	7.3201	3.9991
5	Infrastructure (Workshop, administrative Building etc)	2.1080	2.1080	2.0705
6	Roads & Railways	11.8657	11.5271	3.2875
7	Mineral Processing	0.2960	0.2960	0.2960
8	Township area	1.8278	1.8278	1.8278
	<b>Total</b>	<b>149.6353</b>	<b>153.6411</b>	<b>219.2250</b>
9	Magazine(with safety zone)	15.7530	15.7530	6.9568
10	Statutory barrier	9.5287	9.5287	9.5287
11	Tenaments	2.1186	2.1186	2.1186
12	Others	189.2754	185.2696	128.4819
	<b>Grand Total</b>	<b>366.3110</b>	<b>366.3110</b>	<b>366.3110</b>

**Post Mining Land-use**

During post mining stage, the excavated mining area will be partly backfilled from the existing waste dumps prevailing over the lease at that time to restore the natural profile. The backfills will be properly graded & terraced and will be biologically reclaimed by coir-matting & plantation. Remaining mined out benches will be afforested with dense plantation. The quarry

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area will be fenced to prevent any inadvertent movement of persons into the area. Township area and builtup infrastructure such as office, workshop and administrative buildings etc. will be handed over to local people/state govt. for social & public use. Processing & conveying facilities will be de-commissioned and will be afforested by dense plantation. Total area covered under waste dumps and mineral stacking & processing will be afforested by plantation. Mine roads will be afforested and other roads within the lease will be used for public transport facilities. Plantation will be carried out 7.5 m statutory barrier. Thus, at the post mining stage the area will have partly backfilled mined out voids surrounded from all the sides by plantation and dense avenue plantation.

The post mining land use thereafter is given below:

**Post Mining Land-use**

S N	Type of land use	Area at Conceptual Stage, Ha	Post Mining Land use, Ha					Total
			Reclamation & Afforestation	Afforestation	Public Use	Water bodies	Un-utilised Land	
1	Area for Mining	200.5192	51.8300	96.9692	-	51.7200	0.0000	200.5192
2	Sub-grade storage	6.9662	-	6.9662	-	-	-	6.9662
3	Overburden dump	0.2587	0.2587	-	-	-	-	0.2587
4	Mineral storage	3.9991	-	3.9991	-	-	-	3.9991
5	Infrastructure (Office, Workshop, Admn Building, Magazine etc.)	2.0705	-	-	2.0705	-	-	2.0705
6	Roads	3.2875	-	3.2875	-	-	-	3.2875
7	Mineral separation plant (Processing & conveying incl. space for other plant facilities)	0.2960	-	0.2960	-	-	-	0.2960
8	Township area	1.8278	-	-	1.8278	-	-	1.8278
9	Magazine with Safety Zone	6.9568	-	6.9568	-	-	-	6.9568
10	Statutory Safety Barrier	9.5287	-	9.5287	-	-	-	9.5287
11	Tenements	2.1186	-	-	-	-	2.1186	2.1186
12	Others	128.4819	-	-	-	-	128.4819	128.4819
<b>Total</b>		<b>366.3110</b>	<b>52.0887</b>	<b>128.0035</b>	<b>3.8983</b>	<b>51.7200</b>	<b>130.6005</b>	<b>366.3110</b>

**B. UNDERGROUND MINING**

Not applicable

**C. Extent of Mechanisation**

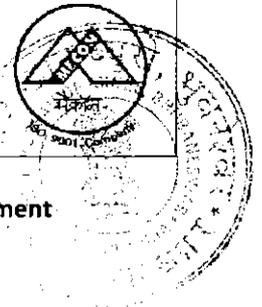
No change in the method of mining has been proposed. Mining will be carried out by opencast method. It has been planned to operate the Khandabandh Iron ore lease with the proposed fleet of mining machineries as given in table 5.4.

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**(Table 5.4) Proposed Fleet of Major HEMM & Auxiliary Mining Equipment**

Parameters	HEMM Fleet
Excavator, 0.9 – 2 cu.m	3
Excavator, 1.5-3.0 cu.m	3
Loader, 1.7cu.m	2
Tipper, 25t	19
Wagon Drill, 115 mm	3
Wheel Dozer,275HP	2
Dozer,324 KW	2
Grader,125KW	1
Explosive van	1
Service van	1
Pick up van	1
Water tanker, 12 kl	5
Diesel browser	1
Tyre Handler	1
Portable lights for face lighting	6
Tower lights	20
Tractor compressor	3
Mobile Crushing & screening unit (350 tph)	1
Cranes,5t	1
Cranes, 15 t	1

The details of the calculations for major HEMM are given in tables 5.5 to 5.8.

**(Table 5.5) Drilling Fleet Calculation**

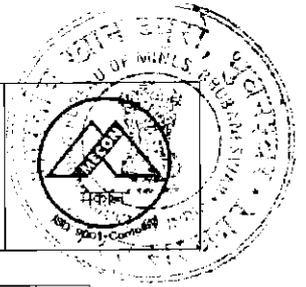
Sl.No.	Parameter	Details	Unit of Measurement
1	Max. Excavation Quantity	2.0	Mt
2	% of Rock Requiring Blasting	70	%
3	Total Excavation requiring blasting	1.40	Mt
4	Deployment % of Drills for drilling	100.00	%
5	Drill hole Diameter	115	mm
6	Burden	3	m
7	Spacing	3.5	m
8	Bench Height	6	m
9	Subgrade Drilling	0.6	m
10	Blast hole depth	6.6	m
11	Yield/hole	180	tonnes
12	Drill factor	27.30	tonnes/m
13	Drill rate	10.00	m/hour
14	Drill capacity/hour	273.00	t/hr
15	Availability	0.78	%
16	Utilisation	0.52	%

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Sl.No.	Parameter	Details	Unit of
17	Net Utilisation	0.41	%
18	Effective run. Hrs/ drill/ annum	3000.00	Hrs
19	Production capacity/yr./drill	0.82	Mt
20	Actual Production capacity / yr/drill (80% of theoretical)	0.66	Mt
21	Total Drills Required	3.0	Nos.
	<b>Total Drills Required (Rounded)</b>	<b>3.00</b>	Nos.

**(Table 5.6) Excavator Fleet Calculation**

Parameter	Details		Unit
	ROM Handling	Product Handling	
<b>Maximum Handling</b>	<b>2.00</b>	<b>1.00</b>	<b>Mt</b>
<b>Bucket capacity</b>	<b>3</b>	<b>1.5</b>	<b>cu.m</b>
% Deployment	100	100	
Cycle time	28	28	Sec
Bucket fill factor	0.8	0.8	Fraction
Operators efficiency factor	0.85	0.85	Fraction
Swell Factor	0.8	0.8	Fraction
Loose density	2.6	2.6	t/cu m
Theoretical mass handled per hour	546	273	t / h
Actual handling/hour	436	218	t/h
% age Availability	0.8	0.8	
% age Utilization	0.76	0.76	
Effective run. Hrs/ shovel/ annum	3600	3600	h
Handling/ annum/ shovel	1.57	0.79	Mt
Excavator Fleet Required to operate	2	2	Nos.
Total Excavator fleet required	3	3	Nos.
<b>Total Excavator fleet required (Rounded)</b>	<b>3</b>	<b>3</b>	<b>Nos.</b>
<b>Total Excavator fleet required (Rounded)</b>	<b>6</b>		<b>Nos.</b>

**(Table 5.7) Tipper Fleet Calculation**

Sl.No	Parameter	Details		Unit
		ROM Handling	Product Handling	
1	Maximum Handling	2.00	1.00	Mt
2	Capacity	25	25	t
3	% Deployment	100	100	%
4	Pay load	20	20	t
5	Speed of dumper Uphaul	20	20	km/h
6	Speed of dumper downhaul	25	25	km/h
7	Lead (Uphaul)	0.75	0.5	Km
8	Lead (downhaul)	0.75	0.5	Km
9	Lead (Level)	1.5	1	Km
10	Swings required to load a dumper	3	5	Nos.

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Sl.No	Parameter	Details		Unit
		ROM Handling	Product Handling	
11	Loading time	72	144	secs
12	Hauling time (loaded)	405	270	secs
13	Hauling time Empty)	324	216	secs
14	Positioning time etc	60	60	secs
15	Total cycle time	861	690	secs
16	Theoretical Handling/ hr./ dumper	84	104	t/h
17	Actual handling/dumper/hour (80 % of theoretical handling)	67	84	t/h
18	Availability	80	80	%
19	Utilisation	75	75	%
20	Net Utilisation	60	60	%
21	Effective run. Hrs/ dumper/ annum	3600	3600	h
22	Handling/ annum/ dumper	0.24	0.30	Mt/dumper
23	<b>Dumper Fleet Required to operate (Rounded)</b>	<b>11</b>	<b>8</b>	<b>Mt</b>
	<b>Actual Dumper Fleet Required (Rounded)</b>	<b>19</b>		<b>Nos.</b>

(Table 5.8) Loader Fleet Calculation

Capacity, cu.m	1.7
<b>Purpose</b>	<b>CLO/ fines handling/Oversize handling from screen</b>
Annual running hours	3000
Productivity, tph	170
Production per m/c per year, Mt	0.68
Max. handling, Mt	1.00
Loaders required to operate, Nos.	2
% Availability	75
<b>Loaders required, Nos.</b>	<b>2</b>

**D. Blasting**

- a) **Broad blasting parameters like charge per hole, blasting pattern, charge per delay, maximum number of holes blasted in a round, manner and sequence of firing, etc.**

The blast design configuration for Khandabandh iron ore mines is given below:-

Parameters	Ore	Waste	Unit
<b>Total Excavation,</b>	<b>1</b>	<b>0.51</b>	<b>Mt</b>
% of Rock Requiring Blasting	70	70	%
Total Excavation requiring blasting, Mt	0.70	0.36	Mt
Hole Dia	115	115	mm
Burden	3	3.5	m
Spacing	3.5	4	m
Bench Height	6	6	m
Subgrade	0.6	0.6	m
Hole Depth	6.6	6.6	m
Stemming	3	3	m

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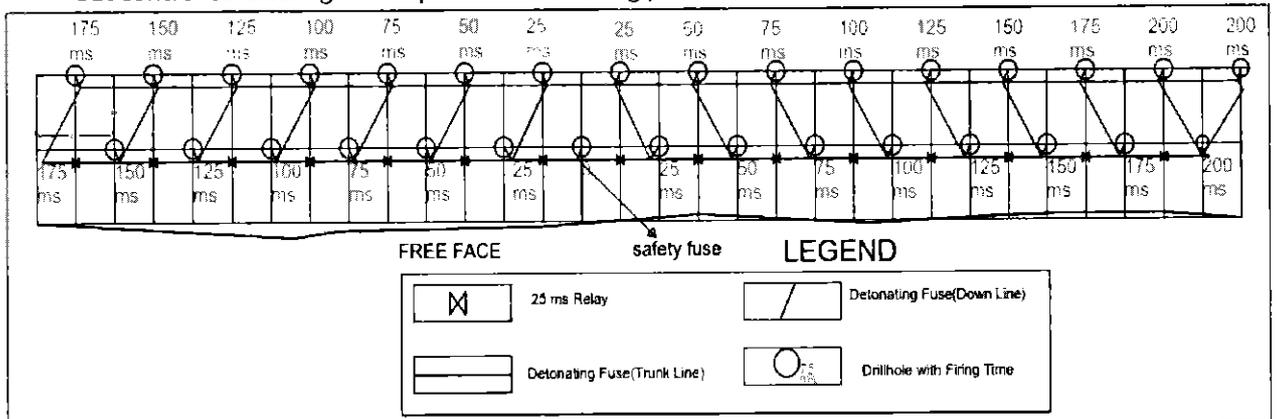


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Parameters	Ore	Waste	Unit
Charge Length	3.6	3.6	m
Explosive Density	1.1	1.1	g/cc
Loading Density, kg/m	11.4	11.4	kg/m
Total Explosive Charge/hole	41.04	41.04	kg
Rock Density	2.6	2.6	t/cu.m
Yield/Hole	163.8	218.4	tonne
Total Holes/yr	4274	1635	Nos.
Drill Factor	30.0	30.0	t/m
Total Meterage required/yr	23333	11900	m
Total no. of holes to be blasted/year	5908		Nos.
Blasting frequency/week	3	2	Nos.
No. of operating faces/round	1	1	Nos.
No. of holes/face	31	17	Nos.
No. of Row/blast	2	2	Nos.
No. of Holes/Row	15	9	Nos.
Drilling Pattern	Staggered		
Initiation System	Electric Detonator/DF/NONEL		
Firing Pattern	Wide V –Cut		
Explosive consumption/year	175385	67085	kg
Explosive consumption/week	3732	1427	kg
Explosive consumption/round	1244	714	kg
Max. Charge/delay	164.16	164.16	kg
<b>Powder Factor</b>	<b>3.99</b>	<b>5.32</b>	<b>t/kg</b>

Rock breaker will be used therefore no secondary blasting is required. It is proposed to undertake ground vibration monitoring studies by an expert agency to determine the maximum charge/delay to keep the ground vibration level within permissible limit. It is proposed to carry out controlled blasting in the quarries considering presence of hutments within leasehold.



**Typical Firing Pattern**

*(Signature)*  
(Qualified Person)

*(Signature)*  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
LESSEE: THE ODISHA MINING CORPORATION LTD.**



**3.0 MINE DRAINAGE**

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

Water sample monitoring stations from where monitoring was regularly carried out prior to suspension of mining operation in Khandabandh Iron Ore Mines /outside the lease area is given below.

**Water Sampling Locations**

Stn. No.	Location	Type	Significance
SW-35	Jururhi Nala near lease area	Surface water	Downstream with respect to mine lease
SW-36	U/S of Jururhi Nala from River Baitarni	Surface water	Downstream with respect to mine lease
SW-37	D/S of Jururhi Nala from River Baitarni	Surface water	Downstream with respect to mine lease
GW-54	Khandbandh Dispensary	Ground water	-
GW-57	Jarhibahal	Ground water	Downstream with respect to mine lease
GW-58	Palsha	Ground water	Downstream with respect to mine lease
GW-59	Gurda	Ground water	Downstream with respect to mine lease
GW-61	Jururhi	Ground water	Downstream with respect to mine lease

Ground water table at Khandabandh Iron ore lease varies from 544-548 mRL.

- b) **Indicate maximum and minimum depth of Workings.**

Maximum and minimum depth of Workings of existing quarry, at the end of proposed plan period and conceptual stage is given below.

Deposit	Existing Quarries		At the end of Plan period i.e. 31.03.2018	
	Topmost Bench RL	Bottommost Bench RL	Topmost Bench RL	Bottommost Bench RL
Deposit -I	642.46 mRL	561.55 mRL	664.403 mRL	561.55 mRL
Deposit -II	618.202 mRL	579.795 mRL	618.202 mRL	579.795 mRL
Deposit -III	Quarry 2B : 623.451mRL Quarry 2C : 627.85 mRL Quarry 2D :592.198 mRL	Quarry 2B : 606.563 mRL Quarry 2C : 579.79 mRL Quarry 2D : 585.029 mRL	Quarry 2B : 623.451mRL Quarry 2C : 627.85 mRL Quarry 2D :592.198 mRL	Quarry 2B : 606.563 mRL Quarry 2C : 579.79 mRL Quarry 2D : 585.029 mRL
Deposit -IV	674.299 mRL	642 mRL	674.299 mRL	642 mRL
Deposit -V	612 mRL	584.6 mRL	642 mRL	584.6 mRL
Deposit -VI	659 mRL	589.5 mRL	659 mRL	589.50 mRL

Mine workings is expected to be around 17 m above water table by the year 2017-18.

- 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 the mine is located at hilltop, rain water will flow through natural drainage system. Besides, 03 Nos. & 03 nos. of check dams have been proposed to be constructed in the FY 2016-17 & 2017-18 respectively along the streams to protect surface runoff.

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(Qualified Person)



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

The mining block lies at altitudes between 525 and 677 mRL. Almost the entire area is hilly. The hill slopes are moderately steep. The top of the ridge at the lease has a peak at 670 mRL. The area has dendritic pattern of drainage because of its hilly topography. The area has dendritic pattern of drainage. Because of the hilly topography, there are numerous seasonal drainage channels but only a few perennial streams / rivers (Kundra Nala, Baitarani River, Karo River). The mine lease is drained by Baitarani River. The seasonal drainage channels coming out of the lease area drain into the Baitarani River which flows at a distance of 2.8 km east of the mine lease. The average annual rainfall as recorded at IMD observatory at Keonjhar is 1269.1 mm. The Southwest monsoon lasts from mid June to mid September and the area gets more than 80% of the annual rainfall during this period. Drainage network of the area is given in figure 3.3.

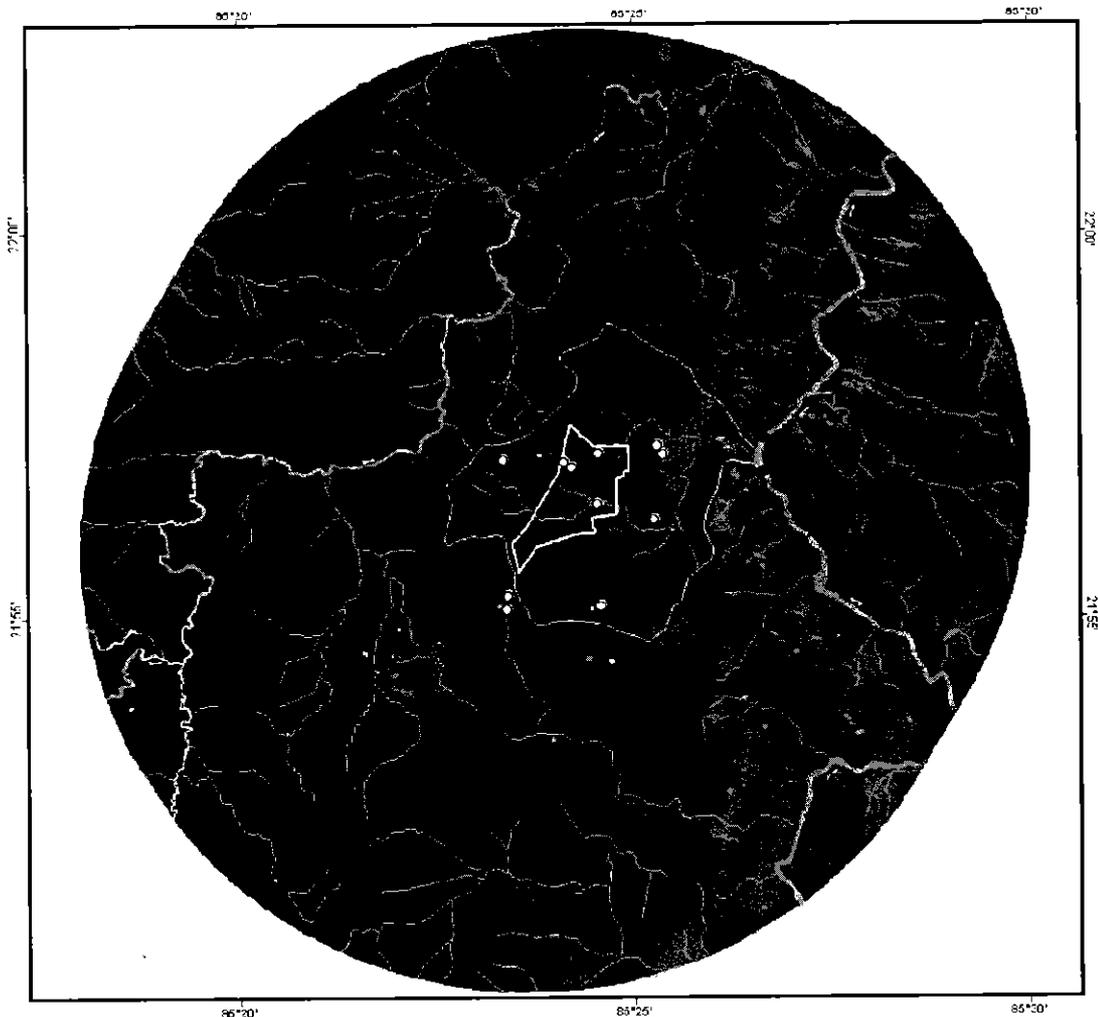


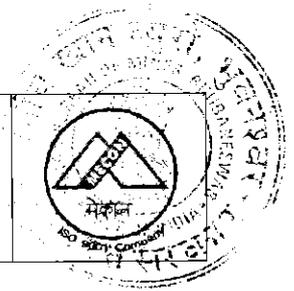
Figure :3.3 Drainage Network of the area

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
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**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 off.

No top soil will be generated during the plan period. Overburden/Inter-burden is mostly laterite, BHJ, Lateritic Soil and shale. Year-wise subgrade generation during proposed plan period is given below.

**Year-wise Sub grade generation**

Year	Subgrade Generation, Million Tonnes	Avg. Fe%
2015-16	0.0118	49.47
2016-17	0.046	50.77
2017-18	0.058	50.56
<b>Total</b>	<b>0.1158 ~ ( 0.116)</b>	<b>50.53</b>

Entire subgrade generated during the plan period will be blended with high grade ore, therefore separate stacking of subgrade is not required.

Since entire working during the plan period is confined within the existing broken area, no top soil will be generated during the period from 2015-16 to 2017-18.

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

Year	Top Soil (Mil. cum)		Mineral Rejects (Mil.)		Sub grade (Mil. cum)	
	Reuse/ spreading from the stored qty.	Storage	Back-filling	Storage	Blending	Beneficiation
2013-14	Plan period has already lapsed					
2014-15	Plan period has already lapsed					
2015-16	Nil	Nil	Nil	0.186	0.0118	Nil
2016-17	Nil	Nil	Nil	0.507	0.046	Nil
2017-18	Nil	Nil	Nil	0.506	0.058	Nil
<b>Total</b>	<b>Nil</b>	<b>Nil</b>	<b>Nil</b>	<b>1.199</b>	<b>0.1158</b>	<b>Nil</b>

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.

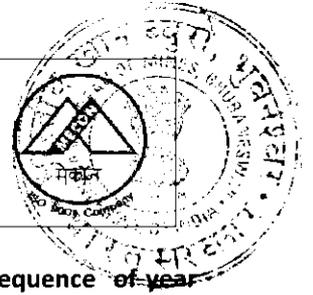
Waste dumping during the plan period has been proposed in the proposed waste dump WD1 between 335400E & 2427720 N to 335700E & 2428150N at Deposit III. Site selected for waste dumping have been proved non mineralized by borehole No. KB/III/DTH/150, KB/III/DTH/151, KB/III/DTH/154, KB/III/DTH/252, KB/III/DTH/398 to 400 & KB/III/DTH/402 and are located outside the mineralized zone beyond ultimate pit limits.

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(Qualified Person)



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

All the dumps will be formed by retreating method of dumping, so as to facilitate early reclamation. The height of the individual terrace will be 10 m and the maximum height of the dump will be limited to 60 m. The bank slope angle considered for designing the dump is 37 degrees. Two years of plan period i.e 2013-14 & 2014-15 has already lapsed. Year-wise generation, disposal, configuration and built up for the proposed plan period i.e. FY 2015-16 to 2017-18 is given below.

Year	Waste Generation, M cu. m	Waste Dump Destination	Waste Dump Location	Dumped Waste Quantity, M cu. m	Base Area, Ha	Bottom RL	Top RL	No. of Terrace	Individual Terrace Height, m
2015-16	0.186	WD1	Between 335400E & 2427720 N to 335700E & 2428150N at Deposit III near quarry 2A	0.186	5.747	600	606	1	1st terrace : 6m
2016-17	0.507	WD1		0.507		600	622	3	1st - 2nd terrace : 10m 3rd terrace : 2m
2017-18	0.506	WD1		0.506		600	640	4	1st - 4th terrace : 10m
<b>Total</b>	<b>1.199</b>	<b>WD1</b>		<b>1.199</b>		<b>5.747</b>	<b>600</b>	<b>640</b>	<b>4</b>

**Existing Environmental protection measures**

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

Year	Location	Garland drain		Retaining wall	
		Name/ No.	Size, L x W x H, m	Name/ No.	L x W x H, m
2011-12	Dump of Quarry 1 at Deposit I	-	-	R3	775 x 1.0 x 1.0
	Dump of Quarry 4 at Deposit IV	GD2	325 x 1.0 x 0.75	R2	541 x 1.0 x 1.0

Besides, parapet wall of 368 m length & 1.10 m height has also been constructed during FY 2012-13 along the crusher road side.

**Proposed Environmental Protection Measures**

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

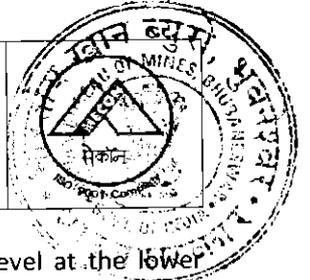
Year	Location	Garland drain		Retaining wall		Settling tank	
		Name/ No.	Length, m	Name/ No.	L x W x H, m	Name/ No.	No.
2015-16	Near proposed waste dump WD1 at	GD1	405	R1	397 x 1.5 x 1.2	SP1	1
	Near Stack yard area	GD4	175	R4	175 x 1.5 x 1.2	SP4	1
	Near Existing Subgrade Dump SG4	GD5	240	R5	234 x 1.5 x 1.2	SP5	1
	Near Existing Subgrade Dump SG5A	GD6	250	R6	250 x 1.5 x 1.2	SP6	1

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The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. A series of settling pits along with a main settling tank of 15 m length at the outlet of the garland drains will be provided to arrest the wash-off solid particles. The settling tank will be provided with three compartments each of around 5m width to arrest the suspended solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. The retaining walls will be of 1.5m height and 1.2 m width at the top and around 1.5m at the base. 05 Nos. & 03 nos. of check dams have been proposed to be constructed in the FY 2016-17 & 2017-18 respectively. Typical design of proposed retaining wall, garland drain & settling pit is given in Annexure – 28.

Besides, following protective measures must also be implemented for safe, scientific & eco-friendly mining.

Period	Protective Measures	Location of Check Dams
2016-17	Construction of 05 Nos. of Check dams	Between 335900 E to 336100E & 2428400N to 2428600N
2017-18	Construction of 03 Nos. of Check dams	Between 334500E to 335700E & 2426400N to 2427500N
Regular cleaning of existing and proposed garland drains		

Typical engineering design of a check dam is given at annexure 37.

The OB dumps will be compacted and afforestation will be carried out on the terraces as well as along the slopes after spreading a layer of top soil over it before rehabilitation.

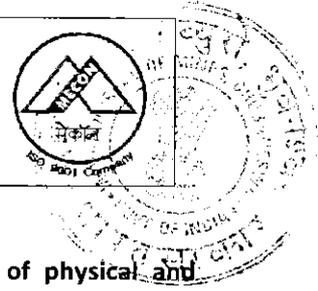
The year-wise plan & sections of the waste dumps have been shown in drawing No. MEC/Q76Q/11/16/13.

  
(Qualified Person)

  
(Qualified Person)



**MODIFIED MINING PLAN  
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**5.0 USE OF MINERAL AND MINERAL REJECT**

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

The entire ore production including lumps and fines produced from Khandabandh lease will be consumed in neighbouring steel plants/sponge iron plants of Odisha. Quality parameters of lumps and fines as specified by the steel plants are as follows.

SN	Parameters	Lump Ore	Fines Ore
i	Fe	65.0 % (min)	64.5 % (min)
ii	SiO <sub>2</sub>	2.0 % (max)	2.0 % (max)
iii	Al <sub>2</sub> O <sub>3</sub>	2.0 % (max)	2.0 % (max)
iv	Total Gangue (Al <sub>2</sub> O <sub>3</sub> + SiO <sub>2</sub> )	4.0 % (max)	4.0 % (max)
v	Size	+10 - 40 mm (Over & under size : Max. 5% Each)	Size: - 10mm {with oversize 5% maximum and undersize 20% maximum.

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

Fe	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	P	Moisture	LOI	Size
64% to 65%	2.52%	1.48	0.046%	2.9% Maximum	3% maximum	+5 to -18 mm as well as +10 to -40 mm

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

The entire ore produced will be sold to long term buyers for use in their steel plants. Major probable long term buyers are Bhushan Steel Limited, Vandana Global Limited, Visa Steel Ltd., Gimpex Industries Ltd. & Kalinga Allied Industries.

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

The entire ore produced will be sold to long term buyers for use in their steel plants.

d) Indicate precise physical and chemical specification stipulated by buyers

The entire ore production including lumps and fines produced from Khandabandh lease will be consumed in neighbouring steel plants of Odisha. Quality parameters of lumps and fines as specified by the long term buyers are as follows.

SN	Parameters	Lump Ore	Fines Ore
i	Fe	62.0 % (min)	60 % (min)
ii	SiO <sub>2</sub>	2.0 % (max)	2.0 % (max)
iii	Al <sub>2</sub> O <sub>3</sub>	2.0 % (max)	2.0 % (max)
iv	Total Gangue (Al <sub>2</sub> O <sub>3</sub> + SiO <sub>2</sub> )	4.0 % (max)	4.0 % (max)
v	Size	+10 - 40 mm	Size: - 10mm.
vi	Tolerance	+/- 10%	+/- 10%

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

Subgrade ore containing 45-55% Fe will be blended with high grade ore at mine site itself. ROM will be sized to the desired range suitable for its use in the steel plants by two-stage crushing & screening in the proposed mobile crushing & screening plant.

(Qualified Person)

(Qualified Person)



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

Subgrade ore containing 45-55% Fe will be blended with high grade ore at mine site itself. ROM will be sized to the desired range suitable for its use in the steel plants by two-stage crushing & screening in the proposed mobile crushing & screening plant. The sized material is dispatched to the long term buyers.

  
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**MODIFIED MINING PLAN  
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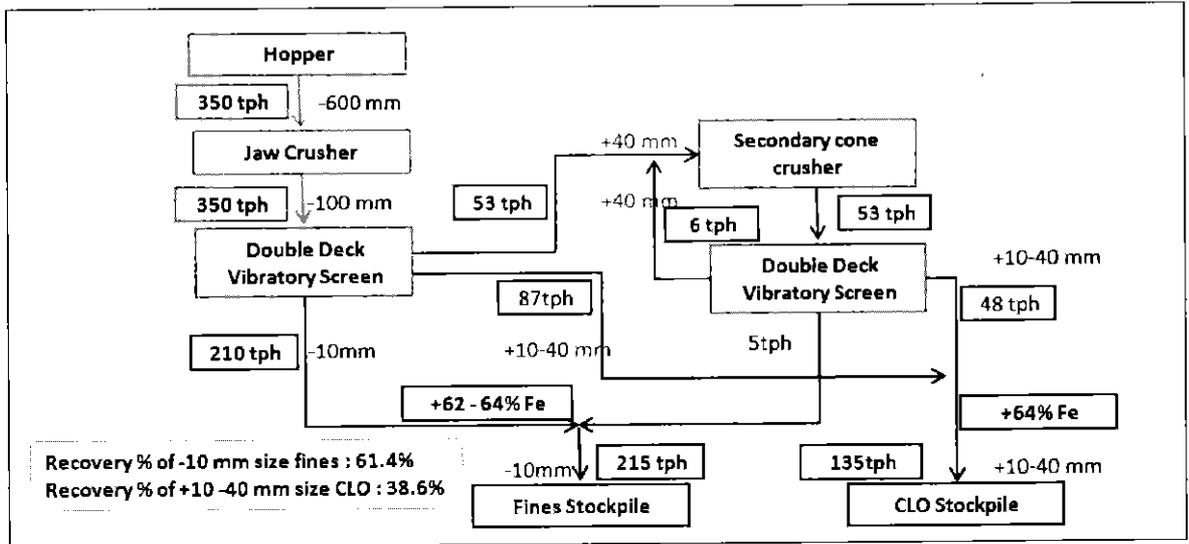


**6.0 PROCESSING OF ROM AND MINERAL REJECT**

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

Presently no crushing & screening facility is available at the mines. Therefore, one 350 tph capacity mobile crushing and screening plant has been proposed from FY 2015-16. The ROM from mine will be transported by 25t tippers to the dump hopper of crushing & screening unit. ROM from dump hopper will be fed to a jaw crusher. The product (-100 mm size fraction) of jaw crusher will be fed to a double deck vibratory screen wherein, -10mm, +10-40mm and +40-100mm will be separated. +40 mm material will be carried to secondary cone crusher. product of secondary cone crusher will be subjected to screening in a double deck screen. -10 mm material from primary screen and secondary screen will be conveyed to the fines stockpile. +10-40 mm size CLO from primary screen and secondary screen will be conveyed to the CLO stockpile and +40 mm size material will be re-circulated to secondary cone crusher for further crushing. The CLO & fines generated after screening the crushed product will be loaded by loader and transported through tippers to the respective stockyard. A tentative flow sheet of proposed crushing and screening plant is given below.

**Proposed 2-Stage Crushing and Screening Facilities**



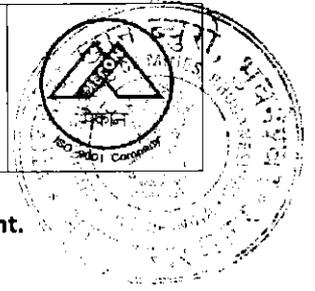
- b) Give a material balance chart with a flow sheet or schematic diagram of the processing procedure indicating feed, product, recovery, and its grade at each stage of processing. The same is given in annexure 27.
- c) Explain the disposal method for tailings or reject from the processing plant.  
Not 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

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- 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.  
Average water requirement at Khandabandh Iron Ore Mine for domestic and industrial use are to the tune of 65 m<sup>3</sup>/day and 102 m<sup>3</sup>/day respectively. Peak water requirement at Khandabandh Iron Ore Mine for domestic and industrial use are to the tune of 65 m<sup>3</sup>/day and 132 m<sup>3</sup>/day, respectively. Water balance chart indicating source, consumption & extent of recycling with average value [peak value] is given in figure 3.4.

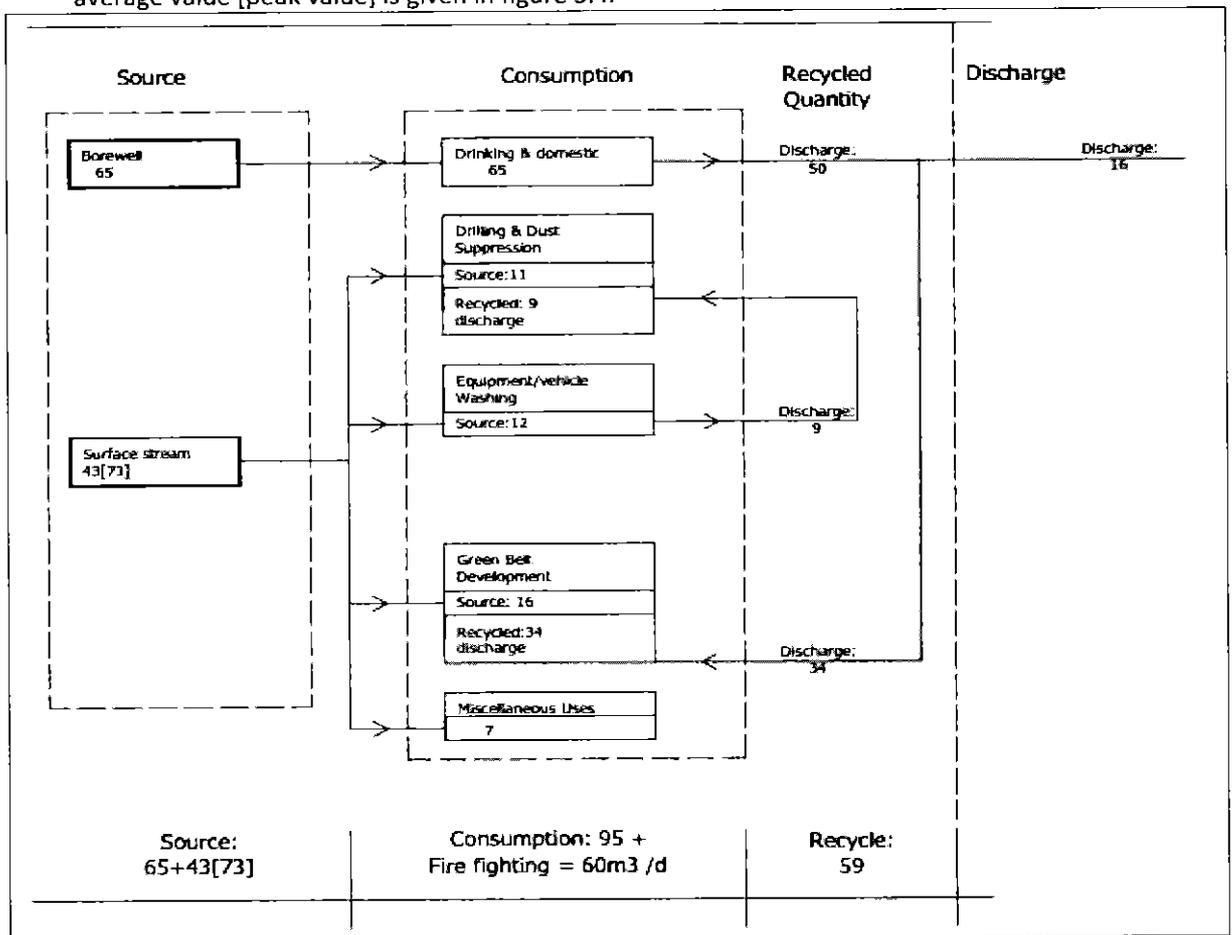


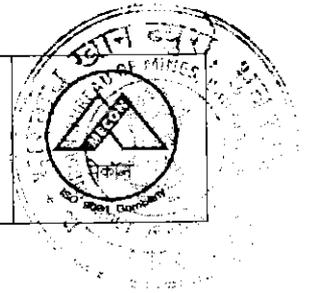
Figure 3.4 : Water balance chart indicating source, consumption & extent of recycling with average value [peak value]

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**MODIFIED MINING PLAN  
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**7.0 OTHER**

**a) Site Services**

Presently following infrastructure are available at Khandabandh Iron ore lease .

**i. Mine Office**

A mine office with survey, mining, geology, administration etc. department is located in the leasehold.

**ii. Township & Guest House**

Township and guest house is located within the lease.

**iv. Other Support Facilities**

All the statutory facilities such as canteen, first-aid centre, Dispensary, vocational training centre, school etc have been provided. To take care of the drinking water needs at different working areas, water tankers have been provided.

Power supply facilities are also available in the township & offices.

**b) Employment Potential:**

Considering the statutory requirement and requirement of various operational departments the estimated executive and non-executive manpower requirement is given in table 7.1.

**Table 7.1: Manpower Requirement**

Category	Total
Administrative	14
Highly skilled	36
Skilled	41
Semi-skilled	124
unskilled	500
<b>Total</b>	<b>715</b>

Details of statutory manpower requirement for Khandabandh Iron Ore Mines are given below.

Statutory Manpower	Nos.
Agent	1
Manager (Mines)	1
Geologist	1
Assistant Manager/Engineer	2
Surveyor	1
Electrical Supervisor	1
Foreman	2
Mining Mate	2
Shotfirer	1
<b>Total</b>	<b>12</b>

  
(Qualified Person)

  
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**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
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**8.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 (B) OF MCDR'1988**

**8.1 Environment Base line information:**

**Existing land use pattern**

The existing land use as on 01.04.2015 is given below:-

Sl. No.	Particulars	Existing Land-use
1	Excavated Area	110.6279
2	Subgrade dump	14.1172
3	Waste dump	1.1198
4	Mineral Storage	7.6729
5	Infrastructure (Workshop, administrative Building,etc)	2.1080
6	Roads & Railways	11.8657
7	Mineral Processing	0.2960
8	Township area	1.8278
	<b>Total</b>	<b>149.6353</b>
9	Magazine(with safety zone)	15.7530
10	Statutory barrier	9.5287
11	Tenaments	2.1186
12	Others	189.2754
	<b>Grand Total</b>	<b>366.3110</b>

**Water regime**

The area has dendritic pattern of drainage because of its hilly topography. The area has dendritic pattern of drainage. Because of the hilly topography, there are numerous seasonal drainage channels but only a few perennial streams / rivers (Kundra Nala, Baitarani River, Karo River). The mine lease is drained by Baitarani River. The seasonal drainage channels coming out of the lease area drain into the Baitarani River which flows at a distance of 2.8 km east of the mine lease. The average annual rainfall as recorded at IMD observatory at Keonjhar is 1269.1 mm. The Southwest monsoon lasts from mid June to mid September and the area gets more than 80% of the annual rainfall during this period.

**Quality of air, water and ambient noise level**

The same is enclosed as Annexure – 19.

**Flora and Fauna**

**Flora**

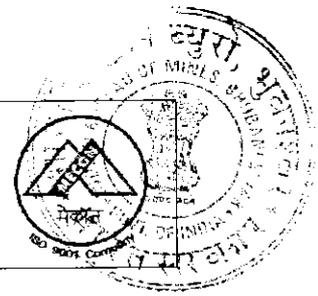
The forest in the leasehold is classified as Northern Tropical Dry Deciduous Forests. The average tree density in core zone is about 1640 trees/ha. The forest is under moderately degraded stage with tree closely spaced and height ranging from 2 to 12m and girth class ranging from 20 to more than 40 cm. Shorea robusta, is the most dominant species with Diospyros melanoxylon, Buchnanian lanzen, Schleicheria oleosa (Kusum), Syzygium cumini (Jamu), Phyllanthus emblica (Aonla), Caserea elliptica (Khakra), Lagerstroemia parviflora (Sidha) etc. as common associates.

  
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(Qualified Person)



**MODIFIED MINING PLAN  
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Fauna

Mongoose, Kuji Neola, Fox, Jackal, rats sloth bear, Cobra, krait, lizard etc. are major faunal species found in the core zone.

Aquatic Fauna

The area contains numerous small and large species of fish, the principal ones being Rohu.

Climatic conditions

The area lies in tropical region where climate is characterized by very hot summers and cool winters. Summer is typically from March to June when monthly temperature ranges from a maximum of 42°C during daytime to a minimum of 15°C at night. Winter is from November to February when the maximum temperature during day goes up to 37°C and minimum temperature at night becomes as low as 8°C.

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

Human settlements

Only Khandabandh, Jaroli, Jajang, Gurda & Jalahuri villages have been found in the 500 m buffer zone of the area. The details of the population of the villages in the buffer zone are given in the table below:-

Name of villages in the buffer zone	Population, Nos.
Khandabandh	1261
Jaroli	3196
Jalahuri	3986
Gurda	275

Public buildings, places of worship and monuments

There is no place of archaeological or religious importance within 5 km of the lease.

Indicate any sanctuary is located in the vicinity of leasehold

No sanctuary is located in the vicinity of leasehold

Environment plan of the mine is shown in drawing no. MEC/Q76Q/11/16/14.

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

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

The land use in stages is given below:-

Sl. No.	Particulars	Existing Land-use	Land use at the end of 2017-18	Conceptual Land use
1	Excavated Area	110.6279	115.3251	200.5192
2	Subgrade dump	14.1172	14.1172	6.9662
3	Waste dump	1.1198	1.1198	0.2587
4	Mineral Storage	7.6729	7.3201	3.9991
5	Infrastructure (Workshop,	2.1080	2.1080	2.0705

(Qualified Person)

(Qualified Person)



**MODIFIED MINING PLAN  
OF KHANDABANDH IRON ORE LEASE (366.311 HA.)  
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Sl. No.	Particulars	Existing Land-use	Land use at the end of 2017-18	Conceptual Land use
	administrative Building,etc)			
6	Roads & Railways	11.8657	11.5271	3.2875
7	Mineral Processing	0.2960	0.2960	0.2960
8	Township area	1.8278	1.8278	1.8278
	<b>Total</b>	<b>149.6353</b>	<b>153.6411</b>	<b>219.2250</b>
9	Magazine(with safety zone)	15.7530	15.7530	6.9568
10	Statutory barrier	9.5287	9.5287	9.5287
11	Tenaments	2.1186	2.1186	2.1186
12	Others	189.2754	185.2696	128.4819
	<b>Grand Total</b>	<b>366.3110</b>	<b>366.3110</b>	<b>366.3110</b>

**ii) Air quality**

Following measures are proposed for management of air quality:-

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

**iii) Water quality**

The water table will not be touched during the proposed plan period. However due to surface run offs there will be likely impact on the surface water quality. Depending upon the drainage pattern of the area where the dump area is located, retaining walls, garland drain with settling tanks will be provided. The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. A series of settling pits along with a main settling tank of 15 m length at the outlet of the garland drains will be provided to arrest the wash-off solid particles. The settling tank will be provided with three compartments each of around 5m width to arrest the suspended solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. The retaining walls will be of 1.5m height and 1.2 m width at the top and around 1.5m at the base. 05 Nos. & 03 nos. of check dams have been proposed to be constructed in the FY 2016-17 & 2017-18 respectively. Typical design of proposed retaining wall, garland drain & settling pit is given in Annexure – 28.

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

Year	Location	Garland drain		Retaining wall	
		Name/ No.	Size, L x W x H ,m	Name/ No.	L x W x H ,m
2011-12	Dump of Quarry 1 at Deposit I	-	-	R3	775 x 1.0 x 1.0
	Dump of Quarry 4 at Deposit IV	GD2	325 x 1.0 x 0.75	R2	541 x 1.0 x 1.0

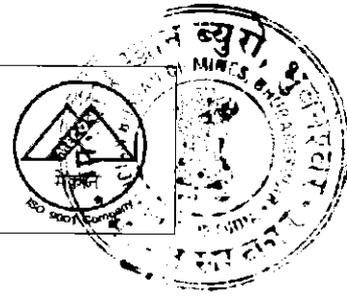
Besides, parapet wall of 368 m length & 1.10 m height has also been constructed during FY 2012-13 along the crusher road side.

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**MODIFIED MINING PLAN  
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The details of the protective measures envisaged for the dumps are given below:-

Year	Location	Garland drain		Retaining wall		Settling tank	
		Name/ No.	Length, m	Name/ No.	L x W x H ,m	Name/ No.	No.
2015-16	Near proposed waste dump WD1 at	GD1	405	R1	397 x 1.5 x 1.2	SP1	1
	Near Stack yard area	GD4	175	R4	175 x 1.5 x 1.2	SP4	1
	Near Existing Subgrade Dump SG4	GD5	240	R5	234 x 1.5 x 1.2	SP5	1
	Near Existing Subgrade Dump SG5A	GD6	250	R6	250 x 1.5 x 1.2	SP6	1

**iv) Noise levels**

Due to operation of the HEMM & plant, ambient noise levels is likely to increase but the same will be managed through proper maintenance of the plant & machineries & use of personal protective equipment.

The monitoring of ambient air quality, surface water & ground water quality and noise quality will be carried out for all the four quarters of the year by the forest & environment section of OMC /External agency. The details of the monitoring stations are given in the table below:-

The results of the ambient air quality / noise quality monitoring reports prior to suspension of mining operation as enclosed in Annexure – 19 indicates that the quality parameters are within the acceptable levels.

**Location of Ambient Air Quality Monitoring Stations**

Stn. Code	Location	Distance & Direction from center of lease
A-87	Khandabandha dispensary	Core zone
A-92	Jaribahal	2.00 km SE
A-79	Chilkapata	2.25 km NNE
A-86	Khandabandha camp	2.25 km NW
A-78	Jalhari	2.50 km NE
A-93	Palsha II*	2.50 km S
A-94	Gurda	3.25 km SW
A-95	Pataberha	4.25 km WSW
A1	Near Hutment of Khandabandh Village	Core zone
A2	Near Deposit I (Quarry – 1)	Core zone
A3	Near Deposit V (Quarry – 3)	Core zone

**Location of Surface/ground Water Sampling Stations**

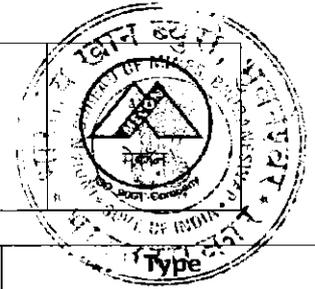
Stn. No.	Location	Type
SW-35	Jururhi Nala near lease area	Surface water
SW-36	U/S of Jururhi Nala from River Baitarni	Surface water
SW-37	D/S of Jururhi Nala from River Baitarni	Surface water
SW1	Near Lease Pillar 7 & 8 in upstream side	Surface water
SW2	Near Lease Pillar 55 in upstream side	Surface water

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Stn. No.	Location	Type
SW-35	Jururhi Nala near lease area	Surface water
SW3	Near Lease Pillar 35 & 36 in upstream side	Surface water
SW4	Downstream side of Jalahuri Nala near Lease Pillar 24	Surface water
GW-54	Khandbandh Dispensary	Ground water
GW-57	Jarhibahal	Ground water
GW-58	Palsha	Ground water
GW-59	Gurda	Ground water
GW-61	Jururhi	Ground water

**Location of Noise Monitoring Stations**

Stn. No.	Location	Core Zone / Buffer Zone
N-57	Jalhari	Buffer zone
N-66	Jarhibahal	Buffer zone
N-67	Gurda	Buffer zone
N-68	Western side of lease	Buffer zone
N-69	Khandband dispensary	Core zone
N1	Near Hutment of Khandabandh Village	Core zone
N2	Near Deposit I (Quarry – 1)	Core zone
N3	Near Deposit V (Quarry – 3)	Core zone

**v) Vibration levels (due to blasting)**

The blast induced ground vibrations will be controlled through limiting the charge per delay and use of in-hole delay by NONEL means of initiation. The blasting frequency will be limited to 3-4 times per week. It is proposed to undertake blasting studies/ground vibration monitoring studies by an expert agency to determine the maximum charge/delay to keep the ground vibration level within permissible limit.

**vi) Water regime**

It is to be noted that the existing groundwater levels are well below the ore-body floor, expectedly more than 35 m bgl. These would therefore remain unaffected by mining operations.

**vii) Acid mine drainage**

Not applicable

**viii) Surface subsidence**

Not applicable

**ix) Socio-economics**

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

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x) **Historical monuments etc.**  
There are no historical monuments or places of archeological interest within 5 km radius of the lease.  
The environment management plan is shown in drawing no. MEC/Q76Q/11/16/15.

**8.3 Progressive Reclamation Plan :**

**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".

Around 5.747 Ha area of proposed waste dump WD1 will be afforested with 9196 nos. of saplings at the end of FY 2017-18 and will be stabilized. As the ore continues upto 480 mRL, concurrent backfilling in the mined out benches is not possible during the proposed plan period.

**8.3.2 Topsoil Management:** The topsoil available at the site and its utilization may be described.  
No top soil will be generated during the year 2015-16 to 2017-18.

Year	Top soil generation
2015-16	Nil
2016-17	Nil
2017-18	Nil

**8.3.3 Tailings Dam Management:** The steps to be taken for protection and stability of tailing dam, stabilization of tailing material and its utilization, periodic desilting measures to prevent water pollution from tailings etc, arrangement for surplus water overflow along with detail design, structural stability studies, the embankment seepage loss into the receiving environment and ground water contaminant if any may be described.  
Not applicable

**8.3.4 Acid mine drainage, if any and its mitigative measures.**  
Not applicable

**8.3.5 Surface subsidence mitigation measures through backfilling of mine voids or by any other means and its monitoring mechanism.** The information on protective measures for reclamation and rehabilitation works year wise may be provided as per the following table.

**Summary of year-wise proposal for item no. 8.3 for the FY 2015-16**

Items	Details	Cumulative Actual Carried out till date (Upto 01.04.2015)	Proposed
Dump management	Area afforested (ha)	NIL	NIL
	No of saplings planted	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Cost including watch and care during the year.	NIL	NIL
	Construction of Parapet walls/ Retaining wall at toe of dumps - 4 Nos. Size - 397m (L) x 1.5 (H) x 1.2 (W) Size - 175m (L) x 1.5 (H) x 1.2 (W) Size - 234m (L) x 1.5 (H) x 1.2 (W) Size - 250m (L) x 1.5 (H) x 1.2 (W)	Rs. 56.84 Lakh (Garland drain – 325 m, Crater Boulder – 1361m, Settling Pit- 2Nos., RCC Parapet wall – 368 m)	Rs. 36.96 Lakh

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**MODIFIED MINING PLAN  
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Items	Details	Cumulative Actual Carried out till date (Upto 01.04.2015)	Proposed
	Construction of settling ponds, Garland drain etc. 1. Garland drain – 4 Nos. Size - 405m(L) x 1.5 m (W) x 1m (D) Size - 175m (L) x 1.5 (H) x 1 (D) Size - 240m (L) x 1.5 (H) x 1 (D) Size - 250m (L) x 1.5 (H) x 1 (D) 2. Settling Tank - 4 Nos. Size - 15 m(L) x 10 m (W)		Rs 4.30 Lakh
	Terracing of existing dumps		NIL
Management of worked out benches	Area available for rehabilitation (ha)	NIL	NIL
	Afforestation done(ha)	NIL	NIL
	No of saplings planted in the year	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Any other method of rehabilitation (specify)	NIL	NIL
	Cost including watch and care during the year	NIL	NIL
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	NIL	NIL
	Void filled by waste /tailings	NIL	NIL
	Afforestation on the backfilled area	NIL	NIL
	Rehabilitation by making water reservoir	NIL	NIL
	Any other means (specify)	NIL	NIL
Rehabilitation of waste land within lease	Area available (ha)	NA	NA
	Plantation carried out (within present retained ML area)	NIL	-
	Plantation carried out (within surrendered ML area)	NIL	-
	Check dams (within retained/ surrendered area)	NIL	-
	Method of rehabilitation	NA	NA
Others (specify)	Total no of saplings planted Inside lease area during FY 2015-16 (actual upto 01.04.2015).	2000 Nos.	500 Nos.
	Total cost including watch and care during the FY 2015-16 (actual upto 01.04.2015).	-	7500
	Total cost including ambient air quality monitoring during FY 2015-16 (actual upto 01.04.2015).	Rs. 5.80 Lakh	Rs. 12.50 Lakh
	Construction of check dam - 05 Nos.	Included in Rs. 56.84 Lakh above	Rs. 50 Lakh

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**Summary of year-wise proposal for item no. 8.3 for the FY 2016-17**

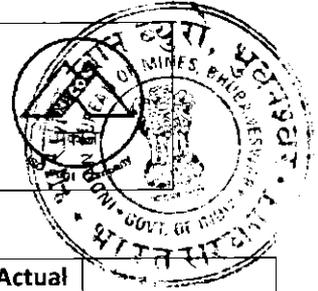
Items	Details	Cumulative Actual Carried out till date (Upto 01.04.2015)	Proposed
Dump management	Area afforested (ha)	NIL	NIL
	No of saplings planted	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Cost including watch and care during the year.	NIL	NIL
	Construction of Parapet walls/ Retaining wall at toe of dumps	Rs. 56.84 Lakh (Garland drain – 325 m, Crater Boulder – 1361m, Settling Pit- 2Nos., RCC Parapet wall – 368 m)	NIL
	Construction of settling ponds, Garland drain etc.		NIL
	Terracing of existing dumps		NIL
Management of worked out benches	Area available for rehabilitation (ha)	NIL	NIL
	Afforestation done(ha)	NIL	NIL
	No of saplings planted in the year	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Any other method of rehabilitation (specify)	NIL	NIL
	Cost including watch and care during the year	NIL	NIL
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	NIL	NIL
	Void filled by waste /tailings	NIL	NIL
	Afforestation on the backfilled area	NIL	NIL
	Rehabilitation by making water reservoir	NIL	NIL
	Any other means (specify)	NIL	NIL
Rehabilitation of waste land within lease	Area available (ha)	NA	NA
	Plantation carried out (within present retained ML area)	NIL	-
	Plantation carried out (within surrendered ML area)	NIL	-
	Check dams (within retained/ surrendered area)	NIL	-
Others (specify)	Method of rehabilitation	NA	NA
	Total no of saplings planted outside lease area during FY 2016-17 (actual upto 01.04.2015).	2000 Nos.	500 Nos.
	Total cost including watch and care during the FY 2016-17 (actual upto 01.04.2015).	-	7500
	Total cost including ambient air quality monitoring during FY 2016-17 (actual upto 01.04.2015).	Rs. 5.80 Lakh	Rs. 12.50 Lakh
	Construction of check dam - 03 Nos.	Included in Rs. 56.84 Lakh above	Rs.30 Lakh

  
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**Summary of year-wise proposal for item no. 8.3 for the FY 2017-18**

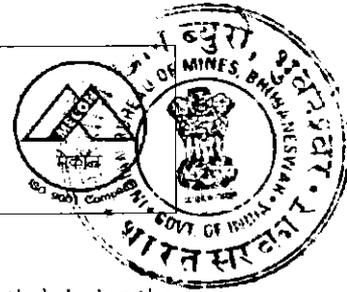
Items	Details	Cumulative Actual Carried out till date (Upto 01.04.2015)	Proposed
Dump management	Area afforested (ha)	NIL	NIL
	No of saplings planted	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Cost including watch and care during the year.	NIL	NIL
	Construction of Parapet walls/ Retaining wall at toe of dumps	Rs. 56.84 Lakh (Garland drain – 325 m, Crater Boulder – 1361m, Settling Pit- 2Nos., RCC Parapet wall – 368 m)	NIL
	Construction of settling ponds, Garland drain etc.		NIL
	Terracing of existing dumps No. of terrace - Nil Total terrace length - Nil		NIL
Management of worked out benches	Area available for rehabilitation (ha)	NIL	NIL
	Afforestation done(ha)	NIL	NIL
	No of saplings planted in the year	NIL	NIL
	Cumulative no of plants	NIL	NIL
	Any other method of rehabilitation (specify)	NIL	NIL
	Cost including watch and care during the year	NIL	NIL
Reclamation and Rehabilitation by backfilling	Void available for Backfilling (L x B x D) pit wise /slope wise	NIL	NIL
	Void filled by waste /tailings	NIL	NIL
	Afforestation on the backfilled area	NIL	NIL
	Rehabilitation by making water reservoir	NIL	NIL
	Any other means (specify)	NIL	NIL
Rehabilitation of waste land within lease	Area available (ha)	NA	NA
	Plantation carried out (within present retained ML area)	NIL	-
	Plantation carried out (within surrendered ML area)	NIL	-
	Check dams (within retained/ surrendered area)	NIL	-
	Method of rehabilitation	NA	NA
Others (specify)	Total no of saplings planted outside lease area during FY 2017-18 (actual upto 30.09.2014).	2000 Nos.	500 Nos.
	Total cost including watch and care during the FY 2017-18 (actual upto 01.04.2015).	-	7500
	Total cost including ambient air quality monitoring during FY 2017-18 (actual upto 01.04.2015).	Rs. 5.80 Lakh	Rs. 12.50 Lakh

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**Time scheduling for abandonment**

A tentative time frame for completion of jobs for mine closure operation (in months) during the FY 2015-16 to FY 2017-8 is shown in table below.

**Time scheduling for abandonment**

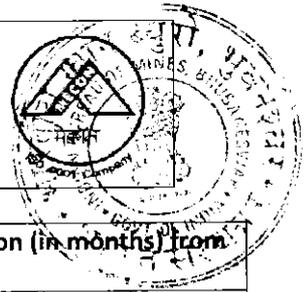
Activities	Tentative time frame for completion of jobs for mine closure operation (in months) from date of cessation.												
	Months →	1	2	3	4	5	6	7	8	9	10	11	12
Reclamation & Rehabilitation of mined out land.	Since the orebody continues upto 480 mRL & present mine working is to be confined within the existing broken area, simultaneous backfilling is not possible in the plan period. The waste generated from the Khandabandh iron ore mines has been proposed be dumped in external dumps												
Waste Management	A total of 1.199Mm <sup>3</sup> of waste will be generated from entire Khandabandh Iron ore lease during plan period. Out of which, 0.186 Mm <sup>3</sup> , 0.507 Mm <sup>3</sup> & 0.506 Mm <sup>3</sup> waste generated during year 2015-16, 2016-17 & 2017-18 will be dumped in proposed waste dump WD1. The manner of disposal of wastes during the plan period is given below.												
	<b>Manner of disposal of wastes</b>												
		Year	Waste Dump Destination	Waste Dump Location	Dumped Waste Quantity, M cu. m	Bottom RL	Top RL						
		2015-16	WD1	Deposit III near quarry 2A	0.186	600	606						
		2016-17	WD1	Deposit III near quarry 2A	0.507	600	622						
		2017-18	WD1	Deposit III near quarry 2A	0.506	600	640						
		<b>Total</b>	<b>WD1</b>	<b>Deposit III near quarry 2A</b>	<b>1.199</b>	<b>600</b>	<b>640</b>						
	<b>Proposed Environmental Protection Measures</b>												
	Following environmental protection measures have been proposed for dump stabilization & water quality management.												
		Year	Location	Garland drain		Retaining wall		Settling tank					
			Name/No.	Length, m	Name/No.	L x W x H, m	Name/No.	No.					
	2015-16	Near proposed waste dump WD1 at	GD1	405	R1	397 x 1.5 x 1.2	SP1	1					
		Near Stack yard area	GD4	175	R4	175 x 1.5 x 1.2	SP4	1					
		Near Existing Subgrade Dump SG4	GD5	240	R5	234 x 1.5 x 1.2	SP5	1					
		Near Existing Subgrade Dump SG5A	GD6	250	R6	250 x 1.5 x 1.2	SP6	1					
The garland drains will be dug around 1 m beneath the adjoining contour level at the lower peripheral areas of the dump. The width of the drains shall be around 1.5 m. A series of settling pits along with a main settling tank of 15 m length at the outlet of the garland drains will be provided to arrest the wash-off solid particles. The settling tank will be provided with three compartments each of around 5m width to arrest the suspended													

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Activities	Tentative time frame for completion of jobs for mine closure operation (in months) from date of cessation.												
	Months →	1	2	3	4	5	6	7	8	9	10	11	12
	solids followed with the chamber to arrest any oil particles. The last chamber shall contain the clean water which will be ultimately discharged. The retaining walls will be of 1.5m height and 1.2 m width at the top and around 1.5m at the base. 05 Nos. & 03 nos. of check dams have been proposed to be constructed in the FY 2016-17 & 2017-18 respectively.												
Decommission of infrastructure												→	→
Safety & Security	→												→
Monitoring of air & water	→												→
Disposal of mining m / c.												→	→

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

The objective of on-site disaster management plan for the mine is to be in a state of perpetual readiness through training and development to immediately control and arrest any emergency situation so as to avert a full fledged disaster and the consequence of human and property damage and in the event of a disaster still occurring, to manage the same so that the risk of the damage to life and property is minimized.

Key elements of a disaster management plan are.

- i. Risk Identification
- ii. Preventive measures for potential risks.
- iii. Defining the responsibility at different levels to tackle the hazard situation & establishing an effective communication channel for flow of information.
- iv. Action plan for handling the emergency situation i.e. on-site & off-site.
- v. establishing emergency response centres.

**i. Risk Identification**

Following risks have been identified for Khandabandh Iron Ore Mines.

- 1. Surface fire.
- 2. Failure of slope in the bench & dumps.
- 3. Fly rock from blasting operations
- 4. Possible accidents due to HEMM

**1. Code of Practice in Case of Fire at Mines**

**Source of Fire:-**

- i) HEMM
- ii) Oil & Lubricant Room.
- iii) Diesel Pump/storage area
- iv) Electrical equipment/substations

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**MODIFIED MINING PLAN  
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**Line of Action:-**

- i. Any person notices any sign of fire shall start shouting FIRE, FIRE to seek assistance and also immediately take steps to give warning by blowing the siren continuously and take steps to extinguish the fire by using appliances available near the site.
- ii. **Duties of Mine Official:** - The Mine officials receiving the warning shall forthwith inform following on Phone.
  - Fire fighting station – for sending fire-fighting team.
  - Security main gate – to inform senior person and to prevent un authorized entry.
  - Shift Engineer – to manage with available resources till then.
  - Mines Manager – for overall supervision and control.

After giving information reach the spot, remove Man & Machinery and take steps to tackle the fire in accordance with the fire fighting instructions. Inform at security office to get Ambulance if required.

- iii. **Duties of Fire Fighting Team:** - On receiving warning the team shall reach the site of fire and depending on its nature, class and extent shall take steps to extinguish it and rescue persons if involved in fire.
- iv. **Duties of Mines Manager:** -
  - On receipt of information about fire the Manager shall forthwith rush to the spot and assess the extent of fire. He shall supervise the fire fighting operation and make necessary arrangement for medical aid to affected person, if any.
  - Inform to senior officials and statutory bodies

**2. Failure of slope in the bench & dumps.**

Bench & dump slope stability depends upon the physic-mechanical properties of the rock such as UCS, coefficient of internal friction, angle of repose, cohesion etc., presence of water, water pressure, joint spacing & orientation, type of rock etc. joint mapping & its stereo plotting shall be carried out to determine the possibility of failure and type of failure, if any.

Dump slope failure occurs mainly due to accumulation of water in dumping areas, formation of gullies in the dump slopes, improper terracing/dumping etc.

The well-developed drainage system over the lease area ensures that storm water does not accumulate in the lease area and therefore hydrostatic pressure remains at a low level. Geo-technical investigation & slope stability analysis and inspection of bench slopes shall be carried out.

**Line of Action**

- i) In the advent of slope failure following personnel shall be immediately informed.
  - a. Shift incharge : to manage the situation within available resources.
  - b. Security main gate – to inform senior person and to prevent un-authorized entry.
  - c. Mines Manager – for overall supervision and control.
  - d. Nearby Hospital – for providing medical aids

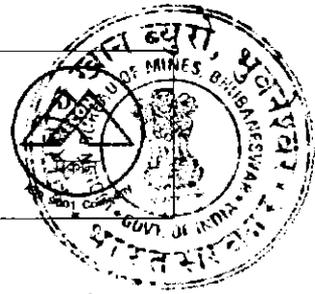
After giving information reach the spot, remove Man & Machinery and take steps to tackle the situation in accordance with the safety instructions. Inform at security office to get Ambulance if required.

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**MODIFIED MINING PLAN  
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**3. Fly rock from blasting operation**

Main reason of fly rock due to blasting is Improper blast design i.e less stemming, inadequate burden & spacing, high charge concentration, improper delay, presence of geological discontinuities such as joints, faults, muds etc.

Following measures shall be taken to prevent accident due to fly rock.

- Blasting operation shall be carried out under the supervision of assistant manager/manager (Blasting)
- Code of signaling should be strictly followed during blasting.
- Proper blast design
- Controlled blasting should be adopted.
- No person other than required for blasting shall be allowed to enter the mines during blasting.

**4. Possible accidents due to HEMM**

Following safety measures shall be taken to prevent an accident due to HEMM.

**a. General Safety Procedures During Dumper/Tipper Operation**

- Before moving the dumper/tipper, always give a warning signal. Sound the following code horn before moving the vehicle:
  - Moving forward - 2 beeps
  - Moving backward - 3 beeps
- During operation of dumper/tipper, always keep the cabin doors closed.
- During night, always use dipper while approaching an oncoming vehicle.

**b. Safety procedures during travelling of dumper/tipper**

- Operate the dumper/tipper in reverse only if there is a clear view of the area behind the vehicle or with the assistance of an authorized spotter. Give an audible warning signal before reversing a dumper/tipper.
- Where there are no separate lanes for two-way traffic, give way to the oncoming dumper/tipper cautiously.
- As far as possible, avoid turning the dumper/tipper on a slope. It may cause the machine to roll over or slip sideways.
- As far as possible, do not reverse loaded dumper/tippers on gradient.
- Before starting up or down a grade, select a transmission gear range that will ensure safe driving and provide control of the vehicle under all conditions.
- Negotiate downhill gradients in low gear so that minimum of braking is required.
- Do not shift gears or run the dumper/tipper in neutral on steep down slopes.
- Do not drive dumper/tipper over sharp stones and boulders.
- If any stone or boulder is found on the road, inform the spotter or incharge to get it removed to avoid any damage to the machine components.

**c. Safety Procedures During Operation**

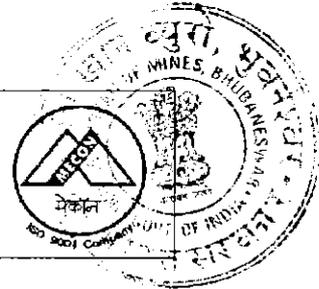
- Always press the accelerator pedal gradually so as to achieve smooth acceleration.
- Do not operate the steering wheel fast. This may overturn the dumper/tipper.
- Do not brake suddenly.

  
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- Avoid fanning the treadle by partial, intermittent applications while using service brakes as this may cause reduction in air pressure level to dangerous limits. So use service brakes sparingly and only when necessary.
- Use the right gear and speed to match load conditions.
- Before engaging the transmission from neutral to forward or reverse, ensure that the engine is at idle speed. Before shifting the gear from forward to reverse or reverse to forward, apply brakes to completely stop the dumper/tipper, otherwise the transmission may get damaged.
- Shift the gears from one to five one by one, otherwise the transmission may get damaged.
- Use retarder brake sparingly as excessive use of retarder brake heats up the transmission. Retarder brake should not be applied for more than 30 seconds at a time.
- Do not use dump brakes while the dumper/tipper is in motion.
- Except in case of emergency, use parking brake only for parking the dumper/tipper.
- Never take the dumper/tipper too close to an overhang or an unsafe edge that may collapse.
- Pull into the loading area with caution. Remain at a safe distance while dumper/tipper ahead of you is being loaded.
- When approaching loading equipment, sound the audible warning signal and do not attempt to pass the loading equipment unless there is a proper audible signal in reply.
- Avoid backing over rocks at the shovel and dump areas.
- For loading, place the dumper/tipper on a level ground.
- When the dumper/tipper is being loaded, stay in the dumper/tipper cab or sufficiently far enough from dumper/tipper to avoid being struck by flying fragments.
- When the dumper/tipper is being loaded, do not take your head out of the cab window.
- Ensure that the dumper/tipper is not overloaded and the material is not loaded in such a way so as to project horizontally beyond the sides of its body.
- Do not drive nose-to-tail particularly behind a vehicle with twin rear wheels, from which a stone piece wedged between tyres may fly back into the windscreen of your vehicle. Maintain a distance of 50 feet on level ground and 100 feet on a ramp from the vehicle in front of you.
- If the lights at the crusher hopper are on (indicating that the material should not be dumped into it), do not unload the dumper/tipper.
- While raising the dumper/tipper body, release the accelerator pedal slowly just before the body reaches the desired position.
- After dumping the material, move the dumper/tipper only after completely lowering the dump body.
- Never turn front wheels, particularly on loaded dumper/tippers unless the dumper/tipper has some fore or aft movement. Such stress can literally shear the tread from the carcass.

**d. Safety Procedures During Dumping/Tipping**

The operator should take the following precautions during tipping on stockpiles and dumping of overburden:

- While doing the first tipping, it should be done at a distance of 3 meter from the edge.
- On entering a tipping/dumping area, the operator should visually check the general area of the tip, especially in the dumping area.

  
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- Backing visibility is available only to the driver's side of the dumper/tipper. So make sure that there are no personnel or any obstructions on the other side.
- All care should be taken regarding the positioning of the dumper/tipper's rear wheels at the tipping face. A dumper/tipper should not back up to an area that has not been visually inspected by the operator.
- If a spotter is present, follow his signals.
- Be especially careful of soft edges and cracks.
- When dumping in an area where no berm is present (e.g. construction of a new haul road where material would be laid down in layers), material should be tipped short of any edge.
- Dumper/tippers tipping over the berm should back up squarely to the berm.
- After positioning the dumper/tipper for tipping, the operator should raise the hoist only after making sure that the dumper/tipper is stationary and on a level ground, transmission is in neutral and dumping brakes are applied.
- As soon as the material has been dumped out from the dumper/tipper, release dump brake, shift transmission into 1st or 2nd forward gear and at the same time depress the accelerator pedal to move away from the dump area slowly and carefully.
- As the dumper/tipper starts moving, pull the hoist control lever all the way down to lower the dump body.
- During these operations, do not stop anywhere for unnecessary reasons and the operator must always remain in the cabin.
- If at any time the operator considers the operation unsafe, it should be immediately reported to the manager or the in charge.

**e. Safety Procedures While Parking**

- When not in use, move the dumper/tipper and park it at a proper parking place.
- While parking the dumper/tipper at the workshop or work site, do not park in a haphazard way.
- When parking the machine, park it in a safe place outside the working area or in the specified place. It should be parked on flat, firm ground where there is no danger of rock falls or landslides. Ensure that the gear is in neutral position before stopping the engine. Make sure that the dump body is in down position. Apply parking brakes. While leaving the operator's seat, switch off the engine and all the electrical accessories that are not in use, remove the ignition key and lock the cabin.
- While parking the dumper/tipper always apply parking brakes.
- Do not stop or park on a haul road unless unavoidable. If you must stop, move dumper/tipper to a safe place. If this is impossible, adequately fence the area with big enough boulders to caution other operators.
- If a disabled dumper/tipper is to be left on a haul road, apply parking brake and block the wheels securely. Adequately fence the area with big enough boulders to caution other operators.
- Never park the dumper/tipper on slopes.
- If the conditions are such that the dumper/tipper has to be parked on a slope, apply parking brakes, steer the wheels away from center and block the wheels securely.
- As far as possible, park the machine on a level ground. Correct level of lubricants is indicated only if the machine is parked on a level ground.

  
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**Fixing the Responsibility & establishing communication channel**

Following officers of the mines will be responsible for co-ordination in case of emergency situation in any part of the mine.

Person	Responsibility
Head of Department / Mine Agent	Site Controller
Mines Manager / Shift in-charge	Accident Controller / Communication Officer
Employee who gives the first information about the incident / accident	Primary Controller
P & A Department (HOD)	Liaison Officer

**Key Personnel and their responsibilities**

**Site Controller:**

- The head of the department / mine agent shall have an overall responsibility for controlling the incident / accident and directing the personnel.
- To prepare a full proof plan for control of accident like, slope failure, fire, fly rock, flood and other natural calamities.
- To inform statutory bodies of the State and Central Government.
- To inform communication officer about the emergency, control centre and assembly point.
- To provide all assistance and call for fire squad, security officer and other services required for removing / control of danger.
- To ensure that all necessary personnel assemble at assembly point.
- Make arrangement for medical treatment to the personnel injured seriously.

**Accident Controller:**

- Mines manager shall act as accident controller/ communication officer.
- Mock rehearsal of management plan prepared for accident.
- To withdraw men / machine from the affected area with priority for safety of personnel, minimize damage to the machines, environment and loss of material.
- To make a report based on the facts and figure and submit to the site controller.
- To communicate to the site in charge and make arrangement for first aid and transportation of the injured personnel.

**Primary Controller:**

- To inform the Accident Controller / shift in-charge from the nearest means of communication about the location and the nature of accident.
- To assist in clearing any obstruction in relief of accident.
- To carry out all instructions of accident controller.
- To provide first aid treatment and communicate to the shift in-charge.

**Emergency Control Centers**

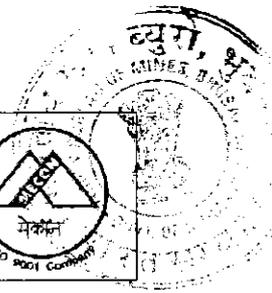
The emergency control center is the place from where the operations to handle the emergency will be directed and coordinated. The site main controller, key personnel and the senior officers of the fire and police services will attend it. The center will be equipped to receive and transit information and directions from and to the incident controller and other areas of the works, as well as outside.

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Emergency control centers will therefore contain the following:

- (a) In-charge of external telephone;
- (b) An adequate of internal telephones;
- (c) A plan of the works, to show:
  - (i) Areas where there are large inventories of hazardous materials, if any;
  - (ii) Sources of safety equipment;
  - (iii) The fire-fighting system.
  - (iv) Site entrance and roadways, including up-to-date information on roadworks;
  - (v) Assembly points;
  - (vi) The location of the mines in relation to the surrounding community;
- (d) Notepads, pens and pencils;
- (e) A nominal roll of employees;
- (f) A list of key personnel, with addresses, telephone numbers, etc. The emergency control center should be sited in an area of minimum risk.

**Role of the Police**

The police normally assume the overall control of an emergency, with a senior officer designated as emergency coordinating officer. Normal duties of the police during an emergency include protecting life and property and controlling traffic movements. The functions include controlling bystanders, evacuating the public, identifying the dead and dealing with casualties and informing relatives of dead or injured.

**Role of the Fire Authorities**

The control of a fire is normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site. The senior fire brigade officer may also have a similar responsibility for other events, such as explosions and toxic releases. Fire authorities having major hazard works in their area should have familiarized themselves with the location on site of all stores of flammable materials, water and foam supply points and fire-fighting equipments.

**Role of the Health authorities**

Health authorities, including doctors, surgeons, hospitals, ambulances and so on, have a vital part to play following a major accident and they should form an integral part of any emergency plan. For major fires, injuries will be the result of the effects of thermal radiation to a varying degree and the knowledge and experience to handle this in all, but extreme, cases may be generally available in most hospitals.

**Capability of Lessee:**

Following facilities are available at mine site:

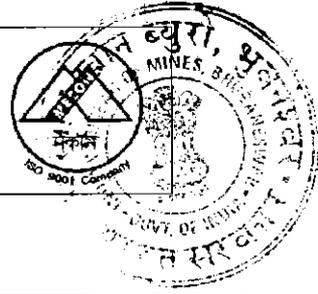
- Telephone / Mobile handsets
- Runners / Messenger
- Emergency alarm
- Fire fighting equipment and accessories with trained manpower
- Training centre
- Fire extinguishers
- Dispensary & Ambulance van
- Jeeps

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List of contact person of mines in case of emergency is given below.

**List of contact person of mines in case of emergency**

Name	Designation & Department	Address	Contact No.
Shri Laxmi Narayan Ghana	Regional Manager	Regional Office OMC Ltd., P.O.- Barbil Via- Barbil, Dist. – Keonjhar Odisha - 758035	06767-275253
Shri Manoj Kumar Sethy	Mines Manager	OMC Ltd., Village: Khandabandh, P.O.- Joda, Taluka : Joda Dist. – Keonjhar Odisha	06767-214023 +919437883572
Shri D Manoharan	Geologist	OMC Ltd., Village: Khandabandh, P.O.- Joda, Taluka : Joda Dist. – Keonjhar Odisha	+919438021255

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

When the mine is temporarily discontinued due to any unforeseen circumstances the following care and maintenance shall be carried out:

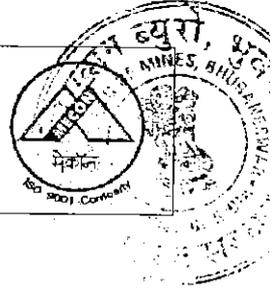
- Notice to be served to all the concerned authority.
- Temporary fencing shall cover the mine entries.
- All access roads/openings to the pit / face shall be closed by parapet wall as per rule.
- Warning shall be displayed on the 'Notice Board' at appropriate places.
- Security personnel shall be posted at every danger point.
- No unauthorized person shall be allowed to enter into the mine without prior permission of the management.
- Environmental protection measures such as retaining walls, garland drains & settling pits shall be made all around the mine and dumps to prevent water flow towards mine for prevention of landslide/side fall and siltation etc.
- All men and machinery shall be withdrawn from the mine and shall be kept in a compound and safe place.

  
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**8.6 FINANCIAL ASSURANCE:**

The financial assurance calculation is given in the table below.

S N	Type of land use	Area of land use (in Ha)			The area considered as fully reclaimed and rehabilitated	Net area considered for calculation financial assurance
		Area put into use at the start of plan period	Addl Area required During plan period	Total Area at the end of the plan period		
	(a)	(b)	(c)	(d) = (b) + (c)	(e)	(f) = (d) - (e)
1	Area of excavation	110.6279	4.6972	115.3251	0.0000	115.3251
2	Storage for top-soil	0.0000	0.0000	0.0000	0.0000	0.0000
3	Overburden dump	1.1198	0.0000	1.1198	0.0000	1.1198
4	Mineral storage	7.6729	-0.3528	7.3201	0.0000	7.3201
5	Infrastructure (Office, Rest shelter & pumping station)	2.1080	0.0000	2.1080	0.0000	2.1080
6	Roads	11.8657	-0.3386	11.5271	0.0000	11.5271
7	Railways	0.0000	0.0000	0.0000	0.0000	0.0000
8	Green belt	0.0000	0.0000	0.0000	0.0000	0.0000
9	Tailing pond	0.0000	0.0000	0.0000	0.0000	0.0000
10	Effluent treatment plant	0.0000	0.0000	0.0000	0.0000	0.0000
11	Mineral separation plant	0.2960	0.0000	0.2960	0.0000	0.2960
12	Township area	1.8278	0.0000	1.8278	0.0000	1.8278
13	Sub-grade storage	14.1172	0.0000	14.1172	0.0000	14.1172
	<b>Total</b>	<b>149.6353</b>	<b>4.0058</b>	<b>153.6411</b>	<b>0.0000</b>	<b>153.6411</b>

Total financial assurance upto 31.03.2018 will be Rs. 3841027 /- @ Rs.25000/- per hectare for an area of 153.6411 Ha. The above financial assurance will be submitted in the form of BG by lessee.

Progressive mine closure plan for Khandabandh Iron Ore Lease is given in drawing No. MEC/Q76Q/11/16/16 to 16B.

अनुमोदित  
APPROVED

(Qualified Person)

क्षेत्रीय खान नियंत्रक  
REGIONAL CONTROLLER OF MINE  
भारतीय खान ब्यूरो  
INDIAN BUREAU OF MINES  
भुवनेश्वर/BHUBANESWAR  
(Qualified Person)