



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



फैक्स: (080) 23371027 / 23373287
दूरभाष: 080-23371027 / 23375366/67
Email ID: ro. bangalore@ibm.gov.in

29, इंडस्ट्रियल सर्वे II स्टेज, तुमकुर रोड,
गौरगुंटापाल्या येशवंतपुर,
बेंगलुरु -560022

सं/No.: 279/1103/2019/BNG 1557

दिनांक/Date: 27/09/2019

सेवा में To,

M/s. MSPL Limited,
Preferred Bidder,
Baldota Enclave, Abheraj Baldota Road,
Hosapete, Ballari,
Karnataka-583 203.

विषय/Sub: Approval of Mining Plan including Progressive Mine Closure Plan in respect of Narasimha Iron Ore Mining Block (ML No. 2148) (auction block of Swamymalai Iron ore Mine of M/s. H.G.Rangan Goud) over an area of 60.66 Ha in Dharmapur Village, Sandur Taluk, Ballari District of Karnataka State, submitted for approval under rule 16 of MCR, 2016- Private/ Fresh/ Reserved Forest/ Cat. A - FM / Captive.

संदर्भ /Ref: 1. Your letter No. MSPL (NIOM)/IBM/2019-20 dated. 29/08/2019.
2. This office letter of even number dated. 12/09/2019.
3. Your letter No. MSPL (NIOM)/IBM/2019-20/2 dated.25/09/2019 submitting final bound copies of the Mining Plan.

Sirs,

In exercise of the powers conferred by clause (b) of sub-section (2) of section 5 of the Mines and Minerals (Development & Regulation) Act, 1957 read with Govt. of India order No.S.O.445 (E) dated 28.04.1987 and S.O.1857 (E) dtd.18/05/2016, I hereby approve the Mining Plan including Progressive Mine Closure Plan in respect of Narasimha Iron Ore Mining Block (ML No. 2148) (auction block of Swamymalai Iron ore Mine of M/s. H.G.Rangan Goud) over an area of 60.66 Ha in Dharmapur Village, Sandur Taluk, Ballari District of Karnataka State. This approval is subject to the following conditions:

1. The Mining Plan is approved without prejudice to any other laws applicable to the mine 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.
2. 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.
3. It is clarified that the approval of your aforesaid Mining Plan does not in any way imply the approval of the Government in terms of any other provisions of the Mines and Minerals (Development and Regulation) Act 1957 or the Minerals (Other than Atomic and Hydro Carbon Energy Minerals) 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 Rules & Regulations made there under.
4. 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.
5. 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.

Contd...2

6. The execution of Mining Plan shall be subjected to vacation of prohibitory orders / notices, if any.
7. The Approval of Mining Plan is strictly confined to the proposals contained within the mining leasehold demarcated as per lease sketch given by the joint survey team constituted by the CEC and duly authenticated by the State DMG. It does not convey approval to the proposals falling outside the Mining Lease boundary.
8. The Approval of Mining Plan is without prejudice to the final order of the Hon'ble Supreme Court order dtd.18/04/2013 in W.P. No. 562/2009 and interim orders passed by the Hon'ble Supreme Court from time to time in the said W.P. Nos. 25910/2009 and 26083/2009.
9. The contents of Circular No: 2/2010 issued by the Chief Controller of Mines, IBM, Nagpur vide his letter No.11013/3/MP/90- CCOM Vol-VII dated 06/04/2010 shall be complied with.
10. A copy of Environment Impact Assessment and Environment Management Plan as approved by the MOEF, New Delhi in terms of Hon'ble Supreme Court order dtd. 20/04/2012 shall be submitted to this office along with a copy of their approval letter within one month of the date of such approval.
11. Environmental Monitoring Cell of the company shall continue monitoring ambient air quality, dust fall rate, water quality, soil sample analysis and noise level measurements on various stations established for the purpose both in the core zone and buffer zone as per Department of Environment guidelines and keeping in view IBM's circular No.3/92, season wise every year or by engaging the services of an Environment Laboratory approved by MOEF/CPCB. The data so generated shall be maintained in a bound paged register kept for the purpose and the same shall be made available to the inspecting officer on demand.
12. In case the mining lease falls within a radius of 10 kms of National Park/ sanctuary, recommendations of NBWL have to be obtained as per the Order of Hon'ble Supreme Court in IA No. 460/2004.
13. An yearly report shall be submitted to this office before 1st July of every year setting forth the extent of protective and rehabilitative works carried out as envisaged in the approved mine closure plan.
14. The Mining Plan is approved for proposals contained therein and as applicable from the date of approval of the document for the mining activities to be carried out within the mining lease hold.
15. The Mining Plan is approved for total Mineral Reserves of **48.40 Million tonnes** of Iron ore and the proposals are valid for the following period with respective production capacity.

Year	Production In Tonnes (ROM Iron Ore)
I	770000
II	770000
III	770000
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भवदीय/Yours faithfully,

संलग्नक : One copy of approved Mining Plan along with Progressive Mine Closure Plan.

(जी सी मीणा/ G C Meena)

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

Contd.....3

प्रतिलिपि सूचनार्थ'Copy for kind information to:

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2. The Director of Mines Safety, Directorate General of Mines Safety, Bellary Sub- Region, 31, Infantry Road, Cantonment, Bellary - 584104
3. The Controller of Mines (SZ), Indian Bureau of Mines, Bangalore along with soft copy in CD form
4. Sri S.Srivakumar, QP, M/s. MSPL Limited, Baldota Enclave, Abhenaj Bahketa Road, Hospete-583 203.
5. Mine file / Guard file

संलग्नक : As above

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(सी सी मीणा/ (S C Meena)
क्षेत्रीय खान नियंत्रक/Regional Controller of Mines
भारतीय खान ब्यूरो/Indian Bureau of Mines



MINING PLAN
(Including Progressive Mine Closure Plan)
Narasimha Iron Ore Mine
By Preferred Bidder M/s. MSPL LIMITED
ML No 2148

(erstwhile swamymalai Iron Ore Mine of M/s. H.G.Rangan Goud)

Submitted under Rule 16(1) of MCR 2016



Volume -1: Text

ML Area: 60.66 Ha
LOI: No: DMG/MLS/AUC/'C'-2148/2018-19/2990
Dated 06 OCT 2018

Opencast, Category 'A' Fully Mechanized
Proposed for 'Captive Mine'

Total area: 60.66 Ha
Validity: 50 Years w.e.f Lease execution date
Forest Area: 60.66 Ha
Name of the Forest: Kumaraswamy Reserved Forest
Reg No: IBM / 199 / 2011

Prepared By

S.Shivakumar
M.Sc.Geology

Qualified Person
September 2019



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



MINING PLAN
(Including Progressive Mine Closure Plan)
Narasimha Iron Ore Mine
By Preferred Bidder M/s. MSPL LIMITED
ML No 2148

(erstwhile swamymalai Iron Ore Mine of M/s. H.G.Rangan Goud)

Submitted under Rule 16(1) of MCR 2016



Volume -1: Text

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LOI: No: DMG/MLS/AUC/'C'-2148/2018-19/2990
Dated 06 OCT 2018
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Proposed for 'Captive Mine'
Total area: 60.66 Ha
Validity: 50 Years w.e.f Lease execution date
Forest Area: 60.66 Ha
Name of the Forest: Kumaraswamy Reserved Forest
Reg No: IBM / 199 / 2011

Prepared By

S.Shivakumar
M.Sc.Geology

Qualified Person
September 2019

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MSPL LIMITED



MINING PLAN

**Narasimha Iron Ore Mine
(ML No 2148)**

**MINING PLAN OF
NARASIMHA IRON ORE MINE**

0.0 INTRODUCTION:

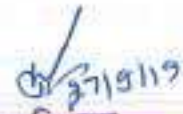
0.1 MSPL LIMITED is a leading mining company in Ballari - Hosapete region in private sector and engaged in mining of iron ore for last six decades. We have introduced state of art systems / method in mining. So that iron ore deposits are systematically and scientifically developed to produce iron ore. Company has setup a 1.2 MTPA of Pellet Plant at Koppal, near Hosapete.

0.2 Narasimha Iron Ore Mining Block of by preferred bidder M/s. MSPL Limited, erstwhile Swamymalai Iron Ore Mine of M/s. H.G.Rangan Goud. (ML. No. 2148) is situated in Kumaraswamy Reserved forest, Dharmapur village, Sandur taluk, Ballari district, Karnataka state.

0.3 The extent of this mining block was 60.70 ha when originally granted on 21-07-1992 to M/s H.G. Rangangouda. The lease is valid up to 20-07-2012. The lease has been worked for nearly 19 years, Further the mining activities remained suspended due to Blanket Ban of mining in Karnataka by the order of the Hon'ble Supreme Court by order dated 29.07.2011 imposed complete ban on mining operations and transportation in the areas of Ballari, Chitradurga and Tumkur districts, Karnataka.

0.4 The Hon'ble Supreme Court has directed the Government of Karnataka to formulate Reclamation & Rehabilitation Plan (R & R) for the mine affected districts viz., Ballari, Chitradurga and Tumkur. The study was entrusted to Indian Council of Forestry Research and Education (ICFRE), Dehradun, by the Government of Karnataka, vide letter No. DMS/MLS/R&R/2011-12, dated 27.12.2011, and the Director, Department of Mines and Geology, Bangalore vide letter No.DMG/MLS/R&R/2011-12/15179 dated 31.03.2012. In this context, the Narasimha Iron Ore Mine (ML No 2148) of M/s. MSPL Limited., (erstwhile Swamymalai Iron Ore Mine of M/s. H.G. Rangan Goud) was visited for preparation of R & R plan during 6th May 2014 and 24th June 2019. Accordingly, the R & R Plan of category A & B mines have been prepared in the first phase and that of the category-'C' mines initiated in second phase.

This Mining Plan is approved subject to the conditions / stipulations indicated in the Mining Plan approval letter No. 279/1103/2019/BN4.
Date: 27/09/2019


क्षेत्रीय खान नियंत्रक
Regional Controller of Mines
भारतीय खान ब्यूरो
Indian Bureau of Mines,
बंगलूरु / Bangalore - 560 022



MSPL LIMITED



MINING PLAN

**Narasimha Iron Ore Mine
(ML No 2148)**

0.5 On the basis of classification of mines Hon'ble Supreme Court ordered dated 18.04.2013 C-category mines area cancelled and to go for auction of all 'C'-category leases.

0.6 This mine was classified under 'C'- Category, by the Joint Team of CEC. The area under lease deed is 60.70 ha and after digitizing, it is 60.66 Ha. As per the recommendations of CEC Joint Survey Team, an area of 21.65 Ha has been identified as encroachment area, comprising of mine pit (5.61 Ha), OB dumps (10.97 Ha), roads (0.43 Ha and others (4.64 Ha).

0.7 As per the direction of the CEC vide letters (i) File No.1-26/CEC/SC/2013-Pt XXXXIV dated 24-10-2014; (ii) No. 2161/CEC/SC/2003 Pt II dated 07.11.2014 and wide DMG letter No. DMG/MLS/ICFRE/2017-18/3199 dated 11th October 2017. Therefore the assessment of reserve capacity of the mine has been worked out using the MECL data and provisional R & R plan has been prepared accordingly. The provisional R & R plan has been prepared based on the field survey, updated the plans and MECL exploration data as per suggestions of CEC vide letter No.61/CEC/SC/2012-PtII dated 20.08.2015. Accordingly the Govt. of Karnataka has provided the exploration work to M/s. Mineral Exploration Corporation Limited (MECL), a Government of India Enterprise, Nagpur, to assess the mineral reserves in all "C" category mines in Ballari, Chitradurga and Tumkur Districts of Karnataka State.

The Mineral Exploration of India Limited (MECL) carried out detailed exploration by large scale mapping, drilling during February 2016 and March 2016 and analysis completed on 06.05.2016 in Narasimha Iron ore mining block - ML No 2148 of M/s. MSPL Limited (erstwhile Swamymalai Iron Ore mine of M/s. H.G.Ranganagoud)

0.8 The Commissioner & Director, Department of Mines & Geology, as per the Mines & Minerals (Development & Regulations) Amended Act, 2015 and the Mineral Auction Rules, 2015 issued the notification and notice invited tender dated 30th January 2018 for grant of mining lease for M/s. H.G.Rangana Goud, ML No 2418 block.

0.9 The e-auction process was conducted in accordance with the mineral auction rules 2015 and the tender document for the said mineral and M/s. MSPL Limited declared as the **"Preferred Bidder"** in accordance with Rule 9(9)(iii) of Mineral (Auction) Rules, 2015. The Government of Karnataka has issued a Letter of Intent



MSPL LIMITED



MINING PLAN

**Narasimha Iron Ore Mine
(ML No 2148)**

with reference to e-auction dated 06.09.2018 for grant of Mining lease in ML No. 2148 block in Dharmapur village, Sandur Taluk, Ballari District over an extent of 60.66 Ha in forest land for a period of 50 years to MSPL Limited vide letter No. DMG/MLS/AUC/'C'-2148/2018-19/2990 dated 06.10.2018 **Ref: Annexure 1.**

0.10 ICFRE has initiated the R & R plan preparation of Swamymalai erstwhile Narasimha Iron Ore Mine of M/s. MSPL Limited (ML No. 2418) block, situated in Kumaraswamy Reserved Forest in Dharmapura village, Sandur taluk, Ballari district, Karnataka state in association with domain experts and as well as in consultation with the district administration of Ballari district and the Department of Mines and Geology, Govt. of Karnataka. Accordingly, studies were undertaken in Swamymalai erstwhile Narasimha Iron Ore Mine (ML No. 2148), classified by the CEC under 'C' Category mines.

The main objectives of the study were as under:

- Preparation of Supplementary Environmental Management Plan (SEMP) for incorporating additional environmental safeguards in respect of the leases not found to be involved in illegal mining.
- Preparation of R & R Plan for the mining leases found to be illegal mining.
- Comprehensive environmental plan for Mining Impact Zone (MIZ) for the areas surrounding the mining leases including all the working leases and non-working leases.
- Recommending short-term and long-term management measures for maximum sustainable utilisation of the natural resources as well as area that is presently under mining and for the future exploitation. The ICFRE team inspected the mine and reviewed its statutory approvals as well as assessed the ground reality of the area with the following main objectives.
- To delineate the level of degradation in various environmental aspects, in terms of physical, chemical, biological and sociological aspects due to mining.
- To identify suitable site specific plan for rehabilitation and reclamation plan.
- To provide code of practices and guidelines for pollution reduction, recovery, reuse and recycle as well as develop a frame work for rehabilitation and reclamation.



MSPL LIMITED



MINING PLAN

**Narasimha Iron Ore Mine
(ML No 2148)**

As per the order of supreme court of India dated 30.07.2015, The category of 'C' mines are required to be auctioned. The CEC vide letter No.-61/CEC/SC/2012-Pt II dated 20.08.2015, has stated that the R & R Plan for the areas under illegal mining pit/overburden dump, etc., in respect of C category mines may be prepared before auction and SEMP and MPAP may be prepared and finalised only after the auction based on the updated baseline data to be provided by the successful bidder to ICFRE.

Pursuant to the auction of this lease, Govt. of Karnataka has issued the Letter of Intent (LoI) vide Letter No.DMG/MLS/AUC/'C'-2148/2018-19/2990 dated 06.10.2018, for grant of ML for M/s. H.G. Rangan Goud, ML No. 2148 Block in Dharmapura village, Sandur taluka, Ballari district, karnataka state over an extent of 60.66 Ha area of forest land to M/s. MSPL Limited.

Therefore, final R & R plan has now been prepared based on the inspection of the mine lease by the ICFRE team along with the domain experts and representatives of M/s. MSPL Limited on 24.06.2019. The R & R Plan of Narasimha Iron Ore Mine of M/s. MSPL Limited (ML No. 2148) of erstwhile M/s. H.G.Rangan Goud of 60.66 ha. area has been prepared by ICFRE & same has been approved by CEC vide their letter F.No.2-61/CEC/SC/2017-Pt.III dated 21.08.2019. Monitoring committee has been issued a letter No. MC/ R&R / CCA/2148/2019-20/120/3092 dated 03.09.2019.

Ref: Annexure 2.

As per the approved R & R Plan of Narasimha Iron Ore Mine, the annual permissible production limit of the mine based on reserves, waste dumps, infrastructure facilities and EC capacity have been worked to **3.00, 0.77 and 1.93 and 5.00 MTPA** respectively. Based on the above, the permissible production capacity of the mine will be **0.77 MTPA** based on waste dump capacity, which is the least of the four criteria. The production capacity is subjected to confirming to the overall limit of production capacity stipulated by the Hon'ble Supreme Court of India for the sector and conditions being stipulated to the sector from time to time by concerned authorities.

The mining plan is being prepared in the context under Rule 16 (1) of MCR 2016, for the 5 year period.

**MSPL LIMITED****MINING PLAN****Narasimha Iron Ore Mine
(ML No 2148)**

The following items/particulars observed as per the approved R & R and also considered while preparation of Mining Plan are given below:

Table 1

Sl No.	Item/Particulars	As per approved R & R Plan/Records.
1	Mining Lease	1) The lease was granted originally for a period of 20 years on 21.07.1992 for an area of 60.70 Ha under ML No. 2148. The lease was valid upto 20.07.2012. 2) The extent of this block was 60.66 Ha as per the CEC sketch. CEC Joint Survey Team observed an area of 21.65 Ha has been identified as encroachment area, comprising of mine pit (5.61 Ha), OB dumps (10.97 Ha), roads (0.43 Ha) and others (4.64 Ha). 3) This Mining Block has been auctioned by Government of Karnataka and Issued a Letter of Intent for grant of Mining Lease for this auctioned block over an extent of 60.66 Ha for a period of 50 years to the M/s. MSPL Limited. Vide letter No DMG/MLS/AUC/'C'-2148/2018-19 dated 06.10.2018.
2.	Mining Plan	1) The earlier scheme was approved vide letter No. MS/BLR/Fe-82-SZ, dated 26.10.2006. The draft SoM was submitted to IBM on 28.3.2011 for approval. (Source: Provisional R & R) 2) The modified SoM was approved under Rule 10 of MCDR 1988, for the period 2007-08 to 2010-11 with a production capacity of about 5.0 MTPA. was approved by IBM, vide letter No. MS/BLR/Fe-82-SZ, dated 1.2.2007. (Source: Provisional R & R) 3) The Mining Plan has to be obtained afresh by the "Preferred Bidder" to be submitted under Rule 16 (1) of MCR 2016. By considering the MECL data provided in the tender document.
3	Environmental Clearance	1) Environmental Clearance was granted to the mine vide MoEF & CC letter Nos. J-11015/333/2005-IA.II (M), dated 23.12.2005 for expansion of Swamymalai Iron ore mine from (0.085 MTPA to 1.5 MTPA) Source: (Provisional R & R). 2) Environmental Clearance was granted vide letter No. J-11015/40/2007-IA.II (M), dated 14.03.2008 for expansion of Swamymalai Iron Mined from (1.5 MTPA to 5.0 MTPA). Source: (Provisional R & R). 3) The Environmental Clearance has now been transferred in favour of M/s. MSPL Limited vide letter No. SEIAA 8 Misc-2019 dated 13.05.2019 for expansion of production capacity from 1.50 to 5.0 MTPA.

**MSPL LIMITED****MINING PLAN****Narasimha Iron Ore Mine
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4	Forest Clearance	1) Forest Clearance was obtained, vide MoEF & letter No. Nil, dated 07.07.2003. 2) MSPL Limited applied to PCCF, Bengaluru vide letter dated 20.02.2019 for transfer of FC infavour of MSPL with reference to LoI issued to lessee. 3) The lessee applied online FC in Form - A on 24.06.2019 and resubmitted on 02.07.2019. 4) PCCF asked us submit CA land vide letter no E office File No. KFD/ HOFF / A5-1(MNG)/51/2018-FC dated 19.07.2019.
5	Lease Area	As per CEC 60.66 Ha in Kumaraswamy Reserved Forest.
6	Pit	There are two mining pits which have been worked in the past (MP-1 & MP-2).
7	Method of Working	Opencast, A – Fully Mechanized mine.
8	Production Proposed	0.77 MTPA as per the approved R & R Plan based on dump capacity.
9	Waste Generation	1) Generation of total waste as per the approved R & R the ore to waste ratio is 1: 0.12 (26368105: 3290357) tons based on the cross section prepared by ICFRE. 2) It is proposed for first five years the ore to waste ratio is 1:0.12 (3.85 Million tons:0.467 Million tons)
10	Dumps	1) There are two OB dumps are observed in the ML area and both of them are inactive (ID-1/EID-1, ID-2/EID-2). Both the dumps consists of substantial quantity of sub grade ore. 2) There is no active dump in the lease area. It is proposed one temporary dump (PTD-1) within the UPL towards SW corner of the lease over an area of 2.40 Ha with a volume of 0.23 M Cum.
11	Reclamation Rehabilitation measures	1) Engineering measures have been proposed based on hydrological condition within and outside the lease area along with the cost. 2) Biological measures for dumps, mine pit, haul roads have been suggested suitable species.
12	R & R Cost	Rs. 266.55 Lakhs Excluding cost of SMP, BMP, Monitoring and implementation of R & R capacity building, infrastructure etc.,

**MSPL LIMITED****MINING PLAN****Narasimha Iron Ore Mine
(ML No 2148)**

Table No 2

Estimated Cost Summary of the Proposed Plan for SIOM (ML 2148)* of M/s. MSPL Limited.

SI No	Items	Total Cost in Lakhs
1	Cost for rehabilitation of encroachment area (as per CEC sketch)	37.67
2	Cost of OB dump management	114.27
3	Engineering structures for surface water management	17.60
4	Afforestation of area under mining and others.	86.72
5	Avenue plantation on both side of the approach road	3.68
6	Afforestation of area under green belt.	6.61
7	Social Management Plan (SMP), Biodiversity Management Plan (BMP), Monitoring and implementation of R & R plan, capacity building, infrastructure etc.	As per the guidelines issued by CEC, in respect of "Category-C" mine, the entire amount received by way of penalty etc. may be transferred to SPV for the purpose of taking up various ameliorative and mitigative measures in district Ballari or as decided by task force to be constituted as per the recommendation of Macro-level EIA report and the direction of Hon'ble Supreme Court of India for implementation of R & R plan and EMP.
	Grand Total	Rs. 266.55 Lakhs Excluding cost of items at serial No. 7 proposed above

*The cost proposed of R & R in Indicative and may vary based on actual dimensions of the proposed engineering structures, common schedule rate of Karnataka.

0.11 A fresh mining plan is prepared in the context of under Rule 16(1) of MCR 2016 for approval from IBM.

**MSPL LIMITED****MINING PLAN****Narasimha Iron Ore Mine
(ML No 2148)****1.0 GENERAL:****a) Name and Address of the Applicant**

Table No 3

Name of Applicant/ lessee/Rule 45 registration no.	Preferred Bidder M/s. MSPL LIMITED/ Reg. No. IBM / 199 / 2011
Address	MSPL LIMITED, Baldota Enclave, Abheraj Baldota Road, Hosapete
District	Ballari
State	Karnataka
Pin code	583 203
Phone	08394 - 232003,005
Fax	08394 -232333
Mobile No	9900256797
Email id	meda.venkataiah@mspllimited.com / email@mspllimited.com .

b) Status of applicant/lessee: Public Limited Company.

(i) The resolution of the company, (ii) Address and ID proof of the executive director of the company, (iii) Registration certificate (iv) A copy of list of Board of Directors and address/contact numbers with e-mail id are given & is enclosed as **Annexure 3.**

c) Mineral which is included in the prospecting license (For Fresh grant):

Iron ore (for Fresh grant)

d) Mineral which is included in the Letter of Intent/lease deed:

Iron Ore (Hematite)

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

Iron ore (Hematite)

f) Name of Qualified Person under rule 15(1) of MCR, 2016 or a Person employed under sub rule (2) of Rule 55 of MCDR, 2017 (Applicable for Scheme of Mining only) preparing Mining Plan:



MSPL LIMITED



MINING PLAN

**Narasimha Iron Ore Mine
(ML No 2148)**

Address:

Sri. S. Shivakumar

M.Sc. Geology

AGM (Exploration)

M/s MSPL Limited,

Baldota Enclave

Abheraj Baldota Road

Hosapete - 583 203

Phone: 09900256783

E-mail: shivakumar.s@mspllimited.com

Educational Qualification: Post Graduate in Geology

Professional Experience: 35 years after obtaining the degree.

Copies of certificates are enclosed as **Annexure 4.**

2.0 LOCATION AND ACCESSIBILITY

a) Lease Details (Existing Mine):

Name of mine: Narasimha Iron Ore Mine

Lat / Long of the any boundary point:

Point 'A': (1 st pillar) :LBC 01-N 15° 02' 34.56274" E 76° 32' 05.06362"

Date of grant of lease : LOI has been issued. Yet to be executed.

Period/Expiry Date : 50 Years / w.e.f. Date of execution

Name of Preferred bidder/lessee: Sri. Rahulkumar .N. Baldota, JMD, M/s.

MSPL LIMITED

Postal Address:

M/s MSPL Limited,

Baldota Enclave,

Abheraj Baldota Road,

Hosapete - 583 203,

Ballari District, Karnataka,

Phone :(08394) 232003,

Fax : (08394) 232333, E-mail: meda.venkataiah@mspllimited.com

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

Table No 4

Forest		Non-forest	
Kumaraswamy Reserved Forest	Area (Ha): 60.66 Ha (As per CEC)	(i)waste land, (ii)grazing land, (iii)agriculture land, (iv)others (specify)	Area (Ha) : Nil

Total lease area: A fresh area 60.66 Ha (As per CEC survey) for preparation of mining plan.

District & State: Ballari & Karnataka

Taluk: Sandur Village: Dharmapur

Whether the area falls under Coastal Regulation Zone (CRZ): No

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

20 Km from Sandur town, it can be approached from Ballari, Hosapete and Torangallu Railway station.

Toposheet No. with latitude & longitude of all corner boundary point/ pillar: D43E12 (57 A/12). Latitude & Longitudes are in datum WGS 84.

Table No 5

Sl.No	ML corner boundary point	Latitude	Longitude
1	LBC-01	N 15° 02' 34.56274"	E 76° 32' 05.06362"
2	LBC-02	N 15° 02' 23.77176 "	E 76°31' 53.59217"
3	LBC-03	N 15° 02'56.30705 "	E 76° 31'23.70140 "
4	LBC-04	N 15° 03'02.51540"	E 76°31'31.88420 "
5	LBC-05	N 15° 02'58.78238 "	E 76° 31'43.12497 "

Latitude and longitude of boundary corner points will be maintained as per the rule 12(V) of MCR 2016, the CEC sketch is enclosed **Plate No I**. (As per GoI Notification No:1/15/2015-M.VI Dated:02.07.2015)



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MINING PLAN

**Narasimha Iron Ore Mine
(ML No 2148)**

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.

Refer Key plan **Plate No II.**

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

3.1 Date and reference of earlier approved MP/SOM: ~~Not Applicable~~

The details of earlier approved Mining Plan of erstwhile lessee of M/s. H.G.Rangan Goud. (ML No 2148) are given below: (Source: Provisional R & R Plan).

Table No 6

MP/SOM	Under MCR/MCDR	Period	Letter No. and Date of approval
Scheme of Mining	-	-	No. MS/BLR/Fe-82-SZ dated 26.10.2006
Modified Scheme of Mining	Under Rule 10 of MCDR 1988	2007-08 to 2010-11	No. MS/BLR/Fe-82-SZ dated 01.02.2017

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

Not applicable.

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

Not Applicable.

3.4 Status of compliance of violations pointed out by IBM :

Not Applicable.



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

The Hon'ble Supreme Court by order dated 29.07.2011 imposed complete ban on mining operations and transportation in the areas of Ballari, Chitradurga and Tumkuru districts.

3.6 In case the MP/SOM is submitted under rule 11 of the MCDR 2017 or under rule 17(3) of MCR 2016 for approval of modification, specify reason and justification for modification under these rules.

Not Applicable

3.7 Status:

After the e-auction of iron ore block, MSPL Limited has been declared as preferred bidder. We have conducted the survey, based on the recent survey provided by the GoK in tender document, again a team of experts from ICFRE with the help of domain experts undertook a detailed field inspection of Narasimha Iron Ore Mine on 24.06.2019, verified the updated surface plan.

The R & R Plan of Narasimha Iron Ore Mine of M/s. MSPL Limited (ML No. 2148) of erstwhile M/s. H.G.Rangan Goud of 60.66 ha. area has been prepared by ICFRE & same has been approved by CEC. The proposal of reclamation and rehabilitation measures will be taken up as per the approved R & R Plan.



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MINING PLAN

**Narasimha Iron Ore Mine
(ML No 2148)**

PART - A

1.0 GEOLOGY AND EXPLORATION:

a) Topography, drainage pattern, vegetation, climate, rainfall data of the area applied area/mining lease area:

Physiography of the area is characterized by two elongated ridges trending NNW-SSE. The western ridge is named as Ramgad range and the eastern ridge is named as Donimalai range and the E-W trending South East extension of Ramgad range is called Kumaraswamy range. The height of these hill ranges varies between 600 m to 1100 m from MSL.

The core zone or the lease area is situated on the hill top with ground levels varying from 970 m RL to 910 m RL in the south-eastern side and 960 m RL to 870 m RL in the northern side and western side and 960 m RL to 900 m RL in the south and south-eastern side. The areas on the eastern and north-eastern side are at higher levels.

The Sandur Schist Belt area of Ballari district experience dry semi arid climate with annual rainfall varying from 40 cm to 80 cm. The monsoon begins in June first week and continues up to September and winter from the month of October to January is somewhat pleasant. However, hot to very hot summer is from the month of February to May.

b) Regional Geology with reference to the lease area:

The Ballari-Hospet region forms a part of the 'Sandur Schist Belt'. The rock formation belongs to Iron ore stage of Dharwar group of Precambrian schistose rock. The lithological units include green stones which are the metamorphosed basic igneous rocks occupying the valley regions, with Phyllite-quartzite's forming the canoe-shaped amphitheater of hills, trending NNW-SSE and enclosing Sandur. The Phyllites are locally Shaly and the Quartzite's are of the nature of Banded Hematite Jaspers, and Banded Hematite Quartzites, inter banded with each other.

The Banded Hematite Jaspers, the important source rocks for the iron ores in the area are prominent in the Northern and Western part of the ranges, whereas the associated Shales become prominent in the Southern and Eastern parts of the area. The iron ores form a capping over the quartzites and Shales and overlie a sequence of Manganiferous Phyllitic rocks. Lateritisation is widespread in most of the flat topped ridges.



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**Narasimha Iron Ore Mine
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Structurally, the Sandur hills form a tightly folded synclorium, plunging gently to NNW and the hill ranges broadly delineate the folded limbs of synclines, with close repetition of strata due to minor folds. The strike of the ore bodies is generally parallel to the trend of the hill ranges and dips are often steep, being vertical at number of places. Opposing dips towards NE and SW are found in the Ramandurg and NEB ranges. The iron ore deposits of NEB range from a part of the Ballari-Hospet group of iron ore deposits and occupy the Northern tip of Sandur Synclorium. These deposits lie on the Northern flanks of Sandur basin.

c) Geology of the area, shape & size of the ore deposit, disposition various litho-units indicating structural features if any etc.,

Geologically the iron ore deposit at Narasimha Iron Ore Mine belongs to Donimalai formation. The general strike of the formation is NW to SE and iron ore crop is visible all along the strike length of 1200 m. The width of the deposit varies from 160 m to above 200 m. The dip is 65° to 70°. The rock formations in the mine lease area are as follows:

Laterite mixed with iron ore

Banded Hematite Quartzite (BHQ)

Iron ore reef

Phyllite / Shale

The deposit occurs as a reef (at 45% Fe cut-off). Although there are no structural disturbances observed in the lease area, the recovery of iron ore is 90%. Balance 10% constitutes intercalated waste such as shales/phyllite, BHQ etc.

Hematitic Silicious Ore are characterising by alternate bands of hematite and silicious material, BHQ are originated in mid-oceanic condition/transition zones, by volcanic eruption process, it indicates it is a hard rock/BHQ.

As per the prepared borehole data, longitudinal & vertical sections and analysis report the depth persistent of litho-logies are varies. The deeper boreholes cross sections analysis indicates the percentage of silica content is increasing and hardness of BHQ rock is also increased.



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After plotting the ore body in LV section, it indicates depth persistent of litho-logs varies, due to considering these geological, lithological & analytical results. Based on the geological setup of the ore body the iron ore analysis +35%Fe to 45%Fe is meagerly and not consistent so that, we have not assessed / calculated Heamatatic Siliceous Iron Ore.

d)

- (i) Name of prospecting / exploration agency : MECL
- (ii) Address: Mineral Exploration Corporation Limited, (A Government of India Enterprises)
Dr. Babasaheb Ambedkar Bhavan, High Land Drive Road,
Seminary Hills, NAGPUR - 4440 006
- (iii) Phone: 07122510310
E-mail: headbd@mecl.gov.in

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.

There are two mining pits, which have been worked in the past (MP-1, MP-2).

MP-1: It is located in South direction and about 1/4 its area is encroached towards South East direction (EP-1) and another encroachment of this mine pit (EP-2) is observed towards Eastern direction. The top RL of the pit is 978 m and bottom RL is 905 m. The bench height is 6 m and its width is about 6-8 m. The encroached pit (EP-1) has 7-8 benches. The bench height is 6m and width is 6-7 m.

MP-2: This pit is located towards Northern side of ML area includes its extension. A small portion of the pit was encroached (1.12 ha) towards NW side of the lease (EP-4) and a minute portion is encroached (0.01 ha) towards eastern side (EP-3). The top RL of the pit is 942 m and bottom RL is 905 m. Bench height is about 7 m and width is about 10-12 m. Several heaps of mineral stacks located at the centre of the pit. The top RL is 917 m and bottom RL is 910 m.

The extensive mining operations were carried out by earlier lessee and existing pit dimensions are given in below.

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Table 7

Pit No.	No. of Benches	Height of benches(m)	Width of benches (m)	Length of the pit (m)	Width of the pit	Top RL(m)	Bottom RL(m)
MP1	10	6-8	4-8	714	387	978	905
MP2	4-6	7	10-12	490	255	942	905

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.

The drilling was taken up to estimate the iron ore reserves, MECL conducted core drilling and RC drilling involving 3280.70 m in 48 boreholes, 3174 samples were analysed.

The summary of diamond Core drilling boreholes and RC drilling boreholes that have been drilled at the spacing of less than 100 m interval and between two consecutive holes, along strike interval drilled by MECL.

Table 8

Year	No of Boreholes		Total depth		Prospected by
	Core drilling	RC drilling	Core drilling	RC drilling	
2015-16 (February to March 2016)	10	38	579.70	2701.00	MECL

Source: MECL exploration data as provided along with the tender document during e-auction process.

The details of bore holes are marked on Surface plan, Geological plan/ Cross sections. Please refer Surface plan, Geological plan and Cross section & Longitudinal section. The details of drilled boreholes by MECL is enclosed as **Annexure 5** respectively.



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

Complete chemical analysis of entire strata for all radicals were analysed at MECL laboratory, Utilities Complex, Nagpur by XRF method. (Source MECL report).

iv) Expenditure incurred in various prospecting operations.

Not Applicable.

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 32(1)(a) of MCDR 2017.

The surface plan of the lease area has been prepared on a scale of 1:2000 is enclosed as **Plate No. III.**

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

After the e-auction, preferred bidder M/s. MSPL Limited updated the surface plan. The iron ore exploration in the area was carried out systematically by diamond core drilling & RC drilling by MECL 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.



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The Geological plan of the lease area has been prepared on a scale of 1:2000 is enclosed as **Plate No IV**.

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 cross sections (CS) of the lease area has been prepared by considering the MECL borehole data and updated on a scale of 1:1000 is enclosed as **Plate No V** & Longitudinal Sections (L.V) on a scale 1:1000 is enclosed as **Plate No VI**.

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

The summary of the exploration carried out so far as explained in above para and data incorporated for preparation the mining plan. The friable iron ore mineralized area occupied in 48.00 Ha and it is covered under G1 level of exploration. The complex nature of mineralization of this mining block few bore holes are proposed to drill to ascertain to continuity of mineralization. By taking into consideration the future tentative exploration programme planned in next five years is given below. (Locations of proposed boreholes are shown on Geological plan)

Table 9

Year	Section	Prop. RC Boreholes	Depth (m)	Inclination	Remarks
I	S1	PBH-1	30	90°	To fulfill the UNFC norms, to know the width and depth of ore body behavior.
	S2	PBH-2	70	90°	
	S3	PBH-3	30	90°	
	S3	PBH-4	60	70°	
II	S4	PBH-5	60	90°	
	S4	PBH-6	60	70°	
	S4	PBH-7	70	90°	
	S5	PBH-8	70	90°	



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III	S6	PBH-9	60	90°
	S6	PBH-10	80	70°
	S7	PBH-11	70	90°
	S7	PBH-12	80	90°
IV	S8	PBH-13	50	90°
	S9	PBH-14	110	70°
	S10	PBH-15	110	70°
	S10	PBH-16	110	70°
V	S11	PBH-17	60	90°
	S12	PBH-18	110	70°
	S13	PBH-19	50	90°
	S13	PBH-20	60	70°
Total Meterage			1400	

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 the feasibility/Pre-feasibility study report along with the financial analysis for economic viability of the deposit as specified under the UNFC field guidelines may be incorporated.

UNFC code for categorization of reserves/resources is marked on geological plan and sections. The production capacity based on dump capacity as per approved R & R is 0.77 MTPA. Feasibility report along with financial analysis for economical viability to produce 0.77 MTPA is enclosed as **Annexure 6**.



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k) Furnish detailed calculation of reserves/resources section wise

Updated the geological plan & cross sections the reserves/resources calculation cross section method, category wise reserves/resource are reclassified as on 01.06.2019 (Under UNFC Category) the ore & development quantities are given in **Annexure 7.**

l) 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).

Reserves estimated by detailed exploration (G1) involves the detailed three dimensional delineation of a regular deposit achieved through sampling such as bench sampling, spot sampling, bore hole sampling and updated the geological plan & cross sectional method, the calculation of reserves/resources cross section wise, category wise reserves/resource are reclassified as on 01.06.2019 (under UNFC Category) is given below.

Table 10

Level of Exploration	Reserves/Resources in million tons (as per MECL)	Grade (Wt.Avg. Fe%)
G1 – Detailed exploration	(111) 47.43 (121 & 122) 0.96 Sub Total 48.40 (211) 14.12 (333) 00.81 Total: 63.33	At 45% Cut-off
G2 – General exploration	-	-
G3 – Prospecting	-	-
G4 – Reconnaissance	-	-
Total	63.33	

Resources and Reserves within the lease may be arrived after applying results feasibility study and economic evaluation of deposit based on various factors such as:



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Hematitic Silicious Ore are characterising by alternate bands of hematite and silicious material, BHQ are originated in mid-oceanic condition/transition zones, by volcanic eruption process, it indicates it is a hard rock/BHQ.

As per the prepared borehole data, longitudinal & vertical sections and analysis report the depth persistent of litho-logies are varies. The deeper boreholes cross sections analysis indicates the percentage of silica content is increasing and hardness of BHQ rock is also increased.

After plotting the ore body in LV section, it indicates depth persistent of litho-logs varies, due to considering these geological, lithological & analytical results. Based on the geological setup of ore body the Iron Ore analysis ~~+35%Fe to 45%Fe~~ is meagerly and not consistent so that we have assessed / calculated Heamatatic Siliceous Ore. If at all while mining producing +35%Fe to 45%Fe try to stock in separately.

Entire lease area has been explored fully. All the samples were analyzed Wt.Avg. 58.84 % Fe. There is no sub grade mineral.

- a) Mining Method : Open Cast Mining
Recovery factor : 90%
Mining losses : 10%
Processing losses: Nil

- b) Cut-off grade, Ultimate pit depth proposed.

Reserves/Resources are estimated at 45% Fe Cut-off. The quality of the iron ore reserves of the lease area is having Wt.Avg.Fe is 58.84 % Fe with respect to ultimate pit depth.

- c) Mineral/ ore blocked due to benches, barriers, pillars, road, railway, river, nala, reservoir, electric line and other statutory barriers etc, under forest; sanctuaries etc. where necessary permissions are not available.

1) Geological & Net Geological Reserve have been estimated by MECL, bulk density of 3.47 t / Cu.m considered for calculation purpose. Mineable reserves have not been estimated.

2) As bulk density assumed in the estimation of reserves is high, considering the nature of the ore characteristics the bulk density considered as 3.47 t/ cu.m and

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95% recovery of the net geological reserves as mineable by ICFRE, the details of reserves is as tabulated below.

Table No11 (Quantity in Million Tones)

Category	UNFC Code	Geological Reserves (MECL)	Net Geological Reserves (90% Geological Reserves by MECL)	Mineable reserves at 95% recovery
Proved	111	68.37	61.53	58.45
Probable	122	2.00	1.8	1.71
	Total	70.37	63.33	60.16
	Grade		Wt. Avg. 58.84%	

Based on the detailed exploration data conducted by MECL, 50 m on either side of the iron ore intersection of the borehole has been placed under (111), the next 50 m under (122). However, based on geological inference and the behavior of the iron ore formations an influence of 10-15 m along the down depth has been estimated and placed under (121) category of UNFC.

3) Based on the MECL data MSPL Limited has been reclassified the reserves / resources and re-estimated. By considering the MECL sections the area where the bore holes are drilled at 100 m interval, the reserves are categorized as proved reserves (111) to the lowest depth, beyond that lowest depth the reserves are categorized as probable reserves (121 & 122). Some reserves are beyond ultimate pit limit and are categorized as measured mineral resources (211). Some of the reserves are beyond the ultimate pit limit and beyond the proved depth area categorized as Inferred Mineral Resources (333). The reserves / resources calculation by cross section method, category wise are reclassified as on 01-06-2019 (under UNFC Category).



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Table 12

	UNFC Code	Quantity in million tons	Grade %Fe
A. Total Mineral Reserve			
Proved Mineral Reserve	111	47.43	
Probable Mineral Reserve	121 and 122	0.96	
Sub Total		48.40	
B. Total Remaining Resources			
Feasibility Mineral Resource	211	14.12	
Prefeasibility Mineral Resource	221 and 222	-	At 45% Fe Cut-off
Measured Mineral Resource	331	-	
Indicated Mineral Resource	332	-	
Inferred Mineral Resource	333	0.81	
Reconnaissance Mineral Resource	334	-	
Sub Total		14.93	
Total Reserve (111) + Resources(211+333)		63.33	

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



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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.

Existing: It is an open cast mechanised mine on the top of a plateau. The lease area is a hilly terrain. Mining was carried out by mechanized opencast method by means of HEMM equipment. The development of the mine is systematic. Wheel loaders and tippers were used for loading and dumping of waste material/ore. The haul roads are maintained well with gentle gradients.

There are two mining pits, which have been worked in the past (MP-1 and MP-2).

MP-1: It is located in South direction and about 1/4 its area is encroached towards South East direction (EP-1) and another encroachment of this mine pit (EP-2) is observed towards Eastern direction. The top RL of the pit is 978 m and bottom RL is 905 m. The bench height is 6 m and its width is about 6-8 m. The encroached pit (EP-1) has 7-8 benches. The bench height is 6m and width is 6-7 m.

MP-2: This pit is located towards Northern side of ML area includes its extension. A small portion of the pit was encroached (1.12 ha) towards NW side of the lease (EP-4) and a minute portion is encroached (0.01 ha) towards eastern side (EP-3). The top RL of the pit is 942 m. and bottom RL is 905 m. Bench height is about 7 m and width is about 10-12 m. Several heaps of mineral stacks located at the centre of the pit. The top RL is 917 m and bottom RL is 910 m.

The operations involved mining of the ore and waste by drilling and blasting. Ore excavated from the mine was taken to the mobile crushing and screening plant in the ML area for screening and sizing. The finished products i.e. calibrated lump ore and fine ore were loaded in to tippers and dispatched to the stockyard before dispatching to domestic steel industry.

Inactive dumps (Within Lease):

There are two OB dumps observed in the ML area both of them are inactive.

ID-1/EID-1: The OB dump (ID-1/EID-1) is located on the north-eastern side and 90% of the dump is located outside the ML area towards eastern side (EID-1). A small portion of the OB dump is within in the ML area (ID-1). The top RL of ID-1 is 970 m and the bottom RL is 942 m. The height of the ID-1 dump is about 28 m and observed two terraces and the slope angle is about 50 degrees.



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The lower dump terrace (EID-1) is covered with geo-coir mat and reclaimed with grasses. At some places, deep gullies and rills are observed all along the slopes of EID-1. There is a loose boulder toe wall observed below the EID-1.

The toe wall was completely broken and damaged and it was filled with OB material and hence it has to be re-constructed. The top RL of EID-1 is 977 m and the bottom RL is 848 m at the toe. The height of this dump is about 129 m and slope angle is 60 degrees. No bio-engineering measures are made.

ID 2/EID 2: The OB dump is located on south-western side of the Mine Pit (MP-2) and its major portion is located within the ML area (ID-2). Only a fraction of the dump i.e., bottom of the dump is encroached towards western side (EID-2). The dump is partially stabilized with *Eucalyptus tereticornis* and *Acacia auriculiformis*. It is located in the North-western part of the ML area. The top RL of ID-2 is 963 m and the bottom RL is 865 m. The height of the dump is about 98 m and slope angle is 50 degrees.

Active dump (Within Lease): There is no active dump in the lease area.

Mineral stock : As assessed by the DMG, Hospet, stocks of about 11814 tonnes of lumps, 18114 tonnes of ROM and 7913 tonnes of fines are lying in the mine.

Infrastructure : There is no infrastructure in the lease area.

Proposed: The existing geometry of the benches are irregular, it is proposed to maintain the height of the bench is 10 m and width of bench will be more than 10 m with road gradient maintained at 1:16. Pit slope angle will be at 36° to 45° and bench slope angle will be 70°. It will be maintained as per statutory requirement, the benches are being providing with connecting ramps which is having the gradient 1:16 with hair pin curves and in cases where the bench to bench connection at the bottom/face, the gradient is 1:10 will be mentioned for a distance of not exceeding 100 m as per the statutory requirements.

Narasimha Iron Ore Mine is being operated by open cast mining method with high mechanization comprising of hydraulic excavators and dumpers combinations. It is proposed to work fully mechanized method of operations.

The present RL minimum m RL is 905 and maximum m RL is 980, The advance of benches will be extended towards north west to south east making pits from top to bottom by slicing method during the first five year period.

It is proposed to dump in PTD-1 within the UPL towards SW corner of the lease over an area of 2.40 ha with a volume of 0.23 M.cum. The maximum height of the

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proposed dump is 30 m with each terrace of 10 m height and 8 m width respectively with overall slope angle of 28°.

The extracted iron ore will be temporary stacked near to the mobile crushing plant within the working pits.

It is proposed to work between coordinates E 663700 to 664980 N 1663400 to 1664500 for five year plan period.

b) Indicate year-wise tentative excavation in cubic meters indicating development, ROM, pit wise as in table below.

As per R & R, the production capacity has been fixed by CEC as 0.77 MTPA. Accordingly, the year wise in-situ tentative excavation is proposed for the first five years is as follows:

I. In-situ Tentative Excavation : Table No 13

Year	Pit No.	Total Tentative Excavation (Cum)	Top Soil (Cum)	OB/SB/IB (Cum)	ROM (Cum)		Mineral Reject	ROM/ Waste Ratio (in Cum)
					Ore (Cum)*	Mineral Reject (Cum)		
1	2	3	4	5	6	7	8	9
I	Working Pit-I & II	270222	-	48320	221902 (770000 tons)	-	-	1:0.22
II		269796	-	47894	221902 (770000 tons)	-	-	1:0.22
III		270344	-	48442	221902 (770000 tons)	-	-	1:0.22
IV		262380	-	40478	221902 (770000 tons)	-	-	1:0.18
V		270453	-	48551	221902 (770000 tons)	-	-	1:0.22
Total		1343195	-	233685	1109510 (3850000 tons)	-	-	1:0.21

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

The total ROM ore produced from this mine will be crushed and screened, the ore will be dispatched to MSPL Pellet Plant for its captive use. Physical specification of ore is 100% -10 mm, the chemical composition of processed ore at 45% Fe cut-off grade with Wt. Avg. 54.76% Fe for the five years plan period.



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Year wise section wise production and development the period I,II,III,IV & V is enclosed as **Annexure 8 (A) to 8 (E)**.

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

There is no proposal for dump re-handling (for the purpose of recovery of mineral) for first five years.

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

It is proposed to work in S1 to S13 sections between coordinates E 663700 to 664980 N 1663400 to 1664500 for mining and allied activities. The exploitation will under these sections for five year plan period.

It is proposed to dump in Proposed Temporary Dump PTD1. The overburden mainly consists of shale, Ferruginous Shale, BHQ & BMQ is generated 0.467 million tonnes) will be disposed on proposed dump PTD1. If at all while mining producing +35%Fe to 45%Fe try to stock in separately.

Table No 14

Year	Blocks / Pits		Dumps
	Top (m RL)	Bottom (m RL)	
I	980	970	PTD-1
II	990	980	PTD-1
III	1000	980	PTD-1
IV	1000	980	PTD-1
V	1000	980	PTD-1

Yearly pit wise development plan proposed for the next five years is depicted on plans and sections. Refer **Plate No. VII A to E**. and year wise, section wise production and developments for the five years.



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I year: It is proposed to work in main pit for ore and waste in S1,S2,S11,S12 and S13 sections. The bottom of the RL is 890 and top of the RL is 980. It is proposed to maintain the height of the bench is 10 m and width of bench will be more than 10 m with road gradient maintained at 1:16. Pit slope angle will be at 35° to 45° and bench slope angle will be 70°.The generated waste will be disposed on proposed temporary dumps PTD-1.

II year: It is proposed to work in main pit for ore and waste in S1,S2,S3,S10,S11, S12 and S13 sections. The bottom of the RL is 880 and top of the RL is 980. It is proposed to maintain the height of the bench is 10 m and width of bench will be more than 10 m with road gradient maintained at 1:16. Pit slope angle will be at 35° to 45° and bench slope angle will be 70°.The generated waste will be disposed on proposed temporary dumps PTD-1.

III year: It is proposed to work in main pit for ore and waste in S2,S3,S9,S10,S11, and S12 sections. The bottom of the RL is 870 and top of the RL is 980. It is proposed to maintain the height of the bench is 10 m and width of bench will be more than 10 m with road gradient maintained at 1:16. Pit slope angle will be at 35° to 45° and bench slope angle will be 70°.The generated waste will be disposed on Proposed temporary dumps PTD-1.

IV year: It is proposed to work in main pit for ore and waste in S2,S3,S9,S10 and S12 sections. The bottom of the RL is 870 and top of the RL is 980. It is proposed to maintain the height of the bench is 10 m and width of bench will be more than 10 m with road gradient maintained at 1:16. Pit slope angle will be at 35° to 45° and bench slope angle will be 70°.The generated waste will be disposed on Proposed temporary dumps PTD-1.

V year: It is proposed to work in main pit for ore and waste in S2,S3,S9, and S12 sections. The bottom of the RL is 860 and top of the RL is 980. It is proposed to maintain the height of the bench is 10 m and width of bench will be more than 10 m with road gradient maintained at 1:16. Pit slope angle will be at 35° to 45° and bench slope angle will be 70°.The generated waste will be disposed on Proposed temporary dumps PTD-1.

The development means side burden, over burden consists of shale, Laterite/soil/clay, dump material, BMQ & BHQ. The intercalated waste means intermediate phyllite / shale bands in the mineralized friable iron ore zone is generated (233685 Cu m or 467370 tonnes i.e. 0.467 million tonnes) will be

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disposed on proposed temporary dump no PTD1. The year wise waste generated is as follows:

Table No 15

Year	Volume (Cu.m)			Tons		
	Development	Intercalated waste (10%)	Total	Development (BD- 2 t/ Cu.m)	Intercalated waste (BD -2 t / Cu.m)	Total
I	23664	24656	48320	47328	49312	96640
II	23238	24656	47894	46476	49312	95788
III	23786	24656	48442	47572	49312	96884
IV	15822	24656	40478	31644	49312	80956
V	23895	24656	48551	47790	49312	97102
Total	110405	123280	233685	220810	246560	467370

Note: The development means side burden, over burden consists of shale, Laterite/soil/clay, dump material, BMQ & BHQ. The intercalated waste means intermediate phyllite / shale bands in the mineralized friable iron ore zone.

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

Narasimha Iron ore mine is "A" category fully mechanized mine it is proposed to operate by opencast mining method. The height of the bench is 10 m and width of bench will be 10 m and above with gradient maintained at 1:16. Pit slope angle will be at 36° to 45° and bench slope angle will be 70°.

The present RL minimum m RL is 905 and maximum m RL is 980, The advance of benches will be extended towards north west to south east making pits during the first five year period.

It is proposed to handle the (maximum quantity) for ore and waste is considered for calculation purpose, ore is 770000 tons (221902 Cu.m) and waste is 97102 tons (48551 Cu.m) respectively is considered for Drilling, Blasting, Excavation, Hauling & Transportation of Ore & Over Burden.



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Drilling calculation: The strata are softer rock and drilling requirement will be very less. We will also use rock breaker for medium hard rock. However, considered 20% drilling & blasting is necessary.

Ore = Burden & Spacing = 3 m X 3.5 m

Yield /m of drilling = 36.43 tons (3 x 3.5 x bulk density 3.47 tons/Cu m)

Drilling required for ore (770000*20%=154000) = 154000/36.43 tons/cum of drilling

= 4227 m+ 10% sub grade Drilling (423 m of drilling) Total meters drilling in ore = **4650 m.**

Development = Burden X Spacing = 3.5 m x 4 m

Yield /m of drilling = 28 tons (3.5x 4 x bulk density 2 tons/Cu m)

Drilling required for Development (97102*30%=1040) = 97102/28=1040+10% sub grade drilling (104) Total mt drilling in Development = **1144.**

BLASTING: - After Completion of drilling operation, depends on the requirement, the blasting area will be decided. In this process, normally explosives (slurry explosives, ANFO, LOX etc.,) will be filled in drilled holes and blasted by using delay detonators, card relays. We will also follow certain parameters of charge per meter of drilling in different strata. It varies from 2.4 to 3.5 kg per m from strata to strata and area to area.

The maximum charge of explosives per delay is usually 100 to 150 kgs. Delay detonators / card relays are being used to maintain delay in between holes/rows. This is being done to achieve better fragmentation and to reduce ground vibrations. Muffle blasting is used to prevent fly-rock from damaging human habitats and structures. Secondary blasting is the process of blasting for further reduction of size of boulders generated during primary blasting. Rock breaker mounted on hydraulic excavator will be used to avoid plaster and pop shooting.

Explosive Required:

Ore = Drill meters x 3.5 kgs/ m = 4650 x 3.5 = 16275 kgs

Dev = Drill meters x 2.4 kgs/ m = 1144 x 2.4 = 2747 kgs

Powder factor

Ore = 9.46 tons/kg

Development = 10.6 tons/kg



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Magazine: Presently we are not having magazine licence, it will process for grant of magazine licence, Ammonium nitrate, LOX licence etc. We will use explosives by outsource depends on requirement. Explosives are arranged from authorized dealers as and when required as per stipulated conditions.

EXCAVATION: After blasting, the ore/waste will be in loose/fragmented stage. MSPL will engage HEMM like, hydraulic excavators having bucket capacity ranging from 1.0 m³ to 3.0 m³ to excavate the loose ore/waste and loading into tippers/dumpers. These hydraulic excavators are of HSD operated and having all safety features with AC cabins. Proper care will be taken to avoid mixing of ore and waste during excavation of contact zones. We will also engage rock breakers for excavation depending on the strata.

HAULING & TRANSPORTATION OB and ORE: Ore and OB will be transported by using 16 Tonnes Tippers or 30 Tonnes Dumpers. We proposed an alternate route to transport the iron ore from the lease area (as per the approved R&R logistic plan).

Ore: - Ore will be transported from blasting face to mobile crusher/stock nearer to crusher; The stock yard material will be again loaded by loaders/excavators to Tippers / Dumpers and will be fed to the crusher.

The mobile crusher will be located in lease area depends space availability, and it crushes 100% -10mm is produced out of the crushing and screening plant. The product which is coming out from crushers will be loaded to the tippers / dumpers and it will be transported and unloaded in to the designated stock piles. The external tippers will utilized for the dispatch of products from stock piles/crushers.

Waste: - Waste will be loaded by hydraulic excavators to 16 Tonne Tippers/30 Tonne Dumpers and it will be transported to the designated dump yards for systematic dumping.

**MSPL LIMITED****MINING PLAN****Narasimha Iron Ore Mine****JML No 2148)****Calculations:**

1. Maximum quantity of the ore to be handled for the period 770000 tons (221902 Cu.m) per annum.
2. Maximum quantity for the of Waste to be handled for the period 97412 tons (48551 Cu.m) per annum

Assumptions & considerations:

1. No. of effective Mine working days -280 days
2. No. of hours working -12 hrs (2 shifts)
3. Average Capacity of Excavator -275 TPH of ore and 150 cu. mts of waste per hour (it varies depends on machine model)
4. Average drill capacity -15 m per hour (It changes depends on strata)
5. Actual working hours of machine per day - 7 hrs
6. Yield per mt of drilling: ORE-40.42 tons and WASTE -28.0 tons
7. Powder factor expected: Ore=10.5 t/Kg, OB=10.6 t/Kg.

The requirement of machinery has been calculated by considering the 80-90% availability of machinery and all parameters as discussed above is given in table.

Table No 16

Items	No. of days	Capacity	No. of machines	No. of hours	Capacity per year	Remarks
Excavators						
Excavators-ore	280	275 TPH	1	6	770000 tons	
Excavators-Waste	280	275 TPH	1	6	97412 tons	Capacity per year will change year to year as per area of working
Rock breaker			1			
Excavator for Weigh bridge	280	100 TPH	1	6		To adjust weightment to 16 tonnes/10 tonnes
Excav-Crusher feeding	250	150 TPH	1	6		

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Excav-Dump /Env & Misc.works		150 TPH	1	6		
Excavator-Spare			1			Stand by machinery.
Dumpers	280	25/30 toners	12	6		including spare capacity
Tippers	280	16 toners	10	6		Internal movement/other works – including spare
Drill	280	15 mts/hr	1	6	5381 mts	
Wheel Loaders	280	150 TPH	5	6		Mine pit , stock yards & product loading
Water Tankers			5			
Mobile Crushing&Screening plant	250	150 TPH	2	6	319178 tons	Design capacity is 150 TPH. 92 % of crushing capacity considered.
Road grader			1			

* Requirement of machinery calculated based on assumptions and it may change depend on practical conditions area and year.

As per the requirement of machinery it will be hired / capitalized for the operation of the mine.

Recovery factor: The geomorphologic setup of the iron ore deposit has been well established in this sector. The ore deposit is mostly soft and flaky in nature and hence drilling and blasting may be required except in hard ore zone. Mining has been done by open cast method deploying heavy mining machinery like ripper and dozer, excavator and loader for extraction and loading purpose. Dumpers/tippers were used for transportation of mineral from the mine. Intercalated waste cannot be sorted by machinery, hence we have considered as 90% recovery for ore, and 10% will be the mining loss & processing loss is nil.

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.

It is proposed to maintain the height of the bench is 10 m and width of bench will be more than 10 m and above with gradient maintained at 1:16. Pit slope angle will be at 36° to 45° and bench slope angle will be 70°. The present RL is 905 minimum m



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RL & 980 maximum m RL. The advance of benches will be extended towards north-west to south-east making pits during the first five year period.

It is proposed to work between coordinates E 663700 to 664980 N 1663400 to 1664500 for five year plan period. The exploitation will be under this pit for five year plan period.

It is proposed to dump in Proposed Temporary Dump PTD1. The overburden mainly consists of shale, Ferruginous Shale, BHQ & BMQ is generated 0.467 million tonnes (233685 Cu m)

At present there is no area for dumping. One new proposed temporary dump have been identified within the ML area will be disposed on proposed dump PTD1 for next plan period.

Proposed temporary dump (PTD 1): The overburden is proposed dump in PD-1 (2.4 Ha) within the UPL (Ultimate Pit Limit) is proposed for the temporary dump which can accommodate 0.23 million cu.m of waste material for future dumping. It should be re-handled and backfilled into the economically exhausted mine pit during the plan period. Necessary permission shall be obtained from IBM for the same. All the waste dumps should be rehabilitated by adopting suitable engineering measures as proposed in this plan.

The details of proposed temporary dumps is tabled below:

Table No 17

Proposed Dump	Location	Height (m)	Width (m)	Angle	Area (Ha)
PTD1	E 0664450 to E 0664700 N 1663400 to N1663620	30	125	28°	2.40

During the five years plan period the waste generation is 233685 Cu.m (0.233 Million Cu m) will be disposed of on above ground from lower contours towards southern slopes by retreating method in proposed temporary dump PTD1. The proposals dumping of waste shall be done in lifts/ berms each of 10 m height and width about 8 m with overall slope angle 28°, maximum height is 30 m. Yearly generation of waste and location of disposal is furnishing below.

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Table No 18

Year	PTD 1 (Cu .m)
I	48320
II	47894
III	48442
IV	40478
V	48551
Total	233685
	0.233 Million Cu m

f) Conceptual mine planning upto the end the lease period taking into consideration the present available reserves and resources describing the excavation, recovery of ROM, disposal of waste, back filling of voids, reclamation and rehabilitation showing on a plan with few relevant sections.

The conceptual mining plan has been prepared upto the life of mine by considering the following and showing the conceptual plan and sections is enclosed as **Plate No. VIII.**

Anticipated life of the mine:

The updated category wise reserves is 48.40 MMT. However at the present rate of production capacity 0.77 MTPA, the life of the mine will be 63 years. Whereas LOI issued has been for period of 50 years.

Depth persistence and feasibility of mining:

The friable iron ore deposit at this mine occurs as reef at the top of the hill. Although the depth of the deposit ranges from 30 m to 90 m.

Adequacy of Exploration:

Exploration carried out by MECL:

Geological mapping of lease area for 60.66Ha. A total of 48 boreholes drilled, out of which 10 boreholes for diamond core drilling and 38 boreholes for reverse circulation (RC) non-core drilling, 13 geological cross sections have been prepared, bulk density



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considered 3.47354 T/Cu m. is considered for calculation purpose and the reserves were estimated and given in para 1.0 (i).

Based on the tests conducted by MECL (3 pits) for determination of BD in thin laminated ore, thin laminated powdery ore, and thin laminated ore by MECL is considered 3.47354 t/cum for calculation purpose.

Reclassified the reserves/resources by MSPL:

Based on the recent exploration data conducted by MECL drill data, the reserves/resources are categorized as proved reserves (111) to the lowest depth, beyond that lowest depth the reserves are categorized as probable reserves (121 & 122). Some reserves are beyond ultimate pit limit and are categorized as measured mineral resources (211). Some of the reserves are beyond the ultimate pit limit and beyond the proved depth area categorized as Inferred Mineral Resources (333). The reserves/resources are reclassified as per UNFC as on 01-06-2019.

The friable iron ore covered under G1 level of exploration. The friable iron ore mineralized area occupied in 48.00 Ha and it is covered under G1 level of exploration. By taking into consideration the future tentative excavation programme planned in next five years are given in para 1.0 (i).

Production and Development:

The annual capacity of the production 0.77 MTPA as per the approved R & R plan. The ore benches are first worked and extended across and along the strike. Side burden will be removed as benches advances.

For the conceptual period it is proposed the height and width of the benches are about 10 m, with haul road width more than 10 m with gradient maintained at 1:16. Pit slope angle is maintained at 36° to 45° and bench slopes are 70°.

To win the blocked ore 14.12 MMT under 211 category additional area is required, accordingly we are requesting the state government in future.

Adequacy of land for Disposal of Waste:

At present there is no area for dumping. One new proposed temporary dump have been identified within the ML area. The overburden mainly consists of shale, Ferruginous Shale, BHQ & BMQ is generated will be disposed on proposed

temporary dump PTD1 for next plan period & Back filling in mined out area for conceptual period.

The proposals dumping of waste shall be done in lifts/berms each of 10 m height and width about 8 m with overall slope angle 28°, maximum height is 30 m for ensuring maximum stability.

- 1) The total generation of other waste upto the life of the mine is 6.996 Million Cum including re handling.
- 2) The proposed temporary dump PTD 1 capacity is 0.233 Million Cu.m
- 3) The total generation of waste will not be able to accommodate in the proposed temporary dumps, the extra quantity of the waste will be back filled in the mined out area, after exhaustion of the ore.
- 4) During the first five years plan period the total generation waste will be handled 0.233 Million Cum. It is proposed to dump PTD 1.
- 5) For life of the mine the total generation waste will be handled including the rehandling of proposed temporary dump = $6.996 + 0.233 = 7.229$ Million Cu.m. It is proposed to dump PTD1 for present plan period and back filling will be commenced during 2nd five years plan period. The working pit-2 area will be utilized for backfilling from section S1 to S5 after exhaustion of ore.

Table No 19: (in Million Cu m)

Period	PTD 1	Rehandling of PTD 1	BF	Total
First five years	0.233	0	0	0.233
Life of mine	0	0.233	6.763	6.996
Grand Total	0.233	0.233	6.763	7.229

Biological Reclamation:

Biological measure when implemented will results in the establishment of system that will be self-sustaining. As vegetation climax involves succession, any hindrance causes an imbalance in nature's operational process.

To implement biological measures all the operational activities are planned in well in time.



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In Narasimha mine it is proposed to carry out the afforestation near processing plants, along the road side and near office premises there by creating the green belt, biological reclamation is carried out on inactive dump slopes by using coco-soil erosion control blankets and spreading of grass seedlings on dump slopes to prevent erosion of dump during rainy season.

Optimum exploitation:

For the optimum exploitation of the mineral systematic exploration, proper pit design, utilization of sub grade minerals & systematic and scientific disposal of waste generated are the governing factors, detailed exploitation programme is already discussed in earlier Para, for proper pit design parameters considered are, ultimate pit slope angle of 36° to 45° , and bench slope angle 70° , the height of the bench is 10 m and width of bench will be more then 10m with gradient of 1:16 where as at smaller distance where two benches are required to be connected 1:10. Separate benches will formed in ore and waste.

Utilization of mineral:

The mineral produced will be used for captive consumption. The detailed specification end-use at mine & at plants are given in para 5 & 6.

Reclamation & Rehabilitation measures:

Reclamation & Rehabilitation measures will be implemented as per the approved R & R plan is enclosed as **Annexure 9 (a) to (e)**, and Implementation of schedule of mitigation/engineering measures as per the approved R & R is enclosed as Annexure 9 (f).

Land use pattern at conceptual planning upto the lease period along with mode of rehabilitation is given below.

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Table 20

DETAILS OF LANDUSE EXISTING, 1ST FIVE YEARS & CONCEPTUAL				
PARTICULARS	AREA (Ha)			MODE OF REHABILITATION
	EXISTING	1ST FIVE YEARS	CONCEPTUAL	
Area under Mining	35.49	40.65	37.85	Bench Plantation
Waste Dump ID-1 & ID-2	06.34	04.27	03.29	
Proposed Temporary Dump (PTD-1)	00.00	02.40	00.00	
Backfilling	00.00	00.00	08.70	
Roads	00.96	00.00	00.00	Avenue Plantation
Infrastructure	00.08	01.50	00.00	Plantation
Sub-grade stock	01.48	00.00	00.00	
Safety Zone /Green Belt	02.57	02.57	02.57	Plantation
Unused area	13.74	09.27	08.25	Will remain same
Total	60.66	60.66	60.66	

Note: Existing Roads & waste dumps ID-1 and ID-2 area will utilized for mining and allied activities thus the area of roads and dumps is reducing. The landuse details are given as per the approved R&R.



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Waste management:

To prevent dump run off during rainy season, grass seeds will be spread, gully plugs, settling pits will be constructed at critical points. It is proposed to construct at different places across the nalla gully plugs, check bunds and earthen bunds within and outside the lease as per the approved R & R plans.

Inactive dumps (Within Lease):

There are two OB dumps observed in the ML area both of them are inactive.

ID-1/EID-1: The OB dump (ID-1/EID-1) is located on the north-eastern side and 90% of the dump is located outside the ML area towards eastern side (EID-1). A small portion of the OB dump is within in the ML area (ID-1). The top RL of ID-1 is 970 m and the bottom RL is 942 m. The height of the ID-1 dump is about 28 m and observed two terraces and the slope angle is about 50 degrees.

The lower dump terrace (EID-1) is covered with geo-coir mat and reclaimed with grasses. At some places, deep gullies and rills are observed all along the slopes of EID-1. There is a loose boulder toe wall observed below the EID-1.

The toe wall was completely broken and damaged and it was filled with OB material and hence it has to be re-constructed. The top RL of EID-1 is 977 m and the bottom RL is 848 m at the toe. The height of this dump is about 129 m and slope angle is 60 degrees. No bio-engineering measures are made.

ID 2/EID 2: The OB dump is located on south-western side of the Mine Pit (MP-2) and its major portion is located within the ML area (ID-2). Only a fraction of the dump i.e., bottom of the dump is encroached towards western side (EID-2). The dump is partially stabilized with *Eucalyptus tereticornis* and *Acacia auriculiformis*. It is located in the North-western part of the ML area. The top RL of ID-2 is 963 m and the bottom RL is 865 m. The height of the dump is about 98 m and slope angle is 50 degrees.

Active dump (Within Lease): There is no active dump in the lease area.

Proposed Temporary Dump (PTD1):

It is proposed within the UPL towards SW corner of the lease over an area of 2.40 ha with a volume of 0.23 M.cum. The maximum height of the proposed dump is 30 m with each terrace of 10 m height and 8 m width respectively with overall slope angle of 28°. It should be re-handled and backfilled into the economically exhausted mine pit during the plan period. Necessary permission shall be obtained from IBM for the same.



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Sub-grade Ore Dump: As assessed by the DMG, Hospet, stocks of about 11814 tonnes of lumps, 18114 tonnes of ROM and 7913 tonnes of fines are lying in the mines.

It is proposed to construct engineering measures for dump management and surface water management as per the approved R & R plan. There is no proposal of silt settling tanks in R & R plan, since these temporary dumps will be re-handled for conceptual period. The details of engineering measures are as follows.

Table - 21: Dump Management Plan

Particulars	Toe wall (dry) m	Area	Garland drain (m)
PTD-1	677	0	555
EID-1	980	0	272
ID-2	108	0	0
Geo-Coir matting (EID-1)	0	1.0 Ha	0
Approach road GD-3	0	0	4090
TOTAL	1765	1.0	4917

Table - 22: Surface Water Management

PARTICULAR	LBCD	GCD	RWHP	SMCD	SST	ST	BWCD	LWCD
N1	0	1	0	1	0	0		
N2	2	0	0	0	0	0		
N3	2	0	0	0	0	0		
N4	3	1	0	0	0	0		
TOTAL	7	2	0	1	0	0	75	80

Control of dust:

For controlling the generation of dust during drilling and blasting, it is proposed for wet drilling to be practiced. Dust generation due to haulage of heavy earth moving machinery to be controlled by spraying of water on haulage roads, dust generation points in crushing, screening and plants. Greenbelts will be formed along hauling road side and at dump yards.



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Control on Noise:

For controlling the noise pollution the following measures are proposed to be adopted:

- a) All HEMM are now complying with Euro II norms. For controlling the noise generated due to HEMM regular maintenance and greasing of movable parts will be adopted.
- b) While drilling wet drilling to be practiced and while blasting millisecond delay detonators will be used.
- c) At crushing & screening plants regular oiling and greasing to be carried out.
- d) Ear plugs to be supplied to all the persons working in noise prone areas. There is no continuous exposure to high noise levels.
- e) Roaster system of working will be implemented.

Prevention of water pollution:(surface water)

- a) Gully plugs/settling ponds to be constructed to prevent dump runoff during monsoon.
- b) Dump slopes will be stabilized by plantation.
- c) Desiltation of gully plugs to be carried out during dry season.

As per approved R & R plans: The runoff during heavy down pour (during high intensity rainfall) causes soil erosion. Control of erosion is important both during mining and post mining rehabilitation programme. The major objective of rehabilitation is to establish an adequate cover of vegetation to stabilize the site and control erosion. Measures to protect the soil from water erosion should be carried out on watershed.

Drainage from outside catchments area above lease area must be diverted into adjoining natural channels through diversion of drains/catch water drains. Erosion control in natural channels should be controlled by constructing silt retaining and grade stabilization structures like gabion check dams, stone masonry check dams, earthen check dams, silt settling tanks and debris basins. Check dams retain silt behind it and allow the water to flow in the downstream. Due to retaining of silt, channel gradient is reduced. Reduced channel gradient reduces flow velocity and consequently silt carrying capacity of flowing water is reduced. By adopting these grades stabilizing structures the channel is converted into benches which results in



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reduction of equivalent channel gradient appreciably. This will result in better plant growth. Engineering measures is the first line of defense in controlling erosion and it helps the vegetation to come up at faster pace.

As per the above suggestion it is proposed to construct log wood check dam, brushwood check dams, loose boulder check dams, wire crate/gabion check dam, earthen check dam and stone masonry will be constructed at suitable place with measurement as per the approved R & R plans.

Afforestation:

Afforestation of the mined out and other available areas which are not fragmented but are degraded due to mining activity is the main component of re-vegetation process to mitigate the negative impacts of the mining on environment. Afforestation may lead to restoration of the ecosystem relatively to pre-mining period.

Afforestation will be carried out as per suggestions given in the approved R & R plans. The species recommended for soil moisture conservations and slope stabilization, nitrogen fixing species for nitrogen enrichment, hydro seeding species, suitable species for OB dumps and mine pit stabilization will be planted.

Biodiversity Conservation Plan:

There is no plan for preserve the Biodiversity conservation.

B. UNDERGROUND MINING

Not Applicable.

3. MINE DRAINAGE

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

There are no rivers or perennial water courses in the mine lease area. However, the area is traversed by numerous seasonal water courses which are usually active during monsoon season and draining into the nearby water bodies. Naturally, no rain water accumulates in the lease area. The rain water flows from hill slopes and it



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does not accumulate till it reaches the lower valleys. Hence, the drainage pattern is sub-dendritic in nature and is typical of the hilly area.

A total of 4 nalas are originating within and around the ML area. All nalas following towards north & finally joining the Narihalla stream.

The mining operations for iron ore are located on hill top. The mine drainage is contingently manageable as rain fall in the region is low (870.17 mm per annum). All rain waters flows down the hill slopes by way of either direct run off or percolates through strata. There are numerous seasonal water courses along hill slopes, which drain out rain water falling over the area. These water courses have water only during rains or few hours after heavy rain fall.

Since the mine located in hilly area, the ground water table is well below mine working levels. Even when iron ore mining will reach its bottom most level the situation will be same. The ground water table is 500 m, hence there like to be very little on impact on ground water regime due to mining.

b) Indicate maximum and minimum depth of workings.

The maximum RL is 980 m and the minimum RL is 860 m of mine workings during the plan period. The maximum RL is 975 m and the minimum RL is 820 m of mine workings upto the life of mine.

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.

The rain water may get accumulated at lower benches, the water does not percolate within reasonable limit.

There is no ground water will be encountered in the mine pit.

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.



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The Ballari-Hosapete region covers part of the highly folded and metamorphosed Dharwarian formations (Archean) of the Karnataka State. The hill ranges and contained valleys in the region constitute the "Sandur Synclinorium" with aerial trend of NW-SE to NNW-SSE. The drainage pattern of the area is sub-dendritic in nature. Half of the run-off within the buffer zone drains to-wards northeast. The half part of the run-off flow towards SW. The mine drainage is conveniently manageable as rainfall in the region is low (ranges from 443.4 mm to 1420.3 mm). The rainwater run-off is guided by the hill slopes channels. The Mine is located in low rain fall hilly terrain area with average rain fall of about 870.71 mm annually. There are no major nallahs, streams or river in the buffer zone area.

Within the lease area, there are water run-offs only when it is raining. It is proposed to constructed a large number of gully plugs and bunds to arrest the water at the bottom of hills so that suspended solids carried and settled before water flows further down slopes. The quality of water overflowing these gully plugs/bunds is regularly monitored during the rainy season and except for a rare very heavy rainfall,

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 / BHQ and Mineral Reject to be disposed off.

There is no top soil, the overburden mainly consists shale, Ferrogeneous Shale, Siliceous Ore, BHQ & BMQ is generated will be disposed on proposed dump PTD1. Year wise generation of wastes and location of disposal is furnishing below.

Table No 23

Year	PTD 1 (Cu .m) (E 0664450 to E 0664700 N 1663400 to N1663620)
I	48320
II	47894
III	48442
IV	40478
V	48551
Total	233685
	0.233 Million Cu m



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

Out of 60.66 Ha, 48.00 Ha area is covered under ultimate pit limit area, at present there is no area for dumping. Hence it is proposed new purely temporary dumps have been identified within the UPL (Ultimate Pit Limit) is proposed for the temporary dump which can accommodate 0.23 million cu.m of waste material for future dumping. It should be re-handled and back filled into the economically exhausted mine pit during the plan period. Necessary permission shall be obtained from IBM for the same. The details of proposed dump is explained in earlier para.

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.

During the five years plan period the waste generation is 233685 Cu.m (0.233 Million Cu m) will be disposed of on above ground from lower contours towards slopes by retreating method in proposed dump. The proposals dumping of waste shall be done in lifts/ berms each of 10 m height and width about 8 m with overall slope angle 28°, maximum height is 30 m.

Year wise protective measures for dumps are implemented as per the approved R & R.

5.0 USE OF MINERAL AND MINERAL REJECT

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

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

The total ROM ore produced from this mine will be crushed and screened the ore will be dispatched to MSPL Pellet Plant for its captive use. Physical specification of ore is 100% -10 mm, the chemical composition of processed ore at 45% Fe cut-off grade with Wt. Avg. 54.76% Fe for the five years plan period.



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There is no Hematitic siliceous Iron ore +35% Fe upto 45% Fe in the lease area.

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

Not Applicable.

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

Not Applicable.

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

Not Applicable.

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

There is no process to upgrade the ROM at mine site. It will be upgrade in MSPL pellet plant as per the plant requirement. The transportation of ore will be by road from mines to pellet plant. There is a proposal of railway siding at Dharmaprua as per the KMERC. Further Yeshwanthpura siding is also considered for transportation in future

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.

Processing of ROM: Mobile crushing and screening plant (150 TPH) – 2 No.s

ROM comes to the crushing & screening plant through the trucks and gets delivered to grizzly. Oversize of grizzly flows directly to one number jaw crusher. Jaw crusher product passes through one triple deck screen (40 mm, 20 mm, & 10 mm opening), with the lowest deck as 10 mm. -10 mm material from this screen is diverted to product stockpile, whereas the -20 mm+10 mm goes to one number tertiary crusher. +20 mm material goes to one number secondary crusher. The product of



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secondary crusher goes to same triple deck screen and follows path as described above.

Product of tertiary crusher goes to one vibrating screening of 10 mm. -10 mm material reports to the product stockpile, whereas +10 mm material goes back to tertiary crusher. Thus product of 100% -10 mm is produced out of the crushing and screening plant. The product which is coming out from crushers will be loaded to the Tippers / Dumpers and it will be transported and unloaded in to the designated stock piles. The external tippers will utilised for the dispatch of products from stock piles/Crushers. There is no beatification process at mine site.

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.

Mobile crushing & screening for processing of iron ore, the plant flow sheet showing processing indicates feed quantity, grade & material balance are given as **Annexure 10.**

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

There is no tailing or reject from the processing plant.

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

There is no rejects or tailing.

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

No chemicals are used in the processing plant.

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

No chemicals stored on site / plant.



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9) 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.

There is no requirement of water in processing of ROM.

7.0 OTHER

Describe briefly the following:

a) Site Services:

Major site services are proposed at the mine are listed below.
Workshop, Store, First Aid room, Canteen, Mine office, Computer section, etc.

b) Employment Potential:

Table No 24

Highly Skilled	50
Skilled	70
Semi-skilled	55
Un-skilled	20
Contract	-
Highly Skilled	-
Skilled	-
Semi skilled	-
Total	195

Statutory employment w.r.t. MMR, 1961 & MCDR, 2017 are as mentioned below

Table No 25

Mining Engineer	1
Geologist	1
Mines Manager	1
Asst Mines Manager	2
Mine Foreman	
Mine Mate	10
Blasters	2
Engineers & others	5
Total	28

Indirect employment: 500 (Indirect employment will be provided as transportation of ore from mine to pellet plant, loading at railway siding & miscellaneous)

**MSPL LIMITED****MINING PLAN****Narasimha Iron Ore Mine
(ML No 2148)****8.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 23 OF MCDR'2017****8.1 Environment Base line information:**

Based on the recent exploration data, ultimate pit limit, the existing land use pattern indicating the area already degraded due to mining, roads, processing plant, workshop, township etc in a tabular form.

Table No 26

Sl No	Head	Area (Ha)
1	Area under Mining	35.49
2	Waste Dump ID-1 & ID-2	06.34
3	Proposed Temporary Dump (PTD-1)	00.00
4	Backfilling	00.00
5	Roads	00.96
6	Infrastructure	00.08
7	Sub-grade stock	01.48
8	Safety Zone /Green Belt	02.57
9	Unused area	13.74
	Total	60.66

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

Water Regime:

The mine is located in low rain fall hilly terrain area with average rain fall of about 870.71 mm annually. There are no major nallahs, within the ML area. There are no perennial water courses within the lease or surrounding area within 10 km. Within



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the lease area there are water runoffs only when it is raining. The management is proposed to construct as per the approved R & R gully plugs and bunds to arrest the water at the bottom of hills so that suspended solids carried and settled before water flows further down slopes.

The quality of water overflowing these gully plugs/bunds is regularly monitored during the rainy season and except for a rare very heavy rainfall, The material accumulated behind the gully plugs and bunds is cleaned every year before monsoon.

The requirement of water for the mine will be purchased from outside. There is no acid mine drainage. Hydrological study is not required as ground water table is far below.

Quality of Air:

Air quality was monitored at eight locations for four days during March, 2011. Monitoring was done at two days at a time for 16 hours only. MoEF & CC has prescribed 24 hourly monitoring for two days a week, for 13 continuous weeks.

Monitoring has been done for 5 parameters viz., SPM, RPM, SO₂, NO_x and CO. This again is not as per the latest norms prescribed by MoEF & CC in November 2009, for monitoring of 12 parameters. One of the major changes in the new parameters is SPM and RPM are replaced by particulate matter minus 10 micron and particulate matter minus 2 microns. This is in spite of the fact that, a copy of the new National Ambient Air Quality Standard 2009 is attached with the letter of consent issued by the State Pollution Control Board for the period 01.07.2010 to 30.06.2012

It is proposed to monitor ambient air quality stations in buffer zone at four stations in buffer zone villages. Four stations within the core zone in Mining area.

Ambient Noise Level:

Noise level was monitored at hourly intervals for continuous 24 hours at eight locations, 2 in lease area and 6 in surrounding villages viz., Dharmaupura (S1), Daulatpur (S2), Subbarayanahalli (S3), Bhavihalli (S4), Bujangnagar (S5) and Yeshwantnagar (S6) during the summer of 2011. The observations are given in table.



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Table 27

Noise level data

Time (hrs)	Station code					
	S1	S2	S3	S4	S5	S6
00.00	42.9	42.0	44.9	43.1	44.8	44.2
01.00	42.1	42.9	43.8	44.3	45.1	44.9
02.00	43.8	44.9	45.4	44.8	45.9	44.5
03.00	44.3	43.8	43.9	44.1	45.3	45.8
04.00	43.2	44.9	41.8	42.5	44.2	44.8
05.00	46.9	46.2	43.8	45.2	44.8	43.3
06.00	46.0	46.9	45.3	47.2	50.1	56.1
07.00	58.3	51.1	53.4	50.8	54.4	61.9
08.00	59.5	49.3	57.9	52.1	56.2	63.0
09.00	61.8	52.1	60.6	54.0	58.4	66.3
10.00	62.1	54.0	62.1	57.1	60.6	67.2
11.00	60.4	52.9	63.4	58.8	63.1	68.1
12.00	58.2	52.4	63.7	54.0	61.4	63.3
13.00	58.9	56.0	62.1	53.1	62.4	64.6
14.00	57.1	58.8	61.4	52.4	58.3	64.8
15.00	60.8	58.0	58.1	53.9	54.8	62.1
16.00	61.9	52.1	63.2	51.4	57.4	60.4
17.00	60.6	53.4	65.1	53.9	60.3	62.2
18.00	57.3	52.1	60.4	55.1	53.1	62.9
19.00	59.5	50.4	61.8	47.2	49.2	62.0
20.00	57.1	46.0	54.1	50.1	46.0	55.1
21.00	50.4	46.6	48.4	48.2	43.8	51.0
22.00	45.9	45.1	49.3	46.4	47.1	47.3
23.00	44.1	45.8	47.8	46.0	45.8	45.8
L min	42.1	42.0	41.8	42.5	43.8	43.3
L max	62.1	58.8	65.1	58.8	63.1	68.1
Day Equivalent (Ld)	59.3	53.5	61.0	53.6	58.3	63.6
Night Equivalent (Ln)	44.2	44.6	44.8	44.4	45.2	44.8



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All the day time observations are from 7.00 am to 10 pm are below 75 d(B) A, as per the standards prescribed by Noise (Control and Regulation) Rules, 2000. The night time observations in the mine area were generally above 60 d(B) A, but lesser than 75 d(B) A. In six rural areas, day time noise levels were generally below 60 d(B) A, except at Yeshwantnagar village and Subbarayanahalli village. The night time observations were usually below 45 d(B) A, from midnight to 06.00 hrs. However, the noise levels were higher than 45 d(B) A at most of the villages between 21.00 hrs to 24.00 hrs. Obviously there was traffic for ore transportation up to 12.00 midnight at these villages.

It is proposed to monitor noise quality stations in buffer zone at four stations in buffer zone villages. Four stations within the core zone in Mining area.

Flora: Natural vegetation

The vegetation occurring in the area belongs to Southern tropical dry deciduous forests according to Champion and Seth Classification of forest types of India (1968). The area falls under the mixed deciduous sub classification. According to the classification made by Legris and Pascal (1982) the area falls under deciduous climax forests. According to this classification this type of forests does not have the potentiality of secondary moist deciduous forests. The canopy is open and the majority of the trees shed their leaves to remain with bare branches during the dry months. The flowering and fruiting are generally far advanced before the first flush of new leaves appears with the showers in April - May.

The vegetation in and around the mine lease area is fairly dense. Some of the tree species found growing are: *Acacia chundra*, *Anogeissus latifolia*, *Bridella retusa*, *Buchanania lanzan*, *Cassia fistula*, *Cordia dichotoma* and *Mallotus philippensis*. The shrubs occurring are: *Calotropis gigantea*, *Cipadessa baccifera*, *Dodonaea viscosa*, *Helicteres isora*, *Phyllanthus reticulatus* and *Securinega virosa*. Some of the frequently found climbers are *Cocculus hirsutus* and *Celastrus paniculata*. Herbaceous species like *Aerva lanata*, *Ageratum conyzoides*, *Leucas aspera*, *Orthosiphon glabratus* and *Tephrosia purpurea* are also growing in this area. *Arthraxon hispidus*, *Chrysopogon fulvus*, *Cymbopogon flexuosus*, *C. martini* and *Opismenus compositus* are the commonly occurring grass species. Common weeds like *Parthenium hysterophorus*, *Lantana camara* and *Chromolaena odorata*, which are invasive in nature are also found in the mine lease area. *Dendrophthoe falcata*, *Taxillus tomentosus* and few other species of Loranthaceae grow as parasites on tree branches, while *Striga asiatica* occur as root parasite associated with grasses.

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Species are planted by the lessee include *Acacia mangium*, *Agave americana*, *Azadirachta indica*, *Cassia siamea*, *Eucalyptus sp.*, *Delonix regia*, *Leucaena leucocephala*, *Pongamia pinnata*, *Tecoma stans* and *Tectona grandis*.

Climate:

Ballari district is a part of the northern maiden region with an extensive undulating plateau. The district is also known for hot summer and very dry weather for a major part of the year, and the temperature varies between 22°C and 43°C. The climate of the area is tropical with hot and warm weather prevailing most of the year. The predominant wind direction is from South West to North East. The relative humidity of the region varies from 38% to 95%.

Rainfall:

Generally the monsoon starts in mid June and continues till September. The area enjoys an average annual rainfall of about 870.71 mm. During the 10 years period from 2001 to 2010, the highest rainfall of 1420.3 mm was recorded in the year 2001. The lowest rainfall of 443.4 mm was registered in the year 2003. September month had the highest average rainfall of 199.82 mm, while December month the lowest average rainfall of 1.89 mm.

Table 28 : Monthly Rainfall data (in mm) of Sandur Taluk during 2001 - 2010

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2001	0	0	0	144	87.4	102.4	115.4	269.6	406.2	278	14.8	2.50	1420.3
2002	0	52.5	0	1.7	137	73.3	138.7	82.1	117.2	127	3.4	0	733.3
2003	0	0	0	16.6	0	59.7	24.3	109	68	158	7.8	0	443.4
2004	0	0	0	22.4	33.2	132	135.6	69.2	168.2	68.8	5.4	0	634.8
2005	23	1	1	43.4	83.2	70	302.1	163	119.8	146.2	15.6	0	968.3
2006	0	0	17	38.8	200.4	48.3	56.4	52.6	170.2	36	49	0	668.7
2007	0	0	52	37	38	130.8	12.6	52.8	301.5	0	6	0	583.9
2008	0	1.8	158.6	19.6	52.6	87.1	39.8	134.4	315.2	95	105.6	0	1009.7
2009	0	0	0	42.4	80.5	49.6	62.7	160.6	204.7	328.8	107.6	16.4	1053.3
2010	0	0	0	61.2	110.8	90.2	104.4	316.8	127.2	156	224.8	0	1191.4
Total	23	55.3	181.8	427.1	823.1	843.8	992	1410.1	1998.2	1393.8	540	18.9	870.71
Avg	2.3	5.53	18.18	42.71	82.31	84.38	99.2	141.01	199.82	139.38	54	1.89	870.71
%	0.26	0.64	2.00	4.91	9.45	9.69	11.39	16.19	22.94	16.01	6.20	0.22	100.00



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Temperature:

The summers are usually hot and dry in the Sandur/Hosapete area. The highest recorded temperature during the year is usually above 40° C in April and May. The winters are usually mild with temperature usually above 13° C during the months of December, January and February. The lowest temperature recorded was 12° C during 1991, 1996 and 2002. The April and May are hottest months when maximum temperatures are usually above 40° C while December, January & February maximum temperatures rarely exceeds 35° C and minimum temperature are usually below 17° C.

Relative Humidity:

The relative humidity in the area varies from season to season. The maximum humidity is above 70% throughout the year. The minimum humidity varies considerably over a wide range of 20% to 70%. The months of January to April and December every year, the minimum relative humidity recorded is usually between 20% to 30%.

Wind Direction and Wind Velocity:

Wind velocities are usually below 5 km per hour except during pre-monsoon and early monsoon months. During the latter months wind velocities as high as 20 km per hour have been recorded. Wind direction except during pre-monsoon and monsoon months is from NW-NWW. During the pre-monsoon and monsoon months wind direction is usually from SW - SSW.

Human settlements:

There are 11 census villages in the buffer zone. There is no village in the core zone or lease area. The nearest village is Dharmapur located in north. The population of these villages according to 2001 census. Sandur is the large village with population of 34168 and Somlapur village with a population of 300 is the smallest village.

The demographic profile of the villages coming under the buffer zone of this mine lease is given the names, distances, direction and population of villages present in the buffer zone is as follows:

**MSPL LIMITED****MINING PLAN****Narasimha Iron Ore Mine
(ML No 2148)**

Table 29

VILLAGE POPULATION DATA				
Sl No	Name of Village	Distance (Km)	Direction	Population
1	Ankammanahal	6.20	S	1603
2	Bhujanganagar	6.40	NE	4672
3	Daulatpur	6.40	N	2178
4	Krishna Nagar	6.30	NE	4160
5	Nandihalil	5.00	SE	1137
6	Narsapura	7.10	E	897
7	Dharmapura	2.70	NE	1733
8	Sandur	5.0	NE	34168
9	Somlapur	4.3	W	300
10	Susheelanagar	9.50	N	3833
11	Yeshwanthnagar	3.20	SW	5157

Public buildings, places of worship and monuments:

The world famous Hampi ruins which is a World Heritage Site lies within 32 km of mining lease. However, the major Tungabhadra Dam lies within 31 kilometers of the lease.

There are a number of old temples in Sandur - Hosapete Town as well as in a few large villages, Sri. Kumaraswamy Temple, an ancient archeological monument protected by Ancient Monuments and Archeological sites and remains Act, 1958 under custody of the Archeological Survey of India is located at about 6 Kms aerial distance from the mine boundary. But none of them is declared as a monument

Indicate any sanctuary is located in the vicinity of leasehold

There is no sanctuary is located in the lease area.

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

i. Environmental impacts of mining have been well-documented and voluminous literature exists on this topic. The impacts of mining arises because of various operations carried out during the process of mining such as digging the ground, top



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soil removal etc. The impacts on some of the important components of the environment are summarized below:

The mine lease area exists in forest land. The forest areas adjoining the mine have good natural vegetation with many characteristic dry deciduous species. The landscape of this terrain has been modified to some extent due to mining activities. The disposal of waste materials has been carried out in the mine lease area in an unscientific manner, without proper backfilling of the excavated pits, resulting in erosion of the waste materials. The mining has also affected the catchment areas of natural streams/nalas, which are seasonal. Erosion from the mine lease area resulted in loading of sediments (including chemical pollutants) to nearby water bodies like 'Ulikunda Kere' and Narihalla reservoir especially during rainy season.

Since the entire mining area is located in the forest land, the direct impact on the ecology and biodiversity is inevitable. The ecology of the mine area has been much disturbed due to mining and transportation activities. Therefore, preservation of biodiversity of the surrounding areas, reclamation of the mined out area and proper afforestation using native species are to be taken up to restore the ecology.

The environmental monitoring stations are proposed to monitor regularly for Air, Water & Noise as per the approved R & R Plan. The locations area shown in Environment Plan. **Refer Plate No IX.**

ii. Air quality

The atmospheric pollutants are hazardous to all the living organisms in the biosphere. The dust produced during mechanised opencast mining and allied activities is high and it can affect not only the human beings, but also the plants and animals around the ML area. Therefore strict mitigation measures are absolutely essential to ensure unpolluted, clean environment and maintain sustainability of the ecosystem.

The impact on ambient air quality due to mining operations is well within the prescribed limit. As per air quality monitoring carried out at stipulated as KSPCB.

It is proposed to monitor ambient air quality stations in buffer zone at four stations in buffer zone villages. Four stations within the core zone in Mining area.

iii. Water quality

Since opencast mining is carried out in the lease area with generation of huge quantity of waste materials, adverse impacts on water quality are sure to arise, if



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proper measures are not implemented. The following adverse impacts are envisaged in respect of surface water quality:-

1. Soil erosion.
2. Run-off from the working and roads.

The *nalas* from the mine lease finally reach tanks like 'Ulikunda Kere' and Narihalla reservoir, which are situated near to the ML area. Therefore, proper surface water management measures have to be undertaken by the lessee as the natural streams arising from the ML area will carry lot of silt and sediments down to the dam, during rainy season. Since the mine area is located in hilly slope, the chances of leaching of the chemicals to the ground water level are remote.

It is proposed to monitor water quality stations in buffer zone at four stations in buffer zone villages. Four stations within the core zone in Mining area.

iv. Noise levels

It is proposed to monitor noise level quality stations in buffer zone at four stations in buffer zone villages. Four stations within the core zone in Mining area.

v. Vibration levels (due to blasting)

There is no public or private building within 1 km sites of blasting. Hence there is no danger from blasting vibration causing any drainage.

vi. Water regime: Ground water table in the area is around 500 m RL.

vii. Acid mine drainage: There is no acid mine drainage.

viii. Surface subsidence : Not applicable

ix. Socio-economics

As the basic facilities in the villages surrounding the mine area are meager, there is much scope for improving the educational facilities, health care, supply of safe drinking water and enhancing the status of women, by empowering them with education, employment and income generation, so as to bring up their status in the society.



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MSPL group already adopted 18 villages in Hosapete, Sandur and Koppal taluks. The followings are provided in several villages

- 1) A total 11 RO system established in several villages to provide pure drinking water.
 - 2) A total 2200 toilets has been constructed in certain villages.
 - 3) A total of 1286 Self Help Groups for women's provided.
 - 4) Computer training classes conducted and issued instruments in several villages.
 - 5) A total 2160 women for tailoring training, issued 74 sewing machines, provided financial support through SHGS to 1286 women for business, facilitated for 1305 LPG connections in rural households, and financed 159 people for animal husbandry.
 - 6) Conducting regular Yoga camps.
- i. Historical monuments etc.

There are no historical monuments in lease area or within 10 Km thereof. Except Sri. Kumaraswamy Temple, an ancient archeological monument protected by Ancient Monuments is located at about 6 Kms aerial distance from the mine boundary.

8.3 Progressive reclamation Plan:

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

8.3.1. Mined-Out Land:

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

There is a proposal in approved R&R afforestation in safety zone area, Construction of toe-wall & garland drains for proposed temporary dumps and also engineering measures are given outside the lease area as per the CEC sketch.



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The mined out area for conceptual period there are ponds were created in working Pit-1 having mRL of 840 & at 860 mRL. There is no heavy rains in this sector, only in the rainy season rain water will accumulate in this two pits mRL of 860 & at 880 mRL respectively. The fencing has been provided for these two benches to avoid cattle entry. The other working benches are planted with trees.

The implementation of reclamation/ rehabilitation proposals are shown **Plate No X.**

8.3.2. Topsoil Management:

There is no generation of topsoil, as mining was proposed within the existing pit.

8.3.3. Tailing 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 tailing 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.

There is no pyrite in the ore. So there is no chances of acid mine drainage.

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

There is no back filling during the first five year plan period. The area will be reclaimed by afforestation after the life the mine.

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



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Table No 30

SUMMARY OF YEARWISE PROPOSAL FOR ITEM NO. 8.3

Items	Details	Proposed				
		I	II	III	IV	V
Dump Management	Area Afforested (Ha)	-	-	-	-	-
	No. of Saplings Planted	-	-	-	-	-
	Cumulative no of plants	-	-	-	-	-
	Cost including watch and care during the year (lacs)	-	-	-	-	-
Management of worked out benches	Area available for rehabilitation (Ha)	-	-	-	-	-
	Afforestation done (Ha)	-	-	-	-	-
	No. of saplings planted in the year	-	-	-	-	-
	Cumulative no. of plants	-	-	-	-	-
	Any other method of rehabilitation (specify)	-	-	-	-	-
	Cost including watch and care during the year (lacs)	-	-	-	-	-
Reclamation and Rehabilitation by back filling	Void available for Back filling (L x B x D) pit wise/ stops wise	-	-	-	-	-
	Void filled by waste/tailing	-	-	-	-	-
	Afforestation on the back filled area	-	-	-	-	-
	Rehabilitation by marking water reservoir	-	-	-	-	-
	Any other means (specify)	-	-	-	-	-
Rehabilitation of waste land within lease (Green belt)	Area available (Ha)	1.285	1.285	-	-	-
	Area rehabilitated	-	-	-	-	-
	Method of rehabilitation	Afforestation	Afforestation	-	-	-
Others (specify)	Toe - wall (PTD dumps)	243	136	136	136	136
	Gar land drain (PTD dumps)	111	111	111	111	111



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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 Manager of the mine will be responsible person in case of disaster. He has a mobile phone and these numbers are displayed at the mines. Name and contact no of the person to be contacted in case of emergency is given below.

Table No 31

Name	Contact No	Nearest Hospital	Nearest Police station
P. Nagaraj	7760581122	Sandur - 8 Km	Sandur - 8 Km

In an opencast mine risk to general public (work safety is taken care of by the Mines Act, 1952 and Regulations and Rules etc. framed there under), from the following.

- Failure of external overburden dumps
- Failure of mine bench slopes.
- Fly rocks from blasting operations.
- Chemical spills.
- Fire in bulk fuel storage.
- Plying of trucks etc. on public roads
- Failure of water impounded at higher elevations.

At Narasimha Iron ore mine there is no risk to public on account of the factors listed above, as entry of unauthorized personnel (vehicles) in to the mining and industrial areas is restricted. There is no question of any one inadvertently approaching the area, as it is located on hill top and slopes, which do not have any pathways used by villagers. An assessment of the risk at Narasimha Iron Ore Mine due to each of the above factors aforesaid is given below.

i) In general, failure of external overburden dump is possible, if there are heavy rains and dumps are not stabilized. The rain fall in the area is very meager and this



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has not affected any of the dumps so far. The major portion of dumps will be biologically reclaimed before mining operations over.

ii) The ore and surrounding strata is quite compact and hard. Hence benches are very stable.

iii) The blasting is so designed that there are no fly rocks in normal situation. However, since there are no villages or bastis nearby, there is no risk from accidental fly rocks.

iv) No chemicals are used in iron ore mining operations or beneficiation process. Hence, there is no risk involved due to chemical spills.

v) Only 10-12 toners dumpers ply on public roads, which are essentially public roads, to carry ore to siding for dispatch. There is no traffic on these roads except that of the Narasimha iron ore mine and other surrounding mines. Thus, there is no danger from this to public life and property.

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.

This is an auctioned block ML area, the following protective measures would be taken to deal with the unforeseen circumstances which may be created due to temporary closure of the mine.

i) All heavy earth moving mining machinery deployed in various blocks of Narasimha Iron ore mine will be withdrawn and brought to the safe place so that these do not get buried due to bench collapse, if any, and get damaged during discontinuance. These will be subjected to preventive maintenance.

ii) The entries to the pits in various blocks will be fenced off with display of notice boards at the fence prohibiting entry into the pits by unauthorized persons.

iii) Pit boundaries would be fenced and high berms will be provided to prevent cattle's entering the pit.



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- iv) At the entrance and strategic points in the mine areas, sentries and watchman would be deployed to guard the sensitive/important mine area, explosive magazine and other sensitive stores and services. They would be provided with mobile phones/walk-talkies to contact mine authorities/police/fire station etc., for help during emergency.
- v) The mine area would be kept well illuminated during night time.
- vi) Audible warning sirens would be established at strategic points to be used during emergency so that prompt help can be received from proper sources and protective measures are immediately taken by all personnel available.
- vii) Managerial, supervisory and competent persons of the mine would be engaged else where in other mines of the company as per the needs.

8.6 Financial Assurance:

The financial assurance can be submitted in any en-cashable form preferably a Bank Guarantee from a Scheduled Bank as stated in Rule 27(1) of Mineral Conservation and Development Rules, 2017 for five years period expiring at the end of validity of the document. The amount calculated for the purpose of Financial Assurance is based on the CCOM's Circular no.4 dated 2006 as below. The financial assurance plan is enclosed as **Plate No XI**.

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Table indicating the break-up of areas in the Mining Lease for calculation of Financial Assurance

Annexure to Circular No. 4/ 2006

Table 32

SL.No	Head	Area put on use at start of plan (In Ha)	Additional requirement during plan period (In Ha)	Total (In Ha)	Area Considered as fully reclaimed & rehabilitated (In Ha)	Net area considered for calculation (In Ha)
		A	B	C=(A+B)	D	E=(C-D)
1	Area under mining	35.490	5.160	40.650	0.000	40.650
2	Storage for top soil	0.000	0.000	0.000	0.000	0.000
3	Waste Dump Site					
	(i) In active dump (ID-1 & ID-2)	6.340	0.000	4.270	0.000	4.270
	(ii) Proposed Temporary Dump (PTD-1)	0.000	2.400	2.400	0.000	2.400
4	Mineral storage	1.480	0.000	0.000	0.000	0.000
5	Infrastructure (Workshop, administrative buildings etc.)	0.080	1.420	1.500	0.000	1.500
6	Roads	0.960	0.000	0.000	0.000	0.000
7	Railways	0.000	0.000	0.000	0.000	0.000
8	Tailing pond	0.000	0.000	0.000	0.000	0.000
9	Effluent Treatment Plant	0.000	0.000	0.000	0.000	0.000
10	Mineral Separation Plant	0.000	0.000	0.000	0.000	0.000
11	Township area	0.000	0.000	0.000	0.000	0.000
12	Others (to specify)					
	(i) 7.5 m to be left along the ML boundary	2.570	0.000	2.570	0.000	2.570
	(ii) Unused area	13.740	0.000	9.270	9.270	0.000
GRAND TOTAL		60.660		60.660	9.270	51.390



CONSENT LETTER / UNDERTAKING / CERTIFICATE FROM THE APPLICANT

01. The Mining Plan in respect of Narasimha Iron Ore Mine (ML No 2148) over an area of 60.66 Ha (As per CEC survey) in Kumaraswamy Reserved Forest, Dharmapura village, P.O Sandur, Sandur taluk, District Ballari, State Karnataka, under rule 16(1) of MCR 2016 has been prepared by S.Shivakumar M.Sc. Geology.

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

Sri. S. Shivakumar
AGM (Exploration)
M.Sc. Geology
M/s MSPL Limited,
Baldota Enclave
Abheraj Baldota Road
Hosapete - 583 203
Phone: 09900256783
E-mail: shivakumar.s@mspllimited.com

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

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

03. It is certified that the Progressive Mine Closure plan of Narasimha Iron Ore Mine (ML No 2148) by Preferred Bidder M/s. MSPL Limited over an area of 60.66 ha complies with all statutory rules, Regulations, Orders Made by the Central or State Government, Statutory organisations, Court etc which have been taken in to 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 Mining Plan over an area of 60.66 ha (As per CEC survey) in Ballari district in Karnataka State belonging to **Narasimha Iron Ore Mine (ML No 2148)**, where specific permissions are required, the applicant will approach the **D.G.M.S.** Further, standards prescribed by **D.G.M.S** in respect of **miners' health** will be strictly implemented".

05. We hereby undertake that the **Reclamation and Rehabilitation** measures will be implemented on a time bound manner as per the approved Reclamation and Rehabilitation plan by CEC of Narasimha Iron Ore Mine (ML No 2148) by Preferred Bidder M/s MSPL Limited for an area of 60.66 ha in Kumaraswamy Reserved Forest, Dharmapura village, P.O Sandur, Sandur taluk, District Ballari, State Karnataka,

PLACE : HOSAPETE
DATE : 20-09-2019



Dr. Meda Venkataiah
Whole Time Director



CERTIFICATE FROM QUALIFIED PERSON

The provisions of the **Mineral Conservations and Development Rules 2017** have been observed in the preparation Mining Plan for **Narasimha Iron Ore Mine** (ML No 2148) over an area of 60.66 ha (As per CEC survey) by Preferred Bidder M/s. MSPL Limited in Kumaraswamy Reserved Forest, Dharmapura village, P.O Sandur, Sandur taluk, District Ballari, State Karnataka and whenever specific permissions are required, the applicant will approach the concerned authorities of **Indian Bureau of Mines**.

All Plan & Section are prepared based on Lease sketch as provided by the CEC/ Government of Karnataka

The information furnished in the above Mining Plan including progressive mine closure plan is true and correct to the best of our knowledge.

S. Shivakumar

S. SHIVAKUMAR
M.Sc. Geology

PLACE: HOSAPETE
DATE: 20-09-2019



MINING PLAN
(Including Progressive Mine Closure Plan)
Narasimha Iron Ore Mine
By Preferred Bidder M/s. MSPL LIMITED
ML No 2148

(erstwhile swamymalai Iron Ore Mine of M/s. H.G.Rangan Goud)
Submitted under Rule 16(1) of MCR 2016



Volume -2: Annexures

ML Area: 60.66 Ha
LOI: No: DMG/MLS/AUC/'C'-2148/2018-19/2990
Dated 06 OCT 2018
Opencast, Category 'A' Fully Mechanized
Proposed for 'Captive Mine'

Total area: 60.66 Ha
Validity: 50 Years w.e.f Lease execution date
Forest Area: 60.66 Ha
Name of the Forest: Kumaraswamy Reserved Forest
Reg No: IBM / 199 / 2011

Prepared By

S.Shivakumar
M.Sc.Geology

Qualified Person
September 2019



LIST OF ANNEXURES

Sl.No.	Subject	Annexure No.	No. of Pages
1	Letter of Intent (LOI) Issued by Government of Karnataka, No. DMG/MLS/AUC/'C'-2148/2018-19/2990 dated : 06.10.2018	1	5
2	CEC Letter, F.No.2-61/CEC/SC/2017 -Pt.III dated 21.08.2019 Monitoring Committee letter dated 03.09.2019.	2	3
3	Resolution passed by the Committee of Directors, Photo Identity card of lessee with permanent address proof, Certificate of Registration of the company, List of members of board of Directors.	3	7
4	Qualification and Professional experience certificate of the Qualified Person	4	4
5	Copy of bore hole logs drilled by MECL & Estimation of Reserves / Resources.	5	202
6	Feasibility Report	6	12
7	Estimation of Ore and Waste calculations	7	2
8	Year wise Development & Production	8 (A) to (E)	5
9	Proposed Reclamation & Rehabilitation measures	9 (a) to (f)	6
10	Processing plant flow chart (Mobile Crushing & Screening Plant)	10	1
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GOVERNMENT OF KARNATAKA



ANNEXURE - 1

No:DMG/MLS/AUC/C-2148/2018-19

Office of the Director
Department of Mines and Geology,
Khanija Bhavan, Race Course Road
Bangalore-1, Date: 06.10.2018
Email id: dir-mines@karnataka.gov.in

To:
MSPL Limited
Baldota bhavan, 117,
Maharshi Karve Road,
Mumbai - 400 020.

Sub: Letter of Intent with reference to e-auction dated 06.09.2018 for grant of iron ore mining lease for "Sri H G Rangangouda, ML No: 2148" Block in Dharmapura village, Sandur Taluka, Ballari District over an extent of 60.66 Hectare Area of Forest land.

1. Background:

1.1. The Director, Department of Mines and Geology, Karnataka, pursuant to the Supreme Court judgments and orders in Samaj Parivartana Samudaya and Ors. Vs. State of Karnataka and Ors. in W.P.(C) 562 of 2009 (the "**Judgment**"), the Mines and Minerals (Development and Regulation) Act, 1957 and its amendments (the "**Act**") and the Mineral (Auction) Rules, 2015 including its amendments (the "**Rules**"), issued the notification and notice inviting tender dated 30 January 2018 for grant of mining lease for "Sri H G Rangangouda, ML No: 2148" located in Dharmapura village, Sandur Taluka, Ballari District of Karnataka (the "**Tender Document**"). The e-auction process was conducted in accordance with the Mineral (Auction) Rules, 2015 (including its amendments) and the Tender Document for the said mineral block and "MSPL Limited" was declared as the "**Preferred Bidder**" in accordance with Rule 9(9)(iii) of the Mineral (Auction) Rules, 2015 including its amendments.


6/10/18



The upfront payment for "Sri H G Rangangouda, ML No: 2148" Block is Rs. 66,87,17,49/- (Rupees Sixty Six Crore Eighty Seven Lakhs Seventeen Thousand Four Hundred and Eighty Seven Only). As required under Rule 10(1) of the Mineral (Auction) Rules, 2015, **MSPL Limited** has deposited the first instalment of the upfront payment, being ten percent of the upfront payment, of Rs. 6,68,71,749/- through Demand Draft (DD) bearing No. 986160 dated: 20.09.2018 which was received on 24.09.2018.

1.3. With reference to letter No. DMG/MLS/CCA/12/2016-17 dated 23.08.2018 issued by DMG during the bid evaluation stage and thereupon the declaration submitted, **MSPL Limited** has submitted the revised bid security on 24.09.2018 for maintaining bid validity as 510 days from the Bid Due Date (i.e. 20th August 2018).

2. Grant of Letter of Intent

2.1. Accordingly, pursuant to Rule 10(2) of the Mineral (Auction) Rules, 2015 including its amendments, the Government of Karnataka is issuing this letter of intent for grant of mining lease for "Sri H G Rangangouda, ML No: 2148" Block in Dharmapura village, Sandur Taluka, Ballari District over an extent of 60.66 Hectare Area of Forest land to **MSPL Limited**.

3. Conditions

- 3.1. This letter of intent and the subsequent grant of aforementioned mining lease shall be subject to the provisions of the Judgment, Act and the rules made thereunder, as amended from time to time.
- 3.2. **MSPL Limited** shall be declared as the "Successful Bidder" and subsequently be granted the mining lease only upon satisfactory completion of all requirements under the Judgment, Act, rules made thereunder and the Tender Document.


6/10/18

3.3. For reference, the current requirements under the Rules and the Tender Document for declaration of **MSPL Limited** as the **"Successful Bidder"** and subsequent grant of the mining lease are reiterated below. It is clarified that the requirements mentioned below are only for reference and in the event of any change in Applicable Law, the requirements under the modified law, shall be applicable.

(a) Declaration of the **"Successful Bidder"**:

MSPL Limited shall be considered to be the **"Successful Bidder"** upon:

- i. continuing to be in compliance with all the terms and conditions of eligibility;
- ii. payment of the second instalment of the Upfront Payment which is **Rs 6,68,71,749/- (Rupees Six Crore Sixty Eight Lakhs Seventy One Thousand Seven Hundred and Forty Nine Only)**, as per the Tender Document;
- iii. furnishing the **Performance Security** pursuant to the Auction Rules, valid for the period specified in the Tender Document and Mine Development and Production Agreement (MDPA), for an amount equal to **Rs. 66,87,17,487/- (Rupees Sixty Six Crore Eighty Seven Lakhs Seventeen Thousand Four Hundred and Eighty Seven Only)**. Pursuant to sub-rule (1) of Rule 12 of the Auction Rules, the Performance Security shall be adjusted every five years so that it continues to correspond to 0.50% of the reassessed value of estimated resources including the value of any newly discovered mineral that may be included in the mining lease deed on its discovery determined in accordance with the Auction Rules. In such case, bank guarantee constituting the Performance Security shall be substituted with another bank guarantee of the same value issued in accordance with Clause 10.2 of the Tender Document, which is for the revised amount or if the Performance Security has been provided through a security deposit, additional amount towards security deposit shall be provided;
- iv. satisfying the conditions specified in clause (b) of sub-section (2) of section 5 of the Act with respect to a mining plan;

- v. having cleared all dues to the Government of Karnataka arising from mining activity that the Preferred Bidder has undertaken in Karnataka in the past, if such dues have been determined to be payable by him in terms of the extant provisions of the MMDR Act, 1957 and the rules framed there under, along with an undertaking that he shall also clear all dues that the Government of Karnataka determines in future, payable by him in terms of the extant provisions of the MMDR Act, 1957 and the rules framed there under, to the Government of Karnataka arising from mining activity undertaken by him in Karnataka in the past, if such dues have not been determined; and
- vi. having paid the actual expenses incurred by the Government of Karnataka on mine exploration, preparation of Provisional R&R Plans, survey, construction of pillars and DGPS survey within 60 days of issue of letter of intent. This amount is equal to Rs 8,04,62,037/- (Rupees **Eight Crore Four Lakhs Sixty Two Thousand Thirty Seven Only**).

The above activities shall be completed by the Preferred Bidder in accordance with the timelines mentioned in the Tender Document.

(b) **Signing of the Mine Development and Production Agreement (MDPA)**

MSPL Limited shall sign the Mine Development and Production Agreement with the Government of Karnataka upon obtaining all consents, approvals, permits, no-objections and the like as may be required under Applicable Laws for commencement of mining operations.

(c) **Grant of mining lease**

Subsequent to execution of the MDPA, **MSPL Limited** shall pay the **third instalment** of the Upfront Payment which is **Rs. 53,49,73,989/- (Rupees Fifty Three Crore Forty Nine Lakhs Seventy Three Thousand Nine Hundred and Eighty Nine Only)**. Upon such payment, the Government of Karnataka shall issue a grant order and thereafter within a period of 30 days a mining lease shall be executed in favour of **MSPL Limited** as per Rule 10(6) of The Mineral (Auction) Rules, 2015. The date of the commencement of the period for which a mining lease is granted shall be the date on which a duly executed mining lease is registered.

4. Validity

- 4.1. This letter of intent is valid for a period of **30 months** from the date of its issuance, within which time all the above conditions must be fulfilled and the Mining Lease Deed must be executed between **MSPL Limited** and the Government of Karnataka. In case **MSPL Limited** is unable to fulfil all or any of the above conditions, then it may submit an application to Government of Karnataka, requesting for further extension. It is in the sole discretion of the Government of Karnataka to extend the validity of this letter of intent after **MSPL Limited** submits the reasons/justification for non-compliance with any of the conditions; which shall be due to events beyond the control of **MSPL Limited**.
- 4.2. If the Government of Karnataka is satisfied that a longer period is required to enable **MSPL Limited** to satisfy all or any of the above conditions, it may extend the validity of this letter of intent for such period or periods as the Government of Karnataka may specify.
- 4.3. It is amply clarified that **MSPL Limited** is obligated to make Annual Payments as per the provisions of the Tender Document.

Kindly return the duplicate copy of this Letter of Intent duly signed by authorized signatory of the Company and furnish a suitable Board Resolution in token of having accepted the above terms and conditions. The accepted copy of Letter of Intent along with Board resolution should be submitted latest by 22.10.2018.


DIRECTOR

Department of Mines & Geology

6/10/2018



CENTRAL EMPOWERED COMMITTEE
Constituted by the Hon'ble SUPREME COURT OF INDIA

F.No. 2-61/CEC/SC/2017-Pt.III

Dated : 21st August 2019

To

The Chief Secretary
Government of Karnataka
Vidhan Soudha,
Bengaluru- 560001

Sub : Preparation and implementation of the Reclamation and Rehabilitation Plan of the mining lease falling in District Bellary, Karnataka

Sir

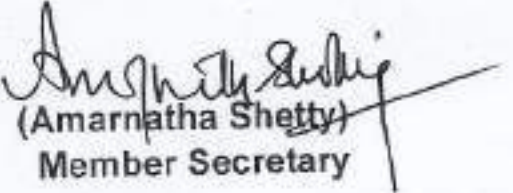
The CEC hereby gives its concurrence to the Reclamation and Rehabilitation Plan of the following mining leases, prepared by the ICFRE with the permissible annual production of iron ore shown against their names :

S.No.	Name of the Mining Lease	ML No.	Permissible annual production of Iron Ore Mine
1.	M/s. MSPL Ltd. erstwhile M/s. H.G. Rangan Goud	2148	0.77 MMT
2.	M/s. MSPL Ltd. erstwhile Kanhiyalal Dudheria	2563	0.23 MMT

It is requested that immediate action may please be taken for the implementation of these Reclamation and Rehabilitation Plans.

It may please be ensured that the mining activities are permitted to be undertaken only after compliance of the Hon'ble Supreme Court orders and in accordance with the stipulated conditions.

Yours faithfully


(Amarnatha Shetty)
Member Secretary

Copy to:

- i) Addl. Chief Secretary (Forest), Government of Karnataka, Bangalore.
- ii) Secretary (Mines), Government of Karnataka, Bangalore.
- iii) Principal Chief Conservator of Forests, Karnataka Forest Department, Bangalore.
- iv) Director, Mines and Geology, Government of Karnataka. It is requested that a copy of the approved R & R Plan may please be provided to the concerned lessee and the IBM.
- v) All Members and Additional Members of the Monitoring Committee with the request to undertake immediate follow up action for the implementation of the R & R Plan.
- vi) Director General, Indian Council for Forestry and Education, Dehradun.
- vii) Controller of Mines (SZ), Indian Bureau of Mines, Bangalore.
- viii) Secretary General, Federation of Indian Mines Industries.

MONITORING COMMITTEE

No MC/R&R/CCA/2148/2019-20/120

Khanija Bhavan, Race Course Road,
Bangalore-5, date: 31.08.2019.

3092

NOTICE

3 SEP 2019

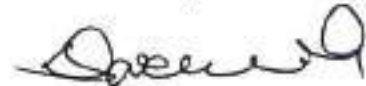
Subj: Concurrence of CEC on final Rehabilitation & Reclamation Plan-
intimation reg.

- Ref: 1: Letter of CEC No.2-61/CEC/SC/2017-Pt.III, dated 21st August 2019.
2: LOI issued to the Preferred Bidder dated 06.10.2018.
3: Letter of Director, DMG dated 30.08.2019.

The ICFRE has submitted the final Rehabilitation & Reclamation Plan of Swamimalai Iron ore Mine of erstwhile lessee M/s H.G.Rangangoud now auctioned to M/s MSPL and the same has been approved by the Central Empowered Committee vide letter cited above in the reference 1 recommending the annual production of iron ore as below;

Name of the Mining Lease	ML No.	Permissible annual production of iron ore mine
M/s MSPL Ltd. Erstwhile M/s H.G.Rangan Goud.	2148	0.77 MMT

The Monitoring Committee has also been informed by the Director, Department of Mines and Geology vide reference 2 above that the you have been declared as Preferred Bidder for the said mine by submitting the highest bid in the auction conducted by the Government of Karnataka. Accordingly, Letter of Intent has also been issued to you on 06.10.2018. As per the orders of the Hon'ble Supreme Court, the R&R Plan proposed by ICFRE and approved by the CEC shall have to be implemented before starting of mining operations. You are requested to start implementation of the R&R Plan only after obtaining approval from the Director, DMG. You are also directed to submit one copy of the approved Mining Plan, Environmental Clearance, approval under the Forest (Conservation) Act, 1980, and other statutory clearances in tune with the annual production of 0.77 MMT.



Chairman,
Monitoring Committee

To,
M/s M/s MSPL Ltd.,
Baldota Enclave, Abheraj Baldota Road,

Hospet - 583203.

Copy to,

1. Director, Department of Mines & Geology, Bangalore for information and necessary action.
2. Regional Controller of Mines, IBM, No.29 Industrial Suburb, II Stage, Tumkur Road, Goruguntepalya, Yeshwanthpur, Bangalore for information and necessary action.



BALDOTA

MSPL LIMITED

Corp. Office : Baldota Enclave, Abheraj Baldota Road, Hospet-583203, Karnataka, India.
Office : +91 8394 232002, 232003 Fax: +91 8394 232333, 232444
Email: entail@msplimited.com url: www.msplimited.com

Regd. Office : Baldota Bhuvan, 117, Mahatma Karve Road, Mumbai-400020, India.
Tel: +91 22 22030989 Fax: +91 22 22019762 Email: mspl.mum@msplimited.com

ANNEXURE - 3

CERTIFIED TRUE COPY EXTRACTS OF MINUTES OF MEETING OF COMMITTEE OF DIRECTORS OF MSPL LIMITED HELD ON 11th MAY 2010

In supersession of resolution passed by the Board of Directors at the meeting held on 14th November 2009 it is hereby **RESOLVED THAT** Sri. Narendrakumar A. Baldota, Chairman and Managing Director, Sri. Rahul Kumar N. Baldota, Sri. Shrenik Kumar N. Baldota, Executive Directors of the Company, Sri. Meda Venkataiah, Executive Director, Sri V. G. Subhramaniam, Vice President (Legal), Sri. Arvind Mathur, Vice President (Business Development) and Dr. Shibbin Kumar Bhushan, Authorised Representative of the Company be and hereby severally authorized to file applications for mineral concessions [Reconnaissance Permit (RP) Prospecting License (PL) Mining Lease (ML)], to pursue these applications, to swear affidavits and other documents needed for the purpose, to appear in hearings and to represent the Company, to file Revisions, to file Writs and other legal proceedings in connection with these applications and to do everything necessary and incidental in this behalf, and also to do everything necessary and incidental in other legal proceedings in all other matters for and on behalf of the Company."

FOR MSPL LIMITED

Chandra Sekhar Naidu
06/06/2016
(K. CHANDRA SEKHAR NAIDU)
COMPANY SECRETARY
ACS 16684

परीक्षा

निदेशों में अपने नाम भारतीय नागरिकों को सहायता दी जाती है कि वे निम्नलिखित भारतीय मिशन/कंसुल में अपना पंजीकरण करावाएँ।

धोखाधड़ी

यह पासपोर्ट भारत सरकार की सम्पत्ति है। इस पासपोर्ट के बारे में किसी पासपोर्ट अधिकारी ने इसके खाल को यदि कोई मुद्रा प्रिंट की है, जिसने पासपोर्ट खोलने की कोशिश की होगी, तो उसका गुण गुणवत्ता बिना गण्य।

यह पासपोर्ट खाल प्रिंट को देख से खतरा न भेजा जाए। यह पासपोर्ट खाल का उसके द्वारा अभिप्रेत व्यक्ति को खदे पें ही होना चाहिए। इससे किसी भी प्रकार का केवलक्षण या विपत्ति नहीं हो जाएगी चाहिए।

पासपोर्ट गुण तो अपने, लेकिन उसे जाने अज्ञान नष्ट हो जाने पर अपनी मुद्रा खाल में पहले निम्नलिखित बातों अधिप्रेत को आज्ञा यदि पासपोर्ट खाल प्रिंट में है तो निम्नलिखित भारतीय मिशन/कंसुल और भारतीय पुलिस को अवगत हो जानी चाहिए। निम्नलिखित के बाद ही दुबई के पासपोर्ट जारी किया जाएगा।

REGISTRATION

INDIAN CITIZENS RESIDENT ABROAD ARE ADVISED TO REGISTER THEMSELVES AT THE NEAREST INDIAN MISSION/POST.

CAUTION

THIS PASSPORT IS THE PROPERTY OF THE GOVERNMENT OF INDIA. ANY COMMUNICATION RECEIVED BY THE HOLDER FROM A PASSPORT AUTHORITY REGARDING THIS PASSPORT, INCLUDING DEMAND FOR ITS SURRENDER, SHOULD BE COMPLIED WITH IMMEDIATELY.

THIS PASSPORT SHOULD NOT BE SENT OUT OF ANY COUNTRY BY POST. THIS SHOULD BE IN THE CUSTODY EITHER OF THE HOLDER OR OF A PERSON AUTHORIZED BY THE HOLDER. IT MUST NOT BE ALTERED OR MUTILATED IN ANY WAY.

LOSS, THEFT OR DESTRUCTION OF THIS PASSPORT SHOULD BE IMMEDIATELY REPORTED TO THE NEAREST PASSPORT AUTHORITY IN INDIA. IF THE HOLDER IS ABROAD, TO THE NEAREST INDIAN MISSION/POST AND TO THE LOCAL POLICE. ONLY AFTER EXHAUSTIVE ENQUERIES SHALL A DUPLICATE PASSPORT BE ISSUED.

First / माता पिता का नाम / Name of Father / Legal Guardian
NARENDRA KUMAR AGHERAJ BALDOTA

माता का नाम / Name of Mother

CHITRA NARENDRA KUMAR BALDOTA

पति या पत्नी का नाम / Name of Spouse

LAVINA RAHUL BALDOTA

पति / पत्नी

CHINAR BALDOTA COLONY

HOSPET BELLARY DIST

KARNATAKA 583203

यदि अपना नाम है, तो कृपया इसे भी लिखें या नहीं / Old Passport No. with Date and Place of Issue

F9606006

23/08/2006

BANGALORE

BNGH01815508



Form I. R.

Certificate of Incorporation

oooooooooooooooo

No. 12160 of 1961-62.

I hereby certify that MINERAL SALES PRIVATE LIMITED is this day incorporated under the Companies Act, 1956 (No. 1 of 1956) and that the Company is Limited.

Given under my hand at BOMBAY this EIGHTEENTH day of OCTOBER One thousand nine hundred and SIXTY ONE. (26th Asvina, 1883)



(S. K. DUTT)
Registrar of Companies,
Maharashtra.



Form I.R.

CERTIFICATE OF INCORPORATION

No. 12100 of 19 61-62.

I hereby certify that MINERAL SALES PRIVATE LIMITED

is this day Incorporated under the Companies Act, 1956 (Act No. 1 of 1956)
and that the Company is Limited.

Given under my hand at BOMBAY

this EIGHTEENTH day of OCTOBER

One thousand nine hundred and SIXTY ONE. (26th Ashvina, 1933)



(S.K. Dutt)
Registrar of Companies.
Maharashtra.

MSP-100, (C-1092)-79-8-57-15,000.

महाराष्ट्र शासन
अधिकांश, अल्पमत अथवा
अल्पमत, अल्पमत
महाराष्ट्र, मुंबई

No 11-12160.

**FRESH CERTIFICATE OF INCORPORATION
CONSEQUENT ON CHANGE OF NAME**

IN THE OFFICE OF THE REGISTRAR OF COMPANIES MAHARASHTRA,
MUMBAI.

In the matter of MINERAL SALES LIMITED. (*)

I hereby approve and signify in writing under Section 21
of the Companies Act, 1956 (Act of 1956) read with the
Government of India, Department of Company Affairs,
Notification No. G.S.R. 507E dated the 24th June 1985 the
change of name of the Company.

from MINERAL SALES LIMITED (*)

to MSPL LIMITED (*)

and I hereby certify that MINERAL SALES LIMITED (*)

which was originally incorporated on Eighteenth
1961 day of Oct. under the Companies Act, 1956 and under the name

MINERAL SALES PRIVATE LIMITED having
duly passed the necessary resolution in terms of section 21 ~~(21)~~
~~(3072300X)~~ of the Companies Act, 1956 the name of the said
Company is this day changed to

MSPL LIMITED (*) and this

certificate is issued pursuant to Section 23(1) of the said Act/

Given under my hand at MUMBAI this Fifteenth
day of December, one thousand nine hundred
ninety - eight.

(Seal of the Registrar of Companies)

U/s. 43A.

(RAM MURTY)
Asstt. Registrar of Companies
Maharashtra, Mumbai.



CERTIFIED TRUE COPY

Asstt. Registrar of Companies
Maharashtra, Mumbai

MSPL LIMITED

Corp. Office : Baldota Enclave, Abheraj Baldota Road, Hosapete - 583203, Karnataka, India.
Office : +91 8394 232002, 232003, Fax : +91 8394 232333, 232444
Email : email@msplimited.com url : www.msplimited.com

Regd. Office : Baldota Bhavan, 117, Maharshi Karve Road, Mumbai - 400020, India.
Tel : +91 22 22030989 Fax : +91 22 22019762 Email : mspl.mum@msplimited.com
CIN U13100MH1961PLC012160

MSPL LIMITED
CIN: U13100MH1961PLC012160

LIST OF DIRECTORS AS ON 09.10.2017

SL	DIN	NAME OF THE DIRECTOR	ADDRESS & PHONE NO.	DESIGNATION	CONTACT NO.	E-MAIL ID.
1	00130619	Mr. Narendrakumar A Baldota	"CHINAR" Baldota Colony, Dam Road Hosapete - 583 203, Karnataka, India PH:08394 - 232003	Chairman & Managing Director	9901012345	na.baldota@mspllimited.com
2	00130764	Mr. Rahul Kumar N Baldota	"CHINAR" Baldota Colony, Dam Road Hosapete - 583 203, Karnataka, India PH:08394 - 232002	Joint Managing Director	9880145678	rahulbaldota@mspllimited.com
3	00130831	Mr. Shrenik Kumar N Baldota	"CHINAR" Baldota Colony, Dam Road Hosapete - 583 203, Karnataka, India PH:08394 - 232005	Joint Managing Director	9741112345	sn.baldota@mspllimited.com
4	06404575	Dr. Meda Venkataiah	"OBA", No. 1019-1 2 nd Cross, M J Nagar Hosapete - 583 203 Karnataka, India PH:08394 - 232007	Whole-Time Director	9900256797	meda.venkataiah@mspllimited.com
5	00143273	Mr. Ramakrishna Hemappa Sawkar	No. 292, 5 th Block, 38 th Cross, Jayanagar Bangalore - 560 041 Karnataka, India PH:08394 - 232003	Independent Director	9900256793	gsocind@gmail.com
6	01086790	Mr. Madhava Ravindra	Flat 1 B, PGP Manor, 29, Barnaby Road, Kilpauk, Chennai - 600 010 Tamil Nadu, India PH:08394 - 232007	Independent Director	9884208964	satkudi@yahoo.com

//Certified True Copy//
For MSPL LIMITED

(K. CHANDRA SEKHAR NAIDU)
COMPANY SECRETARY
ACS 16684



MSPL LIMITED

Corp. Office : Baldota Enclave, Abheraj Baldota Road, Hospes-583203, Karnataka, India.
Office : +91 8394 232002, 232003 Fax: +91 8394 232333, 232444
Email: email@msplimited.com url: www.msplimited.com

Regd. Office : Baldota Bhavan, 117, Mahanhi Karve Road, Mumbai-400020, India.
Tel: +91 22 22030969 Fax: +91 22 22019762 Email: msplmums@msplimited.com
CIN U13100MH1961PLC012160

Date: 08.06.2016

QUALIFICATION AND PROFESSIONAL EXPERIENCE OF Sri. S.SHIVAKUMAR, FOR
PREPARATION OF MINING PLANS/SCHEME OF MINING

This is certify that S.Shivakumar, M Sc. Geology, has been working in Vyasanakere Iron Ore Mine since 01.04.1994. At present he is working as Assistant General Manager (Exploration) for the past 5 years.

He is having vast experience in exploration works , Mineral Concession applications processes and preparation of Mining Plan/Scheme of Mining as prescribed by the IBM.

Dr. Meda Venkataiah

Executive Director (Mining)

GULBARGA UNIVERSITY, GULBARGA.**Certificate Of Passing**

This is to Certify that

Shri/Smt. Shetty Shivakumar

Passed the M. Sc. Final Geology

Examination held by the

Gulbarga University in the month of May, 1983

and was placed in the First Class.

GULBARGA

Dated : 18-6-1984


CONTROLLER OF EXAMINATIONS
Controller of Examinations
Gulbarga University
Gulbarga-585 106.

GULBARGA UNIVERSITY, GULBARGA

No. 1020

CERTIFICATE Showing the number of marks obtained by

Shri/Smt. Shetty Shivakumar in each head of passing
at the II year M.Sc. / II year D.D.E. / II year M.A.Sc. / III year M.A.Sc. Examination held in May 1983

HEADS OF PASSING

Regd. No.	Subject	Maximum Marks	Minimum for Passing	Marks Obtained		Remarks
				In figs	In words	
148	Geology					
Paper I	Hydrogeology	75	26	51	Fifty one	First class
Paper II	Exploration Geophysics & Geochemistry	75	26	53	Fifty three	
Paper III	I.M.D, Ore genesis & Ore microscopy	75	26	43	Forty three	
Paper IV	Engg. Geol, Surveying, Elem. of mining & Miner. Econ.	75	26	42	Forty two	
		—	—	—		
Practical I	Hydrogeology, Ore & Ore microscopy and Geophysics	75	26	40	Forty only	
Practical II	Geochemistry, Surveying and Mine valuation	50	17	38	Thirty eight	
Viva, Lab records & Tour report		25	—	20	Twenty only	
Total		450	180	287	Two hundred eighty seven	
Previous Marks		450	180	276	Two hundred seventy six	
Grand Total		900	360	563	Five hundred sixty three	

Received Rs 5/-

* 'X' Indicates exemptions earned in previous attempts

* Graced under Ordinance

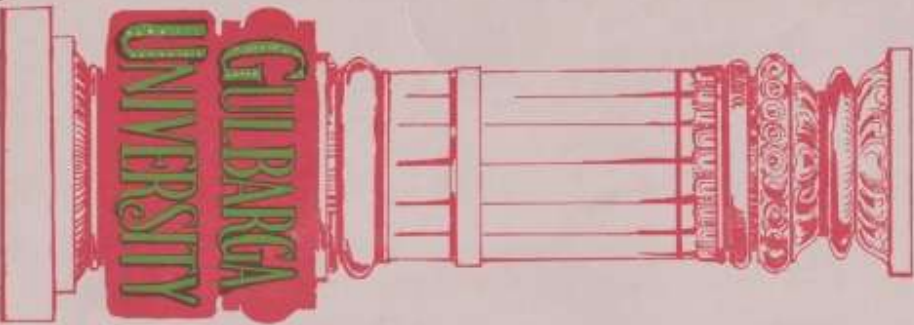
Gulbarga,

Date 2.8.1983

Prepared by.....

Checked by.....


CONTROLLER OF EXAMINATIONS



ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ ಗೌರವಾರ್ಥಿ

ಗೌರವಾರ್ಥಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಕುಲಪತಿ,
ಕುಲಪತಿ ಬಾಗೂ ಸೆನೆಟ್ ಸದಸ್ಯರಾದ ನಾವು

ಶ್ರೀ ಶಿವಕುಮಾರ್ ಶರಣಪ್ಪ ಶೆಟ್ಟಿ

ಅವರು ಮಾಸ್ಟರ್ ಆಫ್ ಸಯನ್ಸ್ (ಇಂಗ್ಲಿಷ್)

ಪದವಿ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಪ್ರಶ್ನೆ ಪರ್ಗದಲ್ಲಿ

ಉತ್ತೀರ್ಣರಾದುದರಿಂದ ಅವರಿಗೆ

ಮಾಸ್ಟರ್ ಆಫ್ ಸಯನ್ಸ್

(ಇಂಗ್ಲಿಷ್)

ಪದವಿಯನ್ನು ಗೌರವಾರ್ಥಿಯಲ್ಲಿ ಒಂದು ಸಾವಿರದ ಒಂಬತ್ತು

ನೂರ ಒಂಬತ್ತೈದನೆಯ ಏಪ್ರಿಲ್ ಎಂಟರಂದು ನೀಡಿದ್ದೇವೆ.

ಈ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಮುದ್ರೆ ಮತ್ತು ಕುಲಪತಿಗಳ

ಹಸ್ತಗಳಿಂದ ಇದನ್ನು ಪ್ರಮಾಣೀಕರಿಸಲಾಗಿದೆ.

We, the Chancellor, Vice-Chancellor
and Members of the Senate of
the Gulbarga University

Certify that

Shri. Shivakumar Sharappa Shetty

having been examined for the Degree of Master of
Science (English) and adjudged

to have passed the examination
in the First Class the Degree of

MASTER OF SCIENCE

(English)

has been conferred on him/her at Gulbarga on the

Eighth day of the month of April in the year

One thousand nine hundred and eightyfour.

In Testimony whereof we set the seal of the said

University and the signature of the Vice-Chancellor.



ಶಿವಕುಮಾರ್ ಶೆಟ್ಟಿ
ಕುಲಪತಿ/Vice-Chancellor

**GEOLOGICAL REPORT ON
ESTIMATION OF IRON ORE RESERVES
IN RESPECT OF**

SHRI. H.G. RANGANGOUD MINE LEASE AREA

(ML NO. 2148)

DISTRICT : BALLARI, KARNATAKA

TEXT, ANNEXURE AND PLATES



A Mini-Ratna Company

MINERAL EXPLORATION CORPORATION LIMITED
(A Government of India Enterprise)
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NAGPUR-440 006

MAY 2016

**GEOLOGICAL REPORT ON
ESTIMATION OF IRON ORE RESERVES IN RESPECT OF
SHRI. H.G.RANGANGOUD MINE LEASE AREA (ML No.2148),
RAMGAD RANGE, SANDUR SCHIST BELT
DISTRICT: BALLARI, KARNATAKA**

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SALIENT FEATURES

1	Name and location of the block	Shri. H.G.Rangangoud Mine Lease Area (ML No.2148), Sandur Taluk, Dist: Ballari, Karnataka, lies between Longitudes 76°31'23.8" and 76°32'05.0" and Latitudes 15°02'23.8" and 15°03'02.5". The block falls in Dharmapur village of Ramgad range. The block is covered in Survey of India Toposheet No.57 A/12.
2	Accessibility	The mine lease area is 20 km from Sandur town which can be approached from Ballari, Hospet and from Toranagallu railway station.
3	Scope of work	i) Borehole fixation, determination of boreholes co-ordinates and RL ii) Detailed geological mapping iii) Estimation of reserves / resources in respect of 'C' category mines as per UNFC guidelines iv) Lumps and fines ratio v) Broken up and non broken up (virgin) area vi) Ore and non-mineralised area vii) Associated minerals if any with quantification as per threshold values. viii) Reporting of mineral resources in accordance with "Mineral (Evidence of Mineral Contents) Rules 2015".
4	Quantum of work a) Geological Mapping b) i) Core drilling ii) RC drilling c) Total Meterage drilled d) Chemical Analysis A) i) Primary (Fe, SiO ₂ , Al ₂ O ₃ ,) ii) Bulk Density iii) Specific gravity iv) Lumps : Fines v) Check Samples B) Composite Sample Analysis i) Determination of Magnetitic iron, Fe	0.606 sq. km (1:1000 RF) 579.70m (10 Bhs) 2701.00m (38 Bhs) 3280.70m (48 Bhs) Coring - 577 Nos. RC – 2494Nos. 5 Nos. 5 Nos. 5 No. of pits 103 Nos. 24 Nos.

	(total), Ferrous iron, S, P LOI and GOI. ii) Determination of Magnetic, Hematitic, Goethetic and Limonitic iron by XRD. C: Physical Analysis i) Petrographic Studies ii) Mineragraphic Studies	24 Nos. 1 No. 3 Nos.
5	Duration of work	Between February -2016 and March- 2016 and analysis completed on 06.05.2016.
6	Geology and structure	The Sandur Schist Belt is known for its economic deposits of Iron and Manganese and studied in detail by many prominent workers like New Bold (1838), Foote (1895), Roy and Biswas(1983), Martin and Mukhopadhyay (1987 and 1993), Naqvi et.al. (1987) on various aspects like depositional environment, structure etc. Iron ore, banded ferruginous cherty quartzite, are intimately associated with gabbro of pre-tectonic and post tectonic origin. The hill ranges trend in NNW-SSE direction, which are similar to regional tectonic trend of the Sandur Schist Belt. The area has under gone two phases of deformation [F1 and F2] and metamorphism. The axial trace of F1 have NNW-SSE trend which is refolded by open F2 folds trending in ENW-WSE direction. The primary structure of banded iron ore formation is bedding and pene-contemporaneous faults; schistosity and fracture cleavage are also common. Repetitions of iron ore bands, which cause the thickening of ore at places, are due to diastrophic folds. The rock type belongs to Ramanamala formation which includes pillow- structured and undifferentiated meta basites, including meta gabbro, greywacke, banded iron formation and undifferentiated banded ferruginous chert and grunerite.
7	No. of BHs drilled up to basement	Nil ; Grid pattern : 100 x 100m
8	Highest RL in lease area Lowest RL in lease area Deepest BH drilled Mineralised Zone	982.52m (SSW of the lease area)- MHGR-17 760.00m (NW of the lease area)- MHGR-8 Bh.No.MHGR-1,RL-816.903m and total depth 95.00m RL Depth-817.059m; Iron ore continues even beyond the explored depth at 45% (MHGR- 24,16,17,7).
9	Thickness at 45% Fe cut-off	Minimum – 1.11m (Bh.no. MHG-22) Maximum – 90.30m (Bh.no.MHGR-24) Iron ore continues even beyond the explored depth.
10	Overburden	Nil
11	Logging and Sampling	3280.70m and 3069 Nos.

12	Samples analyzed for radicals	Fe (%), SiO ₂ (%), Al ₂ O ₃ (%) by XRF at MECL Lab., Utilities Complex, Nagpur.					
13	Average core recovery	85-90%					
14	No. of Geological cross-sections	13 Nos. i.e. S1-S1' to S13-S13'					
15	Specifications (Based on Fe %)	>45%Threshold value; ore zones have been classified at 45% and at 55% Fe.					
16	Structure	The lease area falls on Ramgad Range which is oriented in NW–SE direction, with steep easterly dip of 75° to 85°.					
17	Nature / Type of Ore	i) Haematitic ore, Shaly ore, Soft Laminated ore, Powdery ore, Blue dust, Siliceous ore (enriched BHQ) and Magnetite ore. ii)Waste type / OB / IB – Ferruginous clay, Limonitic clay and BHQ.					
18	Stratigraphy	Massive/Laminated ore, Laminated ore, Powdery ore, Magnetitic ore, Ferruginous Clay, BHQ, BMQ / BHJ,					
19	Ore body dimension	Average Strike length: 1300.40m Wide area : 240m - 370m Depth of intersection: 831.759 m RL Mineralized zone (Depth): 817.059m RL (at 45% Fe). Average True thick: 51.70m					
20	Intercalation	Ferruginous shale, occ. Ferruginous clay (MHGR-38 and MHG-48)					
21	Ore Reserves	Strike length (m)	Average thick (m)	Net Reserves (Million Tonnes)	Grade Fe%	Cut-off Fe%	Remarks
		1300.40	52.65	63.330	58.84	45	Haematitic ore (S1-S13)
		1300.40	49.32	48.102	62.75	55	Haematitic ore (S1-S13)
		99.30	17.63	1.221	44.99	Based on Total Fe.	Magnetitic ore (S4-S4')
		Fe : SiO ₂ + Al ₂ O ₃ ratio is 19.593 Al ₂ O ₃ : SiO ₂ ratio is 1.07 Al ₂ O ₃ : Fe ratio is 0.089					
22	Physical Facts	Lumps – 67.08% Fines – 32.92% Broken up area – 0.444 Sq.km. Non-broken up area – 0.157 Sq.km. Mineralised area – 0.157 Sq.km Non mineralized area – 0.005 Sq.km Associated minerals Magnetitic iron ore between S1-S7'					
23	Recommendations	Shri. H.G.Rangangoud Mine Lease Area (ML No.2148) has potential that would be amenable to systematic scientific mining. Moreover, magnetitic iron ore occur between S1 and S7 over the strike length of 710.00m and average wide area of 83.45m; the average thickness is 17.32m. Qualitatively, owing					

		to the sporadic nature of occurrence of magnetitic ore (MHGR-1 and MHGR-2) the reserves of magnetitic ore has not been attempted. At planning cut-off 35% the iron ore resources estimated is 88.99 m.t. with the average grade of 53.00% Fe, 13.95% SiO₂ and 4.53% Al₂O₃. The average width of mineralized zone is 60.19m. The available metal content would be 47.170 m.t.
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CHAPTER-1

1.0.0 INTRODUCTION

1.1.0 GENERAL

- 1.1.1 The extensive exploitation of Iron ore by small and large lease area holders by violating all norms fixed by the government, besides, the illegal mining beyond their lease boundary by few mine owners had forced the government to stop the mining activity, since September 2011 by the verdict of Hon'ble Supreme Court of India in its Order dated: 24.02.2014. Accordingly, a Committee was formed to assess the extent of encroachment / violation based on the joint survey conducted by authorities under the Chairmanship of the Chief Secretary to Government of Karnataka. Considering the extent of encroachment, 51 mines have been grouped under C-category mines and the mining licenses of these mines were cancelled. As per the guidelines of Director, Department of Mines and Geology vide letter no. GO No.DMG/MLS/MECL/2013-14, dtd. 28.12.2015 has entrusted to MECL to carry out exploration for the estimation of iron ore reserves/resources for 15 C category mines falling in Sandur taluk of Ballari (10 mines), 2 mines in Chitradurga and 3 mines in Tumkur districts of Karnataka. In the subsequent detailed discussions with official of IBM, DMG and MECL, it was decided to restrict the exploratory drilling at 100m grid interval in the mineralized zone and at 200m grid interval in non-mineralized or non-exploited area or virgin area. The method of drilling involved are both RC and Coring, which worked out to be 20% coring and 80% RC drilling (mutually agreed by the Committee consisting DMG, Karnataka, IBM and MECL Officials).
- 1.1.2 Officials from DMG, MECL and IBM have visited 15 abandoned C-Category iron ore mines (Phase-2) in Sandur area of Ballari district, Hiriya area of Chitradurga district, Chikanayakanahalli of Tumkur district between 11.01.2016 to 13.01.2016 in Ballari mines, on 08.01.2016 in Chitradurga mines and 18.01.2016 in Tumkur mines, in prelude to the exploration. It is observed that, no systematic mining were done, no old exploration / Borehole data or chemical data and no updated Surface Plan is available for planning further exploration in these 15C category mines.
- 1.1.3 Based on the GPS Survey data of CEC and together with the geological mapping by MECL, the proposal for detailed exploration for iron ore in 15-C Category mines located in Ramanadurga range, NEB range in Ballari district, 2 mine lease area in Chitradurga district, and 3 mines in Chikanayakanahalli area of Tumkur district of Karnataka were prepared.
- 1.1.4 Sandur Schist Belt is one of the younger schist belts of Dharwar Super Group occupied in about 2500 Sq.km area between Ballari, Hospet and Sandur in the Ballari district of Karnataka is known for its rich accumulation of both Iron and

Manganese ores. Extensive Iron and Manganese Ore Mining is the main activity in Sandur, Hospet and Ballari areas.

- 1.1.5 In future, almost entire Europe (excluding former USSR), Japan, Korea, China and other Asian Countries will nearly depend upon import of iron ore. The main exporters will be Brazil, Oceania [Australia, New Zealand etc.) and former USSR. India has a good export market in the eastern sector as Australia seems to be the sole major competitor; besides, India has a good market even in Europe and Africa. Therefore, it is pertinent to explore large areas to cater to the heavy export of iron ore.
- 1.1.6 The Ramgad, Kumaraswamy, Deodari, Donimalai, Thimmappanagudi, NEB range and Copper mountain Ranges are the most important iron ore mining centers of Ballari - Hospet area.

1.2.0 LOCATION

- 1.2.1 Shri. H.G.Rangangoud Mine Lease Area (ML No.2148) mine lease area falls on Ramgad Range of Sandur Schist Belt, at a distance of about 20 kms from Sandur, lies between Longitudes 76°31'23.8" and 76°32'05.0" and Latitudes 15°02'23.8" and 15°03'02.5". The block falls in Ramgad Range.. The block is covered in Survey of India Topo sheet No.57 A/12 (Plate-I).
- 1.2.2 The Sandur Schist Belt lies between Longitudes 76°22' and 76°52' and Latitudes 14°50' and 15°17'. The area is covered in Survey of India Topo sheet Nos.57 A/7, 8, 11,12,15,16 and 57 B/9.
- 1.2.3 Ballari, Sandur and Hospet are the important townships of the area. Sandur is the tehsil headquarter, which is located in the south central part of Sandur Schist Belt. Ballari is the district headquarter, which is about 60km from Sandur. Donimalai is the NMDC Township, at a distance of about 15 km from Sandur.
- 1.2.4 Jindal had established Vijayanagar Steels (JSW) near Toranagallu (R.S.), with the Thimmappangudi block iron ore resources as captive mine.
- 1.2.5 Pelletisation plant have also been established in Hospet.

1.3.0 ACCESSIBILITY

- 1.3.1 Sandur is connected by road from Ballari, Hospet, Toranagallu (RS) and Donimalai. Hospet, Toranagallu and Ballari are connected by broad gauge railway line on Hubli - Guntakal section of south central railway. Bengaluru is the State capital and it is at about 340 km from Sandur by road and accessible by train from Hospet and Toranagallu,

1.4.0 PHYSIOGRAPHY

- 1.4.1 Physiography of the area is characterized by two elongated ridges trending NNW-SSE. The western ridge is named as Ramgad range and the eastern ridge is named as Donimalai range and the E-W trending South East extension of Ramgad range is called Kumaraswamy range. The height of these hill ranges varies between 600 to 1100m from MSL.

1.5.0 CLIMATE

1.5.1 The Sandur Schist Belt area of Ballari district experience dry semi arid climate with annual rainfall varying from 40cm to 80cm. The monsoon begins in June first week and continues up to September and winter from the month of October to January is somewhat pleasant. However, hot to very hot summer is from the month of February to May.

1.6.0 SCOPE OF WORK

**TABLE-1:
QUANTUM OF WORK EXECUTED IN
SHRI. H.G.RANGANGUD MINE LEASE AREA (ML No.2148)**

Sl. No	Activity	Quantity
1	Topographical Survey - on 1:1000 scale (Dove tailing of data provided by DMG, Karnataka)	60.66Ha
2	Geological Mapping	0.6066sq. km
3	Survey	
	i) Triangulation/Traversing	60.66Hectares
	ii) BH Fixation	48 nos.
	iii) Determination of RL and Co-ordinates	48 nos.
4	Exploratory Drilling	
	i) Core Drilling	579.70m (10 Bhs)
	ii) RC Drilling	2701.00m (38 Bhs)
5	Geological Activities	
	i) Core Logging	3280.70m (48 BHs)
	ii) Sampling	3071 Nos
	iv) Lump and Fine – Pits	05 Nos
	v) Bulk Density determinations	05 Nos
6	Chemical Analysis :	
	i) Primary (Fe,SiO ₂ and Al ₂ O ₃)	3071 Nos.
	ii) Check Sample Analysis	103 Nos
	iii) Specific Gravity determination	05 Nos.
	Composite Samples: a) Determination of Magnetitic iron,Fe total,Ferrous iron, S, P and LOI.	24 Nos.
	Composite Samples: b) Determination of Magnetic, Hematitic, Goethetic and Limonitic iron by XRD.	24 Nos.
	Physical Analysis	
7	i) Petrographic Studies	1 No.
	ii) Mineragraphic Studies	3 Nos.

1.7.0 ACKNOWLEDGEMENTS

1.7.1 MECL is highly thankful to CEC committee headed by Chief Secretary, Government of Karnataka for his valuable suggestions and guidance planning

and execution of the proposed exploration in 2nd Phase, 15-C Category iron ore mines of Ballari – Hospet area, Karnataka.

- 1.7.2 MECL places on record its profuse thanks to Director, Directorate of Mines and Geology, Karnataka for assigning the responsibility of exploration in Shri. H.G.Rangangoud Mine Lease Area (ML No.2148), Ballari district, Karnataka.
- 1.7.3 MECL also gratefully acknowledges the co-operation in execution of exploration activity at Shri. H.G.Rangangoud Mine Lease Area (ML No.2148) by the officials of Directorate of Mines and Geology, Ballari and Hospet.

CHAPTER-2

2.0.0 REGIONAL GEOLOGY AND STRUCTURE

2.1.0 BACKGROUND INFORMATION

- 2.1.1 H. James defined iron formation as a “Chemical sediment, typically thin bedded or laminated, containing 15% or more iron of sedimentary origin and commonly but not necessarily containing layers of Chert”. Banded Iron Formation (BIF) has been formed within a single epoch of earth between 1900 and 2500 million years ago. The amount of iron deposited in this epoch of sedimentation is quite enormous.
- 2.1.2 The pre-Cambrian banded iron formations which are known as **IRON FORMATIONS** or **IRON ORE SERIES** consists of banded haematite quartzite, banded haematite jasper, banded chert, etc. in the un-metamorphosed state; whereas on metamorphism, the bounded ferruginous rocks have given rise to banded magnetite quartzite in which, the magnetite has been derived from the original haematite and in places from grunerite - cummingtonite bearing rocks. The basic eruptive rocks of the Precambrian time are the major source of iron ores. The iron ores have been deposited through sedimentary resources followed by leaching, oxidation by surface water percolation over a long period and re-cementation with some replacement have also played a part at places. The haematite generally occupies the top of the ridges and hillocks, which are of great magnitude. Most of the ores have grade of > 60% and are in association with ores of medium and lower grade in larger quantities. The grain size varies from fine to coarse. Few grains of martite and magnetite are present, which are of not much significance. Due to weathering haematite have altered to limonite and goethite and finally to laterite at places.

GEOLOGICAL DISTRIBUTION OF INDIAN IRON ORE DEPOSITS

Formation	Type of Deposits	Areas of occurrence
Quaternary	Laterite	Small occurrences widely scattered as derived from many formations including Deccan Traps.
Tertiary Eocene and Miocene	Ironstones	NE Regions [Assam] Kumaon Hills, Travancore, Malabar coast.
Jurassic Rajmahal Trap (inter trappean beds)	Ironstones	Birbhum, West Bengal. Rajmahal Hills, Bihar

Formation	Type of Deposits	Areas of occurrence
Triassic Sirban limestone	Haematite and limonite	Udhampur, Kashmir
Gondwana Ironstone	Ironstone and Siderite	Raniganj Coalfield
Barakar Mahadeva	Ironstone and Siderite	Birbhum, Auranga Coalfield
Cuddapah Bijawar, Gwalior, Cuddapah	Haematite and Ferruginous, Quartzite	Bijawar, Gwalior, Indore, Rewa, Mahendragarh, Jaipur, Jhunjhunu, Sikar, Cuddapah
Banded Iron Formation (Metamorphosed)	Magnetite-Quartzite	Guntur, Salem, Tiruchirappalle, Shimoga, Chikmagalur Mandi (Himachal)
Banded Iron Formation	Haematite (massive, shaly, powdery etc).	Singhbhum, Bonai, Keonjhar, Mayurbhanj, Poonch (Kashmir), Bastar, Durg, Jabalpur, Chandrapur, Gadchroli, Ratnagiri, Dharwar, Ballari, Shimoga, Chikmaghur, Goa.
Granites	Magnetites (Residual)	Jaintia Hills (Assam)
Granodiorites (Rampahari Granite)	Apatite-Magnetite rock	Singhbhum, Mayurbhanj
Basic Ultra basic rocks	Titaniferous-vanadiferous magnetites	Singhbhum, Mayurbhanj
Pre-Cambrians	Magnetite	SE Karnataka, Mysore

2.1.3 The BIF has great economic potential, as it hosts many useful metalliferous ores such as iron, aluminum, copper, chromium, gold, uranium, etc.

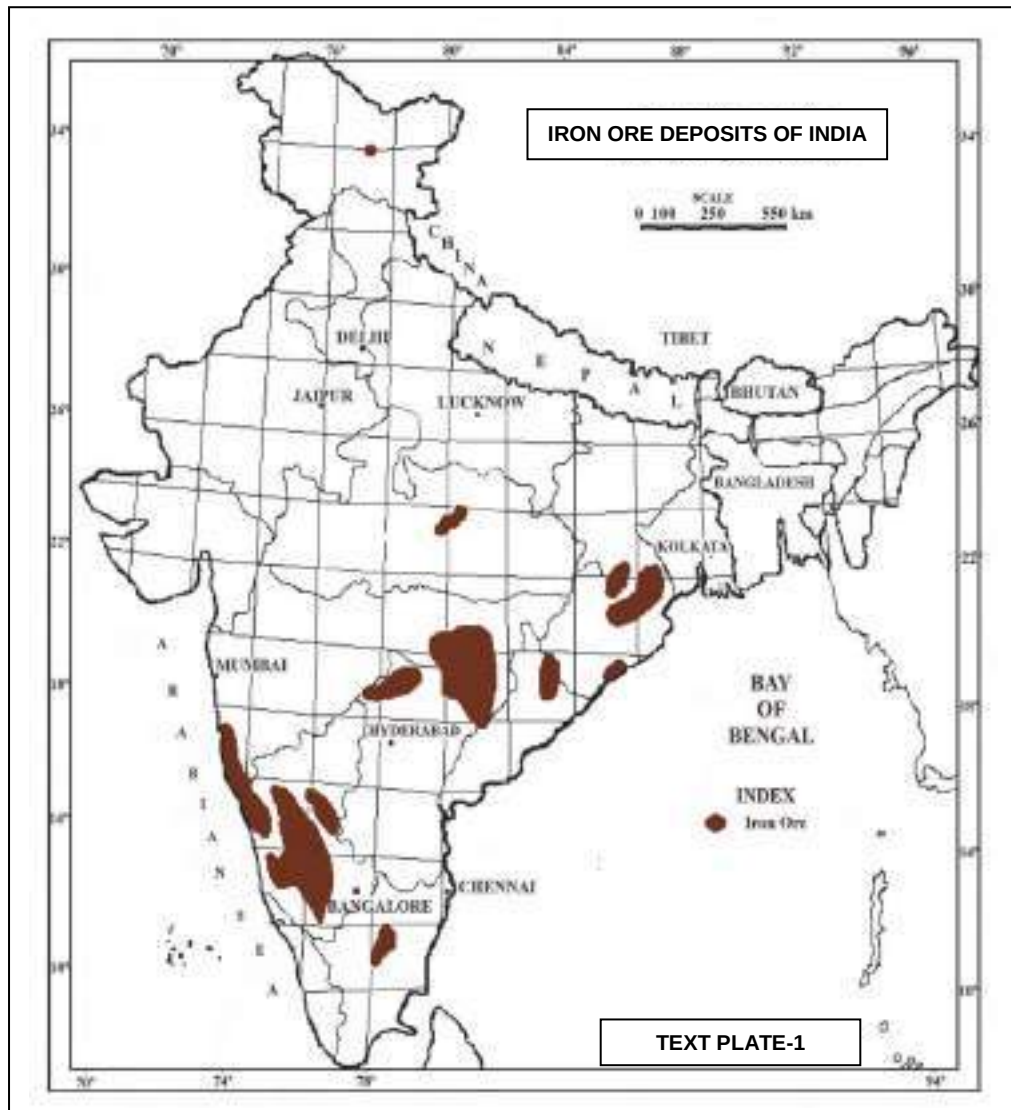
2.2.0 CLASSIFICATION OF IRON ORE DEPOSITS

2.2.1 The iron ore resources of India are mainly distributed within the five major zones as detailed below:

**GEOGRAPHICAL DISTRIBUTION [GSI's Bulletin series A, No.51 (1988)]
(Text Plate-1)**

ZONE	
A	Chiria, Noamundi, Kiriburu, Meghahatuburu, Thakurani, Bolani, Gua, Malong toli, Gandhamardan, Daitari.
B	Bailadila, Dalli, Rajhara, Rowghat, Mahamaya, Aridongri, Surajgarh.
C	Donimalai, Ramgad, Kumaraswamy, NEB Range, Ettinahatti, Tumti, Belagal.
D	N.Goa, S.Goa, Redi.
E	Kudremukh, Bababudan, Kudachadri.

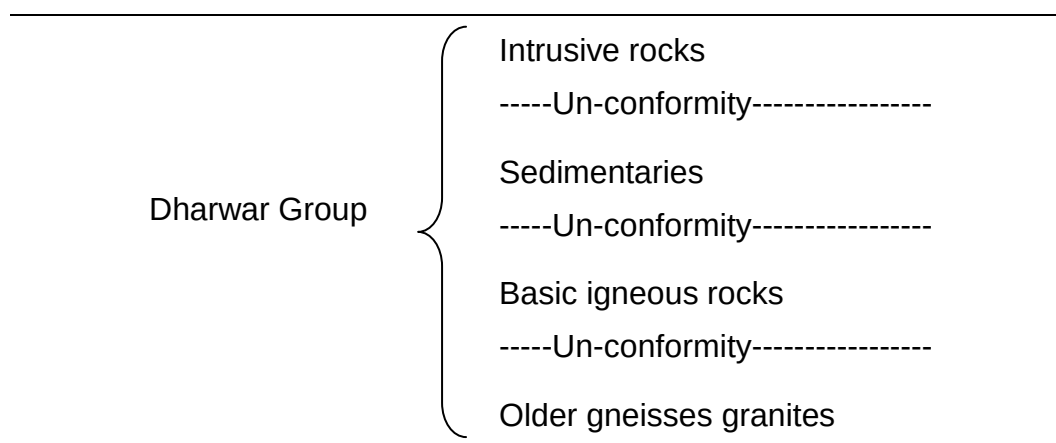
2.2.2 Also less important (deposits) belts are around central Madhya Pradesh, Rajasthan, Haryana, Tamilnadu, Andhra Pradesh etc.,



2.3.0 REGIONAL GEOLOGY

2.3.1 The geological formations of the Ballari, Hospet and Sandur region are known by the name Sandur Schist Belt, belongs to Dharwar Super Group. The generalized succession of these formations was first suggested by Foote (1895) is as follows

2.3.2 STRATIGRAPHIC SUCCESSION OF SANDUR SCHIST BELT



2.3.3 **Older gneisses and granites:** These are the oldest rocks of the area and occur mainly along the Western and South western boundaries of the schist belt.

2.3.4 **Basic igneous rocks:** This group comprises mainly of meta basalt and epidiorites and overlies the gneisses and granites with an unconformity.

2.3.5 **Sedimentaries:** The sedimentary formations consist largely arenaceous sediment (sandstones and quartzites) successively followed by argillaceous (shales, phyllites and slates) and ferruginous sediments (ferruginous shales, quartzites, manganese and iron ores).

2.3.6 **Intrusive rocks:** These include both acid and basic intrusives. The acid intrusives are in the form of granites while the basic ones are in the form of dioritic or doleritic sills.

2.3.7 The two most significant economic mineral deposits of the area are manganese and Iron ores. The manganese ore is confined mainly to the southern portion of Kumaraswamy range and the western flanks of the Ramgad range. Iron ore occurrences are spread over almost all the major hill ranges viz., Ramgad, Kumaraswamy, Donimalai, Devadarigudda, Thimmappanagudi, NEB range and Copper Mountain (Belagal) range.

2.4.0 STRUCTURE

2.4.1 The hill ranges of Sandur Schist Belt appear to be isoclinal synclines trending NNW – SSE with general northeasterly dip. The major valleys are in the anticlinal regions. The Copper Mountain (Belagal), Thimmappanagudi, Ramgad, Kumaraswamy and Donimalai ranges are located in the synclinal

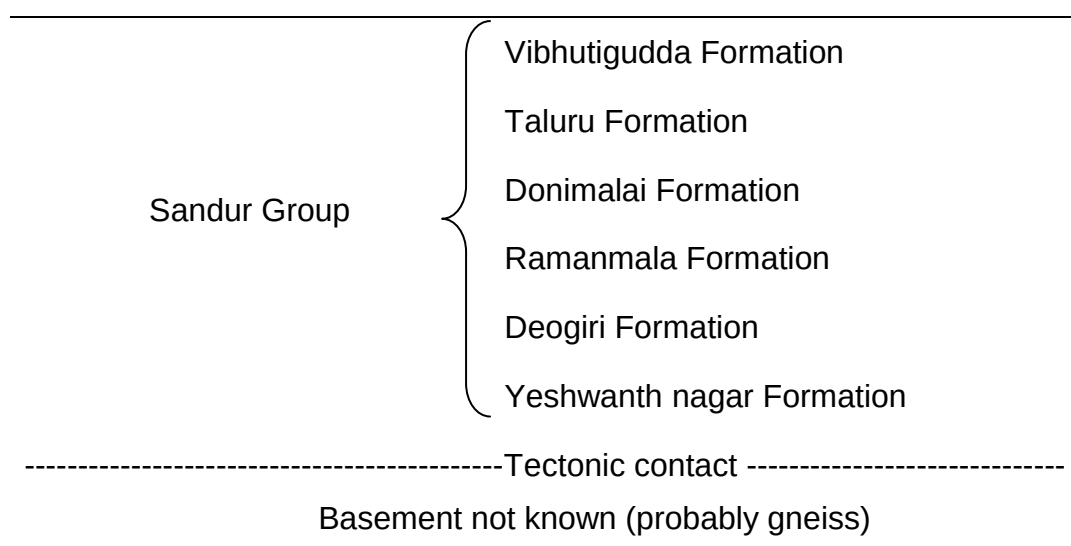
regions. The overall structure of the schist belt is synclinal and it is often called “Sandur Synclinorium”

- 2.4.2 The eastern and western limbs of Sandur Syncline and Copper Mountain cross folded syncline show only iron ore enrichment. The en-echelon drag fold shows concentration of manganese ore along the troughs and the saddles.

2.5.0 GEOLOGY OF THE AREA

- 2.5.1 The Sandur Schist Belt is known for its economics deposits of iron and manganese and studied in details by many prominent workers like New Bold (1838), Foote (1895), Roy and Biswas (1983), Martin and Mukhopadhyay (1987 and 1993), Naqvi et.al. (1987) on various aspects like depositional environment, structure and depositional process etc. Geo-chemical data study by Manikyamba et. al. (1993) inferred that the iron formation were the result of submarine hydrothermal venting at the mid-oceanic ridge, ferruginous volcanic sedimentation and biogenic activity.

- 2.5.2 The lithostratigraphy of the volcanic and sedimentary rocks under the new term are defined as “Sandur Group” which are as follows:



- 2.5.3 **Yeshwantnagar Formation:** This formation is dominated by metamorphosed ultramafic rocks, metagabbro and amphibolites on the south western margin of the schist belt.

- 2.5.4 **Deogiri Formation:** The sedimentary sequence overlies the amphibolites of the Yeshwanth nagar formation. The lowest part of the formation are mostly greywacke and the top most part are manganiferous greywacks which immediately underlie the lowest banded chert of Ramanmala Formation. The greywacks are commonly calcareous. Much of the manganiferous greywacks occurs as secondary concentrations of oxides or hydroxides in the form of nodules or encrustations on fractures.

- 2.5.5 **Ramanmala Formation:** The lower part of the Ramanmala formation is dominated by banded ferruginous cherts and interbedded amphibolites. The chert layers increase in number along the strike of the formation from north-

west to south-east. Many of these chert layers are banded iron formations which are host to economic deposits of secondary haematite on the top of the Ramanmala and Deogiri hill ranges.

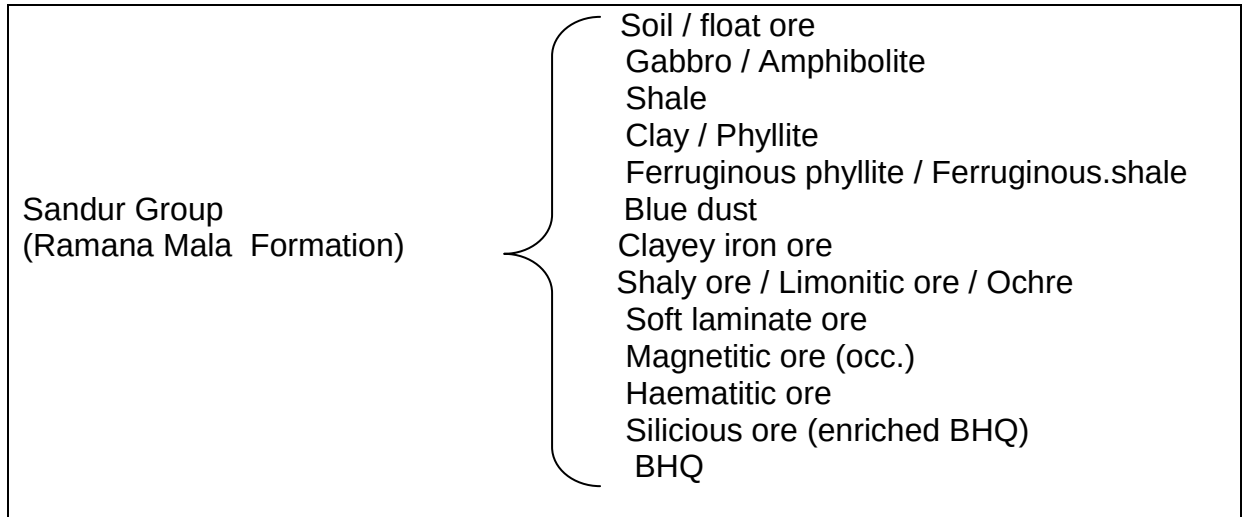
- 2.5.6 **Donimalai Formation:** This formation comprises amphibolites and banded ferruginous cherts with subordinate polymict conglomerate and greywacks. Numerous banded units of chert characterise the Donimalai Formation. They vary in thickness from 10 to 100m. The banded haematite-enriched types of rocks have magnetite, Jasper and pyrite rich cherts to non-ferruginous grey cherts.
- 2.5.7 **Taluru Formation:** The formation mostly comprises of schistose amphibolites and pillow structured metabasalts, which are host to thin, but persistent intercalations of banded cherts and local pods of coarse grained grey carbonates. The lower part of the formation comprises inter bedded banded ferruginous cherts, schistose chlorite carbonate rich amphibolites and siliceous schist.
- 2.5.8 **Vibhutigudda Formation:** The hill ranges northeast of Donimalai range includes formations comprising sedimentary and volcanic rocks such as greywacks and banded ferruginous chert that immediately overlies the amphibolites of the Taluru formations.

2.6.0 STRUCTURAL CONTROL

- 2.6.1 Iron ore, banded ferruginous cherty quartzite, are intimately associated with gabbro of pre-tectonic and post tectonic origin.
- 2.6.2 The hill ranges trend in NNW-SSE direction, which are similar to the regional tectonic trend of the Sandur Schist Belt. The area has under gone two phases of deformation [F1 and F2] and metamorphism. The axial trace of F1 have NNW-SSE trend which is refolded by open F2 folds trending ENW-WSE. The primary structure of banded iron ore formation is bedding and pene-contemporaneous faults. Schistosity and fracture cleavage are common. The repetitions of iron ore bands, which cause the thickening of ore at places, are due to diastrophic folds.

2.7.0 GEOLOGY AND STRUCTURE OF THE MINE LEASE AREA

- 2.7.1 Iron ore band trending NNW-SSE to NW-SE with moderate to steep easterly dip occurs over the entire area of mine lease. The float ore occurs intermittently. Clay bands, ferruginous shale and meta-gabbro as intrusive also occur over the lease area.
- 2.7.2 The sub-surface geology deduced after the exploratory borehole data is given below:



- 2.7.3 The general trend of the iron ore formation is N20°-40°W - S20°-40°E with moderate to steep easterly dip of 45-75°. Float ore is exposed sporadically in the north eastern and south eastern part of the mine lease area. Few intervening clay bands were also noticed (Plate-III).
- 2.7.4 The magnetite band of iron ore occurs between S1 and S7 over 710.00m strike length with in wide average area of 83.45m and the average thickness of 17.30m.

CHAPTER-3

3.0.0 EXPLORATION BY MECL

3.1.0 OBJECTIVE

3.1.1 The main objective of exploration by MECL is to estimate the iron ore reserves and resources in Shri. H.G.Rangangoud Mine Lease Area (ML No.2148) Mine lease area. The following objectives were set for this purpose:

- i) Borehole fixation, determination of boreholes co-ordinates and RL.
- ii) The ratio of core drilling to RC drilling is 1:4 (20% Core drilling & 80% RC drilling)
- iii) To prepare geological map of the mine lease area besides planning and fixation of exploratory boreholes
- iv) To assess the strike and depth continuity of iron ore in the mining lease area
- v) Lumps and fines ratio
- vi) Broken up area / virgin area
- vii) Mineralized / Non-mineralized area
- viii) Associated minerals if any with quantification as per threshold values.
- ix) In accordance with "Mineral (Evidence of Mineral Contents) Rules 2015".
- x) Estimation of iron ore reserves / resources as per UNFC classification

3.1.2 Based on the work order of DMG, Karnataka, the exploration was commenced on 16.02.2016 and completed on 12.03.2016 involving 579.70m core drilling in 10 boreholes and 2701.00m in 38 boreholes by RC drilling thus amounts to a total of 3280.70m in 48 boreholes. The lab studies include 3071 no. of Primary samples, 103 No. of check samples, petrography and mineragraphy samples 1 no. and 3 nos. respectively., 5 nos. of bulk density determinations and 5 Nos. of specific gravity determinations. Further 24 no. of composite samples has been analysed for determination of magnetitic ore both by classical and XRD method. The chemical analysis were completed on 06.05.2016.

3.2.0 SUMMARY OF EXPLORATION WORK DONE

3.2.1 The summary of physical work done by MECL is given in Table 1.1. The detailed account of each activity is presented in the following paras.

3.3.0 SURFACE SURVEY

3.3.1 The survey work has been carried by using Differential Global Positioning System (DGPS) of Tremble make having an accuracy of 0.10m with WGS 1984 datum. In the absence of survey of India reference point, within the vicinity of the area, base stations T1 and T2 are fixed at highest elevation of the area, the details of which are given below:

Bearing between T-1 and T2	= 156°29'2.75"
Distance between T-1 and T2	= 505.4892m
Line Accuracy	2 seconds

The boreholes have been fixed and RL's were determined by triangulation method. The triangulation station details and co-ordinates and borehole header details have been provided as Annexure-I and II.

- 3.3.2 The DMG Officials of Hospet had shown the pillar nails existed on the ground which was surveyed by MECL and plotted on the map [Text Plate-2]. The survey work has been continued to prepare the topographical map on 1:1000 (Plate-III) and fixation of boreholes by using the Electronic Total station (Sokkia make). The co-ordinates, both National and UTM, of triangulation stations, boundary pillars and boreholes are provided in Annexure-I and II respectively. The total station data including the buffer / encroachment area is also given.

SHRI. H.G.RANGANGOUD MINE LEASE AREA (ML No.2148)

Point No.	Geodetic co-ordinates provided by CEC (Hand held GPS, WGS-84)					
	LATITUDE			LONGITUDE		
	D	M	S	D	M	S
1	15	02	34.5	76	32	05.0
2	15	02	23.8	76	31	53.7
3	15	02	56.4	76	31	23.8
4	15	03	02.5	76	31	31.9
5	15	02	58.8	76	31	43.2

3.4.0 GEOLOGICAL MAPPING

- 3.4.1 The geological mapping was carried out with the help of tape and compass over an area of 0.6066 sq.km on 1:1000 scale but produced on 1:2000 scale as Plate-III. The survey stations fixed on the cross sections line were used as reference points.
- 3.4.2 During the exploration, the benches dug were also studied carefully to decipher and delineate the nature and behavior of iron ore bands. Other formations as well as surface geological features were also incorporated in the topographical and geological map. Structural features viz. attitude, different formations, joints, foliation etc. were also recorded and provided in Plate-III. A few field photographs have been appended the following pages numbered 19 to 22. [Field Photo-1 to 8]

3.5.0 BULK DENSITY DETERMINATIONS

- 3.5.1 The in-situ bulk density has been estimated on different ore/ rock types by making a pit of 50 x 50 x 50 cm on the clean floor of the ore formations/BHQ/other formations. The excavated material was weighed and volume measured by filling the pit with a measured quantity of uniform grain sized sand. Thus the bulk density is measured by $D=M/V$, wherein M= weight of ore material in kg, V= weight of known volume of sand representing its volume. The total of 5 bulk density determinations estimated has been given below:

Sl.No.	Pit No.	Lithology	Gravity
1	HGRD -1	Thin laminated ore (occ. free silica)	3.37
2	HGRD -2	High grade ore	3.26
3	HGRD -3	Thin laminated powdery ore	3.35
4	HGRD -4	Lateritic ore (limonitic patches)	3.73
5	HGRD -5	Thin laminated ore	3.12

3.6.0 LUMPS AND FINES

- 3.6.1 Iron ore seldom occurs in the purity form and size composition conforms to users specifications, therefore deleterious impurities like SiO_2 , Al_2O_3 , S and P beyond desired limits render the ores unsuitable for use in various industries. Owing to the nature of its occurrence, the hematitic ores fabrics are such that it consists of varying sizes, which are called lumps.
- 3.6.2 However, when the ore is mined, the lumps of various sizes get produced with bigger particles of more than a meter across and the smallest one being of a millimeter.
- 3.6.3 Blast furnace process requires lumps between 7mm and 25mm. Therefore, the ore must be crushed to produce the maximum particle size. The crushed ore is divided into various fractions by passing it through sieves. Thus lumps of desired sizes are separated from the fines and the lumpy ore of appropriate quality ore could be charged into the blast furnace directly without further processing.
- 3.6.4 Through mechanical operations ore are crushed and screened for various fractions; thus lumps and very fine, called “super fines”, which become physically unsuitable for the blast furnace as they are much finer than the ore fines.
- 3.6.5 The super fines / blue dust, after agglomeration, the ore get subjected to sintering or pelletization.
- 3.6.6 In order to ascertain the lumps and fine proposition of the ore, pits of 0.50m x 0.50m x 0.50m dimensions have been sunk in the already exploited mines at various locations, which will be of utmost usefulness for determining the ratio between lumps and fines. The particles of the ore measuring +10mm size, <10mm size have been classified as lumps and fines respectively. The ratios obtained are given below in respect of Shri. H.G.Rangangoud Mine Lease Area (ML No.2148)).

Pit No.	Northing	Easting	Distribution (%)		Lithology
			Lumps (+10mm)	Fines (<10mm)	
1	1663692.777	664627.968	10.69	89.31	Thin laminated ore (occ. free silica)
2	1663750.926	664793.930	24.69	75.31	High grade ore
3	1663858.178	664513.235	15.95	84.05	Thin laminated powdery ore
4	1663677.548	664567.280	67.08	32.92	Lateritic ore (limonitic patches)
5	1664110.834	664405.398	25.84	74.16	Thin laminated ore

3.7.0 BROKEN UP AREA

- 3.7.1 The total broken up area falling within mine lease area is 44.419Ha.
- 3.7.2 The adjacent area to the mineralized and potential area with the existing boundaries of the lease hold is 55.00 ha.(approx.). This is as per the field joint inspection report of Office of the Commissioner, DMG, Bangalore,Karnataka, No. DMG/MLS/MECL/2015-16, dtd. 25.02.2016.
- 3.7.3 The associated mining company lease area ML No.2434 with an area of 10.14ha is adjacent to Shri. H.G.Rangangoud Mine Lease Area (ML No.2148) towards east. Hence, for the scientific mining and subsequent exploitation of the ore the mine may be auctioned together.

3.8.0 EXPLORATORY DRILLING

- 3.8.1 The boreholes have been released as per the proposal approved by DMG, Karnataka. The boreholes have been drilled by MECL and closed in consultation with DMG officials at Ballari. In order to assess the total potential of iron ore in the mine area, a total of 10no. of boreholes for core drilling and 38no. of boreholes for RC drilling have been drilled involving of 579.700m and 2701.00m respectively. Thus, a total of 3280.70m exploratory drilling has been completed in Shri. H.G.Rangangoud Mine Lease Area (ML No.2148). During the period of execution, due to the finer nature of ore, utmost care has been taken while drilling, so as to achieve the maximum core recovery. In the mineralized zone, the overall recovery has been 85-90% and above.

3.9.0 CORE LOGGING

- 3.9.1 The core and powdery materials recovered from the drilling were logged systematically to demarcate various litho-units. The logging of run wise cores and the powdery materials as well as the cuttings from boreholes have helped in discerning the physical characters like colour, shape, size and nature of pieces (laminated, goethite, clayey, and siliceous etc). Besides these, the qualitative analytical data were helped in delineating the ore types and non ore. Among the non ore, ferruginous shale/clay, banded haematite quartzite has also been demarcated. The upper portion of ore body has been covered, invariably, by laterite / lateritic ore. However, impersistent remnant banded haematite quartzite have been observed at few places. Based on these observations, ore zones and non-ore horizons were distinguished and delineated. The chemical analyses along with lithological details are given in Annexure IIIA and IIIB. In order to prepare graphic lithologs, concise lithologs were generated and presented in Plate-IV.



Field Photo 1: Pit view from northern part facing SE



Field Photo 2: Central pit of Mine Lease Area



Field Photo 3: Southern part of Mine Lease Area



Field Photo 4: Minor slips



Field Photo 5: Laminated ore inter bedded with powdery ore



Field Photo 6: Friable Soft Laminated Ore



Field Photo 7: Central pit view with drill operations



Field Photo 8: View showing shallow dip of the ore body along the bench face

3.10.0 PRIMARY SAMPLING

3.10.1 The borehole cores recovered by drilling were divided into two longitudinal halves. The first (one) half was taken for sampling, whereas the second (other) half was kept for future reference [with DMG, Karnataka]. The first half was subjected to uniform size reduction of 1mm size. It is thoroughly mixed, pounded and powdered to (-) 100 mesh size by pestle and mortar and then coned and quartered. 3 sample packets of 100 gram each have been prepared; out of the three, one packet was handed over to DMG, Karnataka and the other one has been labeled and sent to MECL laboratory for Fe, SiO₂ and Al₂O₃ analyses, whereas the third packet has been preserved for future reference. Generally, one meter length of the core has been considered as a sampling unit, provided no change in lithology or else, the length corresponds to particular lithology has been taken into consideration for sampling purposes. The analytical details of the samples are given in annexure IIIB and IV.

3.10.2 The entire lot of chips and powder material were collected from boreholes drilled by Reverse Circulation drill. 50% mostly of chip samples have been thoroughly mixed to have the desired quantity of 500-600 gms. and pounded to (-) 100 mesh size by progressive reduction, 3 sample packets of 200 gram each has been prepared; out of the three, one has been labeled and sent to MECL Lab., for Fe, SiO₂ and Al₂O₃ analyses, the other packet was handed over to DMG, Karnataka, and the 3rd packet of the sample has been preserved for further studies at camp.

3.10.3 Chemical Analysis: All the primary samples were analyzed for Fe, SiO₂, Al₂O₃ at MECL laboratory by XRF method. The details of analysis are provided in Annexure- IIIB and IV.

3.11.0 COMPOSITE SAMPLES

3.11.1 Composite samples have been prepared for the determinations of magnetitic iron, haematitic iron, goethitic iron, magnesioferrite by XRD as well as and total Fe, ferrous iron, P, S, LOI and GOI by classical method. A total of 24 nos. of samples has been analysed and the results are given in the Annexure-VI.

3.12.0 SPECIFIC GRAVITY DETERMINATION

3.12.1 The specific gravity of different types of ores has been determined on samples by Walker's Steelyard Balance method in the MECL laboratory. The results are given below:

Sl. No.	Sample No.	Lithology	Specific Gravity
1	HGRDC -2	Thick laminated hard ore	3.71
2	HGRDC -3	Massive Haematite ore	3.51
3	HGRDC- 4	Thick laminated powdery ore	2.80
4	HGRDC -5	Soft laminated powdery ore	2.32
5	HGRDC -6	Massive ore (MHG-47- 2.70)	4.29

3.12.2 However, bulk densities determined by different deposits by various agencies are also given below:

Determination of Bulk density by GSI in NEB Range

Ore Zone	Hard Ore	Soft Ore	Powdery Ore
I	3.4	3.0	-
II	-	-	3.0
III	-	-	3.0
IV	4.9	3.0	3.0
V	4.7	3.3	3.0
V-A	4.4	3.0	3.0
X	4.35	3.07	3.0
Mean	4.35	3.07	3.0

Determination of Specific Gravity by IBM in Ballari – Hospet deposit.

Lumpy ore	3.5
Blue Dust	3.8
Mean	3.65

Overall Specific Gravity after consideration of all the deposits is 3.50

3.13.0 COMPARATIVE STUDY ON BULK DENSITY

3.13.1 A total of 3 pits have been made for determination of Bulk density whereas 5 samples have been subjected for Specific gravity determination by Walker's Steel Yard Balance at Lab. and the details are given below.

Sl. No	Lithology	Bulk Density	Specific Gravity
1	Thin laminated ore	3.37	3.71
2	Thin laminated, powdered ore	3.35	3.51
3	Laminated ore	3.73	2.80(Powdery)

3.13.2 Owing to paucity and limitations of approachability only few pits have been made, whereas, on the typical hard, massive ore none of the pits could be made. Hence, a realistic bulk density of 3.50 has been considered for ore reserves/resources estimation

3.14.0 PETROGRAPHIC STUDIES

3.14.1 Samples admeasuring 10 cm into 5 cm have been subjected for petrographic studies by thin section which reveals the nature of host rock of mineralization, structural relationship, mineral alterations and genesis of iron ore formations. The sample study has shown that the grains are well sorted and rounded and at places folded. The details of the Petrographic study has been provided in the Annexure- VIIA.

3.15.0 MINERAGRAPHIC STUDIES

3.15.1 Samples admeasuring 5 cm into 5 cm have been subjected for mineragraphic studies by polished section which reveals grain size, ore minerals assemblages, replacement and byproduct if any. Two samples have been studied.

3.15.2 Mostly hematite occurs as euhedral to anhedral grains sometimes magnetite occurs as relicts in hematite. Goethite is the next predominant mineral. Pyrite occurs as inclusions. Chalcopyrite occurs as accessories. The details of the study have been provided in the Annexure-VIIB.

CHAPER-4

4.0.0 MINERALISATION AND CHARACTERISTICS OF IRON ORE

4.1.0 MINERALISATION

- 4.1.1 The samples with more than 35% has been considered as mineralised zon, whereas, the samples with more than 45% Fe and above as iron ore. The ore exhibits wide variations in physical properties ranging from compact, hard and massive ore to soft, granular, laminated, unconsolidated sandy blue dust in Shri. H.G.Rangangoud Mine Lease Area (ML No.2148). The blue dust occurs rather rarely than the powdery ore.
- 4.1.2 Magnetic ore occur along 710.00m strike length between sections S1 – S7, over an average wide area of 83.45m with an average true thick of 35.50m.
- 4.1.3 However, categorization/classification of the ore based on quantitative data such as hard, soft, laminated, powdery etc., have been possible based on mine data (size range or granulometry). It is also based on physical properties like colour, presence or absence of weakness, cohesiveness of the grains etc. This lithological classification helped in revealing a stratigraphical picture of the relative preponderance of different ore types.
- 4.1.4The iron ore in nature is not homogeneous, but consists of a mixture of many ore types. Hence, practical approach of demarcating the ore zones based on predominant nature of the lithology/ore substantiated with analytical data have been applied.

4.2.0 TYPES OF ORES

- 4.2.1 Various types of iron ores are derived from haematite viz. massive ore, laminated ore, blue dust and magnetitic ore.

Type of Ore	Characteristic Features
Lateritic	Porous and cavernous in nature
Laminated	Closely spaced laminae, which give rise to Biscuity ores.
Blue dust (-)10 mesh	Ore constituting of haematite and martite
Massive (Hematitic)	No planar structure
Magnetitic ore	Black colour, magnetitic property

- 4.2.2 The blue dust normally consists grain size of 10-15% of (-) 100 mesh size fractions and above 80% of (-) 100 to (-) 325 mesh size.
- 4.2.3 Besides the float ore gets accumulated along the slope and foot hills which are of more pure in iron content. In Ballari-Hospet region also the float ore occurs with >64% Fe. The gangue materials are of shale pieces, banded haematite quartzite, dolerite and clay. If lateritisation is extensive, the alumina to silica ratio will be high.
- 4.2.4 The iron content present in various types of ore has been given below:

Type of Ore	Fe%
-------------	-----

Massive ore(Hematitic)	67.69
Compact laminated ore	67
Powdery ore	65
Laminated ore	65

4.3.0 GRADE CLASSIFICATION

4.3.1 The exploration efforts in 70's were mainly for lumpy ores, while, the fines were not given economic importance. Similarly, exploration will also be required to categorize the ore reserves / resources based on end user's grade classifications. At threshold cutoff of 45% Fe as stipulated by IBM and at 55% Fe cut-off, the mineralized zones within the lease hold area have been delineated and presented in the Table-2 and Table-3 respectively.

Table-2
DETAILS OF IRON ORE ZONE INTERSECTED IN THE BOREHOLES
(AT 45% Fe CUT-OFF)

BH. No.	From (m)	To (m)	Thick-ness (m)	True Thick. (m)	Fe (%)	Sio ₂ (%)	Al ₂ O ₃ (%)
MHGR-1	0.00	39.00	39.00	33.54	45.64	27.70	4.43
	53.00	82.00	29.00	24.94	49.29	19.81	6.40
MHGR-2	0.00	20.00	20.00	17.20	55.72	15.39	2.96
MHGR-4	0.00	63.00	63.00	54.18	54.20	16.36	3.19
MHGR-5	0.00	31.00	31.00	26.66	63.62	3.05	2.15
MHGR-6	0.00	24.00	24.00	20.64	58.98	11.33	1.77
MHGR-7	0.00	110.00	110.00	94.60	54.88	12.28	5.26
MHGR-8	0.00	55.00	55.00	47.30	54.63	16.57	2.20
MHGR-9	0.00	81.00	81.00	69.66	54.57	16.33	1.52
MHGR-10	0.00	60.00	60.00	51.60	55.46	9.75	5.34
MHGR-11	0.00	79.00	79.00	67.94	63.19	4.38	1.08
MHGR-12	0.00	43.00	43.00	36.98	55.53	15.58	2.12
MHGR-14	0.00	52.00	52.00	44.72	65.58	1.79	1.18
MHGR-16	0.00	56.00	56.00	48.16	63.00	3.98	2.07
MHGR-17	0.00	50.00	50.00	43.00	52.55	1.63	9.10
MHGR-18	0.00	59.00	59.00	50.74	66.31	1.97	1.95
MHGR-19	0.00	56.00	56.00	48.16	49.39	2.58	10.03
	67.00	70.00	3.00	2.58	50.72	7.94	10.80
MHGR-20	0.00	67.00	67.00	57.62	65.63	2.04	2.23
MHGR-21	0.00	76.00	76.00	65.36	64.62	2.05	2.76
MHG-22	0.00	1.00	1.00	0.86	50.40	21.29	2.20
	5.05	5.30	0.25	0.22	45.77	32.74	1.31
	8.50	8.65	0.15	0.13	51.52	24.21	1.64
	15.50	16.80	1.30	1.12	46.89	28.16	1.24
MHGR-23	0.00	14.00	14.00	12.04	50.35	19.43	6.26
	64.00	65.00	1.00	0.86	45.02	21.18	9.11
	67.00	70.00	3.00	2.58	48.83	24.06	4.67
MHGR-24	0.00	105.00	105.00	90.30	64.49	4.10	2.53
MHGR-25	0.00	90.00	90.00	77.40	57.47	6.06	7.04
MHGR-26	2.00	15.00	13.00	11.18	45.02	3.57	6.61
	25.00	26.00	1.00	0.86	45.69	8.89	7.83

BH. No.	From (m)	To (m)	Thick-ness (m)	True Thick. (m)	Fe (%)	Sio ₂ (%)	Al ₂ O ₃ (%)
MHG-27	16.70	17.65	0.95	0.82	66.01	1.99	2.27
	27.45	39.00	11.55	9.96	46.56	28.95	2.47
MHGR-28	0.00	57.00	57.00	49.02	50.23	3.47	8.16
MHGR-29	0.00	49.00	49.00	42.14	63.46	0.80	2.89
MHGR-30	0.00	43.00	43.00	36.98	64.27	1.24	2.02
MHGR-31	0.00	62.00	62.00	53.32	64.44	3.30	2.25
MHGR-32	0.00	60.00	60.00	51.60	65.92	1.85	1.47
MHGR-33	0.00	60.00	60.00	51.60	65.72	1.64	2.37
MHGR-34	0.00	59.00	59.00	50.74	58.88	11.40	2.73
MHGR-35	2.00	3.00	1.00	0.86	46.63	6.39	13.81
	6.00	7.00	1.00	0.86	49.85	5.47	11.15
	14.00	22.00	8.00	6.88	49.60	4.18	11.63
MHGR-36	0.00	10.00	10.00	8.60	58.51	11.37	2.61
MHGR-37	1.00	61.00	60.00	51.60	46.26	4.20	11.83
MHGR-38	37.00	41.00	4.00	3.44	51.29	9.84	11.20
MHGR-39	0.00	44.00	44.00	37.84	62.43	6.63	2.69
MHGR-40	0.00	28.00	28.00	24.08	59.03	7.05	4.77
MHG-41	0.00	31.45	31.45	27.07	53.12	12.09	8.19
MHG-42	0.00	43.95	43.95	37.79	60.26	8.70	3.68
MHG-43	0.00	47.20	47.20	40.65	66.05	1.71	2.13
MHG-44	0.00	35.20	35.20	30.33	58.48	4.49	4.51
MHG-45	0.00	83.25	83.25	71.71	58.82	2.92	5.27
MHG-46	0.00	28.30	28.30	24.36	60.05	8.52	1.51
MHG-47	0.00	41.40	41.40	35.69	57.67	7.87	4.32
MHG-48	0.00	43.25	43.25	37.20	48.69	1.90	13.84

Table-3:
DETAILS OF IRON ORE ZONE INTERSECTED IN THE BOREHOLES
(At 55% Fe CUT-OFF)

BH. No.	From (m)	To (m)	True Thick. (m)	Fe (%)	Sio ₂ (%)	Al ₂ O ₃ (%)
MHGR-1	0.00	15.00	12.90	56.83	15.08	2.32
	55.00	57.00	1.72	55.57	12.92	6.62
	64.00	72.00	6.88	56.45	13.35	4.87
	76.00	82.00	5.16	55.47	15.89	4.12
MHGR-2	0.00	18.00	15.48	55.99	15.11	3.11
MHGR-4	0.00	40.00	34.40	60.80	6.10	4.12
MHGR-5	0.00	30.00	25.80	63.91	2.64	2.17
MHGR-6	0.00	16.00	13.76	64.90	2.72	2.04
MHGR-7	0.00	89.00	76.54	58.59	5.64	6.15
MHGR-8	0.00	36.00	30.96	61.18	7.43	2.59
MHGR-9	1.00	50.00	42.14	64.29	3.25	1.87
	80.00	81.00	0.86	68.01	1.15	0.42
MHGR-10	0.00	55.00	47.30	56.55	7.72	5.57
MHGR-11	0.00	75.00	64.50	64.06	3.12	1.10
MHGR-12	0.00	26.00	22.36	61.85	5.87	2.07
MHGR-14	0.00	52.00	44.72	65.58	1.79	1.18

BH. No.	From (m)	To (m)	True Thick. (m)	Fe (%)	Sio ₂ (%)	Al ₂ O ₃ (%)
MHGR-16	1.00	56.00	47.30	63.16	3.93	2.03
MHGR-17	1.00	12.00	9.46	55.24	1.89	7.68
	23.00	27.00	3.44	59.75	1.50	4.00
	39.00	45.00	5.16	56.12	1.39	6.90
MHGR-18	0.00	57.00	49.02	66.81	1.44	1.78
MHGR-19	17.00	19.00	1.72	59.50	1.47	5.39
	25.00	43.00	15.48	55.64	1.53	6.56
MHGR-20	0.00	66.00	56.76	65.92	1.63	2.25
MHGR-21	0.00	76.00	65.36	64.62	2.05	2.76
MHGR-23	0.00	8.00	6.88	60.75	3.28	9.19
MHGR-24	0.00	97.00	83.42	66.76	1.17	2.27
MHGR-25	2.00	90.00	75.68	57.60	6.11	6.94
MHG-27	16.70	17.65	0.82	66.01	1.99	2.27
	27.45	31.15	3.20	61.15	7.03	2.52
MHGR-28	18.00	19.00	0.86	56.47	2.14	6.00
	21.00	30.00	7.74	56.47	1.48	5.40
	33.00	45.00	10.32	55.14	1.82	6.10
MHGR-29	0.00	47.00	40.42	64.12	0.79	2.60
MHGR-30	0.00	42.00	36.12	64.50	1.24	1.96
MHGR-31	1.00	59.00	49.88	65.35	2.46	2.11
MHGR-32	0.00	60.00	51.60	65.92	1.85	1.47
MHGR-33	0.00	60.00	51.60	65.72	1.64	2.37
MHGR-34	0.00	42.00	36.12	64.94	2.09	3.17
MHGR-36	0.00	10.00	8.60	58.51	11.37	2.61
MHGR-37	43.00	44.00	0.86	56.48	1.29	6.62
	45.00	48.00	2.58	55.65	1.20	6.67
MHGR-38	39.00	40.00	0.86	60.36	5.00	5.95
MHGR-39	0.00	41.00	35.26	63.40	5.16	2.75
MHGR-40	0.00	25.00	21.50	60.27	4.51	5.16
MHG-41	0.00	19.20	16.54	60.69	3.78	7.01
	30.45	31.45	0.86	64.98	1.09	5.17
MHG-42	0.00	35.50	30.52	65.31	1.24	3.95
MHG-43	0.00	45.20	38.92	66.88	1.19	1.67
MHG-44	1.00	33.80	28.27	59.11	2.96	4.65
MHG-45	0.00	83.25	71.71	58.82	2.92	5.27
MHG-46	0.00	24.25	20.87	63.21	3.85	1.39
MHG-47	0.00	41.40	35.69	57.67	7.87	4.32
MHG-48	10.75	23.00	10.55	66.46	0.86	0.90

4.4.0 DEPTH PERSISTANCE

4.4.1 The general mode of occurrence of haematite deposits which, form bulk of the ore resources in the country, is in the form of surface enrichment. But there are areas like NEB range in Ballari-Hospet, Bailadila Range, Goa, etc., where the ore is in the form of pure sedimentary beds with steep dips as 'reefs'. The average depth range of the mineralised zone proved by the present exploration in the present mine lease area is 48.21m only. However, iron ore persists even beyond the level of 855.583m. Further, at 35% Fe Cut-off the mineralized zone persists up to 782.00m RL, and even beyond the explored depth as could be viewed from the geological cross sections S1-S1' to S13-S13' (Plate-VA to VC).

4.4.2 The details of mineralized zone delineated in the borehole at 35% Fe is given below:

Table-4: Details of mineralized zone at 35% Fe cut-off

BH. No.	From (m)	To (m)	True Thick. (m)	Fe (%)	SiO ₂ (%)	Al ₂ O ₃ (%)
MHGR-1	0.00	95.00	81.70	43.29	27.42	6.24
MHGR-2	0.00	50.00	43.00	43.35	31.66	1.85
MHGR-3	11.00	22.00	9.46	36.01	18.50	15.93
	40.00	49.00	7.74	36.96	30.75	8.24
MHGR-4	0.00	77.00	66.22	50.90	20.97	2.82
MHGR-5	0.00	83.00	71.38	46.91	28.32	1.28
MHGR-6	0.00	65.00	55.90	44.77	32.43	1.21
MHGR-7	0.00	110.00	94.60	54.88	12.28	5.26
MHGR-8	0.00	55.00	47.30	54.63	16.57	2.20
MHGR-9	0.00	100.00	86.00	51.09	21.36	1.35
MHGR-10	0.00	75.00	64.50	52.36	15.90	4.52
MHGR-11	0.00	82.00	70.52	62.20	5.86	1.06
MHGR-12	0.00	54.00	46.44	51.40	20.33	1.96
MHGR-13	0.00	22.00	18.92	38.15	12.16	11.01
	47.00	50.00	2.58	35.80	14.38	12.39
MHGR-14	0.00	78.00	67.08	55.27	16.58	1.20
MHGR-15	17.00	18.00	0.86	36.00	6.58	9.92
MHGR-16	0.00	56.00	48.16	63.00	3.98	2.07
MHGR-17	0.00	50.00	43.00	52.55	1.63	9.10
MHGR-18	0.00	63.00	54.18	64.32	4.67	2.04
MHGR-19	0.00	70.00	60.20	46.05	6.28	12.71
MHGR-20	0.00	72.00	61.92	63.55	5.15	2.15
MHGR-21	0.00	76.00	65.36	64.62	2.05	2.76
MHG-22	0.00	50.00	42.98	36.46	42.12	1.22
MHGR-23	0.00	77.00	66.22	38.98	37.35	3.41
MHGR-24	0.00	105.00	90.30	64.49	4.10	2.53
MHGR-25	0.00	97.00	83.42	56.11	8.57	6.62
MHGR-26	0.00	50.00	43.00	37.34	11.92	12.17
MHG-27	7.50	7.70	0.17	43.47	13.61	11.54
	16.70	39.00	19.22	36.61	27.23	11.15
	41.35	47.15	4.99	35.09	45.72	3.11
MHGR-28	0.00	57.00	49.02	50.23	3.47	8.16
MHGR-29	0.00	55.00	47.30	60.13	2.35	4.39
MHGR-30	0.00	45.00	38.70	63.29	1.23	2.40
MHGR-31	0.00	92.00	79.12	55.21	16.06	1.96
MHGR-32	0.00	60.00	51.60	65.92	1.85	1.47
MHGR-33	0.00	77.00	66.22	58.64	6.01	5.54
MHGR-34	0.00	70.00	60.20	55.78	16.16	2.57
MHGR-35	2.00	24.00	18.92	42.49	7.33	15.81
MHGR-36	0.00	60.00	51.60	39.51	36.36	3.62
MHGR-37	0.00	61.00	52.46	46.20	4.27	11.88
MHGR-38	22.00	30.00	6.88	39.99	16.32	16.69
	37.00	41.00	3.44	51.29	9.84	11.20
MHGR-39	0.00	50.00	43.00	59.76	10.47	2.59
MHGR-40	0.00	47.00	40.42	50.28	17.42	6.18

BH. No.	From (m)	To (m)	True Thick. (m)	Fe (%)	SiO ₂ (%)	Al ₂ O ₃ (%)
MHG-41	0.00	38.20	32.88	50.12	17.69	7.07
MHG-42	0.00	63.40	54.51	52.70	19.70	3.21
MHG-43	0.00	47.75	41.12	65.74	1.94	2.23
MHG-44	0.00	37.40	32.22	57.35	6.70	4.31
MHG-45	0.00	85.00	73.21	58.35	3.82	5.19
MHG-46	0.00	36.00	30.98	55.59	15.84	1.39
MHG-47	0.00	43.00	37.07	56.97	9.19	4.18
MHG-48	0.00	62.50	53.75	43.27	6.98	14.94

4.5.0 MINERALISATION FACTOR

4.5.1 Mineralogy of an iron deposit has a great influence in the ore treatment characteristics and economics. Magnetite is recoverable by relatively simple, economical magnetic separation while, haematite, goethite, siderite require expensive roasting or flotation processes. Although when the grains are coarse, haematite ore may get treated with low cost. Mineralisation factor is the ratio of net ore bearing area to gross area. It is referred as the co-efficient of impurities. Out of the mining lease area of 0.6066 sq. km., the mineralized area is 0.418 Sq.km. Hence, the mineralization factor for Shri. H.G.Rangangoud Mine Lease Area (ML No.2148) is 0.689.

4.6.0 PHYSICAL CHARACTERISTICS OF ORE

4.6.1 The types of ore present in this block are lateritic ore, massive $\pm$ laminated, soft laminated, blue dust, Limonitic ore, powdery, siliceous ore and magnetitic ore.

4.6.2 Principal ore minerals are haematite + magnetite, goethite and limonite. The iron content ranges from 62.7% to 65.5% in blue dust. However, in Shri. H.G.Rangangoud Mine Lease Area (ML No.2148) soft laminated ore has also been encountered.

4.6.3 The physical characteristics of the hematite ore is its natural size as lumps and fines, further mechanical crushing of ore for feeding into the blast furnace also creates fines and super fines.

4.7.0 CHEMICAL CHARACTERISTICS OF THE IRON ORE

4.7.1 In the entire deposit, the high grade ore is almost free from lateritisation and the laterite area is very less (2-3%). The haematitic ore persists even beyond the level of exploration as could be visualize from the geological cross sections (S1 to S-13 – Plate-V).

4.7.2 Silica to Alumina ratio ranges between 0.0930 and 7.284 with the average of 1.070 indicating low level of lateritisation. The ore are in general, rich in iron (>45%Fe), but they also contain 1-7% Al₂O₃ and the ore deposits normally have Al₂O₃: Fe ratio varies between 0.0956 and 0.296

CHAPTER-5

5.0.0 METHOD OF RESERVE ESTIMATION

5.1.0 RESERVE ESTIMATION BY GEOLOGICAL CROSS-SECTION

- 5.1.1 The iron ore reserves have been estimated by geological cross section method. In order to delineate the ore and non-ore, the grade or threshold value of 45% Fe has been adopted, thus non ore above and below ore zones has been demarcated. The rule of gradual change or law of linear function has been applied [Constantine C. Popoff, 1965] along with the rule of nearest points for application of influence of half way between successive boreholes.
- 5.1.2 At threshold cutoff of 45% Fe as stipulated by IBM, the mineralized zone within the lease hold area, the ore reserves are estimated.
- 5.1.3 A total of cross sections serially numbered S1-S1' to S13-S13' from west to east along N50°E-S50°W have been prepared (Plate-V). Based on the interpretation of sub surface borehole qualitative data along with surface geological data, which is perpendicular to general strike of the ore body. A typical geological cross section S9-S9' is given as Text Plate-2.
- 5.1.4 Dip continuity up to 50.0 m on either side of the iron ore intersection of the borehole has been placed under (G1) and beyond 50 meters up to 100m has been placed under G2 Category of UNFC.
- 5.1.5 In order to derive the true horizontal and vertical thicknesses, corrections were applied. Thus for strike correction and dip correction, the factor of 1.154 and 0.86 have been applied respectively. (page-9, Fig.2 computing reserves of mineral deposits – Washington. US Dept. of the Interior, Bureau of Mines – 1966-Popoff, Constaine C).
- 5.1.6 A call factor of 10% reduction has been applied to arrive the net geological reserves.

5.2.0 GRADE CLASSIFICATION

- 5.2.1 The iron ore zone has been classified at 45% Fe and 55% Fe respectively, which, has also been demarcated separately.
- 5.2.2 Litho-units such as ferruginous shale, siliceous iron ore (enriched BHQ) with more than 45% Fe occasionally, or at places, when it falls within the rich zone, owing to thin parting nature of non ore, have also been included in the ore zone.
- 5.2.3 The grade wise zones demarcated are given in table-2 and 3.

5.2.0 SHAPE OF THE ORE BODY

- 5.2.1 The shape of the ore body on the cross section line has been obtained by interpretation and correlation of the borehole data. Each borehole gives a point for the location in space of the ore bottom which, in general is BHQ.
- 5.2.2 The possibility of the ore body being in the nature of folded sedimentary bed, behaving as a stratigraphic unit was considered. The alternative hypothesis of the ore body, being a leached and replaced portion of some pre-existing rock, in this case the BHQ, appeared to be more realistic and adopted for determination of the ore bottom configuration. The ore bottom was delineated by joining intersection on adjacent boreholes through smooth lines, though these lines may cut across the general dip of the formation.
- 5.2.3 The shape of the non ore consisting mostly of BHQ has been ascertained by joining the upper limit of the ore zone [$>45\%$ Fe] in adjacent boreholes. However, in certain cases the thickness of non ore zone [$< 45\%$ Fe], at times ranges between 35% Fe to 45% Fe. Hence, at the planning cutoff of 35% Fe, the mineralized zone has been demarcated and presented in the Table-3 for better utilization of mineralised zone containing iron contents.
- 5.2.4 The intercalation of ferruginous clay/shale and remnant BHQ in the ore body has been consistently of higher side.
- 5.2.5 Influence of each cross section has been taken up to half the distance following “rule of gradual change” and “rule of nearest point”. However at the extreme end of the area of exploration (S1-S1’ and S13-S13’) sectional influence up to buffer zone of mine lease area (7.5m from mine lease boundary) has been considered.
- 5.2.6 Magnetic ore occur along 710.00m strike length between sections S1 – S7, over an average wide area of 83.45m with an average true thick of 35.50m. The study on composite analysis confirms the presence of magnetitic iron in the range of 1.16% to 67.23% and the ferrous iron ranges between 0.36% and 20.88%. The LOI ranges between 0.20 and 0.40 and GOI ranges between 1.30 and 11.50.
- 5.2.7 Owing to the sporadic (MHGR-1 and MHGR-2) nature of occurrence, the reserves of magnetitic ore has not been made.
- 5.2.8 However, by considering the continuity of magnetite mineralisation in boreholes MHGR-1 and MHGR-2, which are adjacent boreholes, an attempt has been made to estimate the magnetite resources. The ore resources estimated is 1.220 m.t with an average grade of 44.99% Fe.

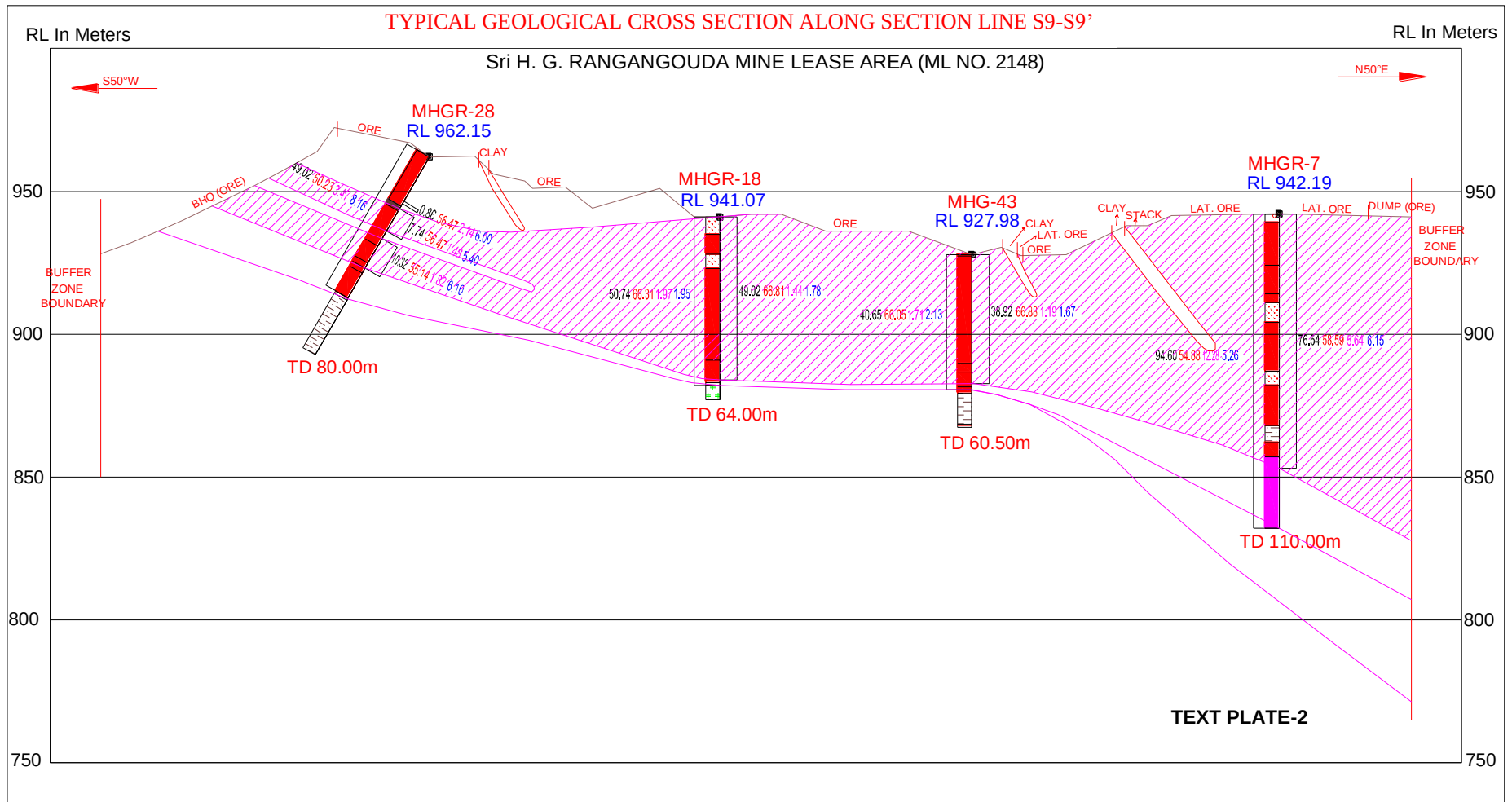
5.3.0 GEOMETRY OF THE ORE BODY

- 5.3.1 Over the entire mining lease area, from east to west, the iron ore zone occur as two different zone as main band and western band. The geometry of the various iron ore bands are as follows:

Cross Section	Strike length (m)	Average thick (m)	Grade Fe%	Cut-off Fe%	Remarks
S1 – S1' to S13 – S13'	1300.40	52.65	58.84	45	Haematitic ore
S1 – S1' to S13 – S13'	1300.40	49.32	62.75	55	Haematitic ore
S4 – S4'	99.30	17.63	44.99	Based on total Fe.	Magnetitic ore (MHGR-1 and MHGR-2)

5.3.2 Based on the geological prudence, the above mentioned behaviour of the ore zone has been deciphered and delineated.

5.3.3 An intrusion of ferruginous clay occurs between bands, within the total wide area of 240-370m between S1 – S7 and S8 – S11. The iron formation trends NNW-SSE with easterly dip 50°-70°. A remnant BHQ formation has been noticed intermittently.



5.4.0 ESTIMATION OF RESERVES / RESOURCES AND GRADE

- 5.4.1 After delineating the limit of the ore zones at >45% and boundaries of different litho-units, geometry of the ore body have been deciphered and demarcated. Any zone with value 45%-55% Fe and >55% Fe have also been delineated. The same has been plotted on to the respective cross sections. (Plate-VA to VC). The sectional area of the ore zone has been computed by the software using AutoCAD map.
- 5.4.2 Ore resource tonnage has been estimated by multiplying the volume with the tonnage factor of specific gravity of 3.50. The sum has been considered as geological in-situ reserves.
- 5.4.3 At the back drop of iron ore extraction from the lease hold area over an average strike length of 1700m over an average wide area of 240.00m – 370.00m, the iron ore has been mined intermittently up to the quite appreciable vertical depth, which allow us to presume that the iron ore zone has both wide lateral and vertical persistence. Moreover, iron ore has been extracted from Kumaraswamy range not only by NMDC but also by SMIORE since Independence. However, Dalmia International has been extracting the ore from NEB range since Independence only for export. Therefore, UNFC code pertains to geological axis of (G1) have been assigned. The estimation of ore reserves at 45% Fe cut off is given in Table-5.
- 5.4.4 A total of 63.331 m.t. of net reserves with average grade of 58.84 % Fe, 6.54 % SiO₂ and 4.25 % Al₂O₃ has been estimated.
- 5.4.5 A rich ore zone intersection at 55% Fe cut-off has also been demarcated in every geological cross section and has been estimated in the mine lease area. A total of 48.102 m.t. of net reserves with average grade of 62.75 % Fe, 3.40 % SiO₂ and 3.25 % Al₂O₃ has been estimated at 55% Fe cut-off. The same has been depicted in Table-6.
- 5.4.6 The behavior of ore bands has been studied along NW-SE direction as well as along the foliation plane in N37°W-S37°E reveals that the ore body persistence and tendency of folding nature of the iron ore. The ore persists even beyond the explored depth of 817.059m RL (MHGR-24).
- 5.4.7 Though the ore zone thickness is quite impressive at 45% Fe cut-off, an attempt has also been made to evaluate the ore resources at a planning cut-off of 35% Fe. The mineralized zone has been persistence over the entire strike length of 1700m along the wide area of 240m – 370m with an average thickness of 60.19m and the ore resources estimated is 88.99 million tonnes with the grade of 53.0 % Fe, 13.95% SiO₂ and 4.53% Al₂O₃.

TABLE-5
SECTION-WISE - BOREHOLE-WISE ORE RESERVES BY CROSS SECTION METHOD (at 45 % Fe cut-off)
SHRI H.G. RANGANGOUD MINE LEASE AREA ML NO. 2148

Section Number	Borehole Number	Intersection (m)		Diff. (m)	True Width (m)	Average Sectional Influence (m)	Area G1 (Sq. m)	Area G2 (Sq. m)	Reserves (G1)	Reserves (G2)	Total Reserves (Tonnes)	Grade (%)		
		From	To									Fe	SiO ₂	Al ₂ O ₃
S1	MHG 44	0.00	35.20	35.20	30.27	88.00	1475.2737		450949.15		450949.15	58.48	4.49	4.51
S2	MHGR 8	0.00	55.00	55.00	47.30	101.20	4739.7189		1666116.64		1666116.64	54.63	16.57	2.20
	MHGR 16	0.00	56.00	56.00	48.16	101.20	4350.5635		1529319.86		1529319.86	63.00	3.98	2.07
S3	MHGR 12	0.00	43.00	43.00	36.98	102.30	2914.5600		1035668.91		1035668.91	55.53	15.58	2.12
	MHG 41	0.00	31.45	31.45	27.05	102.30	2282.7022		811142.57		811142.57	53.12	12.09	8.18
	MHG 46	0.00	28.30	28.30	24.34	102.30	2882.8765		1024410.39		1024410.39	60.05	8.52	1.51
S4	MHGR 6	0.00	24.00	24.00	20.64	98.40	1932.6893		660586.12		660586.12	58.98	11.33	1.77
	MHGR 2	0.00	20.00	20.00	17.20	98.40	1510.8450		516401.29		516401.29	55.72	15.39	2.96
	MHGR 1	0.00	39.00	39.00	33.54	98.40	3134.2180		1071264.23		1071264.23	45.64	27.70	4.43
		53.00	82.00	29.00	24.94	98.40	2176.9159		744061.88		744061.88	49.29	19.81	6.40
	MHGR 39	0.00	44.00	44.00	37.84	98.40	3195.3139		1092146.58		1092146.58	62.43	6.63	2.69
S5	MHGR 5	0.00	31.00	31.00	26.66	99.10	2339.3290		805262.11		805262.11	63.62	3.05	2.15
	MHG 27	27.45	39.00	11.55	9.93	99.10	1935.0892		666111.53		666111.53	46.56	28.95	2.47
	MHGR 4	0.00	63.00	63.00	54.18	99.10	2739.4055		942979.57		942979.57	54.20	16.36	3.19
S6	MHGR 40	0.00	28.00	28.00	24.08	100.00	2711.9396		942003.07		942003.07	59.03	7.05	4.77
	MHGR 34	0.00	59.00	59.00	50.74	100.00	3675.4885		1276695.63		1276695.63	58.88	11.40	2.73
	MHG 22	15.50	16.80	1.30	1.12	100.00	546.2268		189734.06		189734.06	46.89	28.16	1.24
	MHGR 10	0.00	60.00	60.00	51.60	100.00	2833.6585		984282.61		984282.61	55.46	9.75	5.34
S7	MHGR 32	0.00	60.00	60.00	51.60	102.00	6391.5530		2264534.13		2264534.13	65.92	1.85	1.47
	MHG 47	0.00	41.40	41.40	35.60	102.00	3738.0634		1324399.90		1324399.90	57.67	7.87	4.32
	MHGR 31	0.00	62.00	62.00	53.32	102.00	4881.6363		1729569.01		1729569.01	64.44	3.30	2.25
	MHGR 21	0.00	76.00	76.00	65.36	102.00	7554.3200		2676503.73		2676503.73	64.62	2.05	2.76

Section Number	Borehole Number	Intersection (m)		Diff. (m)	True Width (m)	Average Sectional Influence (m)	Area G1 (Sq. m)	Area G2 (Sq. m)	Reserves (G1)	Reserves (G2)	Total Reserves (Tonnes)	Grade (%)		
		From	To									Fe	SiO ₂	Al ₂ O ₃
S8	MHGR 30	0.00	43.00	43.00	36.98	100.20	3251.9678		1131843.19		1131843.19	64.27	1.24	2.02
	MHGR 14	0.00	52.00	52.00	44.72	100.20	4722.6746		1643720.79		1643720.79	65.58	1.79	1.18
	MHGR 11	0.00	79.00	79.00	67.94	100.20	7501.9085		2611029.56		2611029.56	63.19	4.38	1.08
	MHGR 25	0.00	90.00	90.00	77.40	100.20	11819.9562		4113920.48		4113920.48	57.47	6.06	7.04
S9	MHGR 28	0.00	57.00	57.00	49.02	101.50	5787.0220		2040297.42		2040297.42	50.23	3.47	8.16
	MHGR 18	0.00	59.00	59.00	50.74	101.50	6204.0748		2187335.35		2187335.35	66.31	1.97	1.95
	MHG 43	0.00	47.20	47.20	40.59	101.50	5413.0721	104.3339	1908456.03	36784.41	1945240.44	66.05	1.71	2.13
	MHGR 7	0.00	110.00	110.00	94.60	101.50	10529.3263	2378.7869	3712264.66	838675.36	4550940.02	54.88	12.28	5.26
S10	MHGR 26	2.00	15.00	13.00	11.18	98.10	1621.7585		552621.14		552621.14	45.02	3.57	6.61
	MHGR 33	0.00	60.00	60.00	51.60	98.10	5914.0385	3193.7035	2015233.90	1125985.87	3141219.77	65.72	1.64	2.37
	MHGR 36	0.00	10.00	10.00	8.60	98.10	862.4636		293888.16		293888.16	58.51	11.37	2.61
	MHGR 9	0.00	81.00	81.00	69.66	98.10	3610.5506		1230310.55		1230310.55	54.57	16.33	1.52
S11	MHGR 17	0.00	50.00	50.00	43.00	98.30	4087.7513		1395758.52		1395758.52	52.55	1.63	9.10
	MHG 48	0.00	43.25	43.25	37.20	98.30	4213.6250		1438737.97		1438737.97	48.69	1.90	13.84
	MHG 42	0.00	43.95	43.95	37.80	98.30	4009.9478		1369192.59		1369192.59	60.26	8.70	3.68
	MHGR 23	0.00	14.00	14.00	12.04	98.30	1842.2676		629040.40		629040.40	50.35	19.43	6.26
		67.00	70.00	3.00	2.58	98.30	538.0445		183714.75		183714.75	48.83	24.06	4.67
S12	MHGR 19	0.00	56.00	56.00	48.16	104.00	4929.6400		1780823.38		1780823.38	49.39	2.58	10.03
		67.00	70.00	3.00	2.58	104.00	236.6772		85499.20		85499.20	50.72	7.94	10.80
	MHGR 29	0.00	49.00	49.00	42.14	104.00	5062.7507		1828909.37		1828909.37	63.46	0.80	2.89
	MHGR 24	0.00	105.00	105.00	90.30	104.00	9262.5605		3346082.94		3346082.94	64.49	4.10	2.53
	MHG 45	0.00	83.25	83.25	71.60	104.00	6669.7546		2409436.58		2409436.58	58.82	2.92	5.27

Section Number	Borehole Number	Intersection (m)		Diff. (m)	True Width (m)	Average Sectional Influence (m)	Area G1 (Sq. m)	Area G2 (Sq. m)	Reserves (G1)	Reserves (G2)	Total Reserves (Tonnes)	Grade (%)		
		From	To									Fe	SiO ₂	Al ₂ O ₃
S13	MHGR 35	14.00	22.00	8.00	6.88	107.30	1337.5342		498513.50		498513.50	49.60	4.18	11.63
	MHGR 37	1.00	61.00	60.00	51.60	107.30	4488.4519		1672894.69		1672894.69	46.26	4.20	11.83
	MHGR 38	37.00	41.00	4.00	3.44	107.30	1286.3006		479418.18		479418.18	51.29	9.84	11.20
	MHGR 20	0.00	67.00	67.00	57.62	107.30	9130.2243		3402933.59		3402933.59	65.63	2.04	2.23
Geological In-situ Reserves									68366019.87		70367465.51	58.84	6.54	4.25
Net Reserves (Tonnes)									61529417.88		63330718.96			
Net Reserves (Million Tonnes)											63.331			

TABLE-6
SECTION-WISE - BOREHOLE-WISE ORE RESERVES BY CROSS SECTION METHOD (at 55 % Fe cut-off)
SHRI H.G. RANGANGOUD MINE LEASE AREA (ML NO. 2148)

Section Number	Borehole Number	Intersection (m)		Diff (m)	True Width (m)	Average Sectional Influence (m)	Area G1 (Sq. m)	Area G2 (Sq. m)	Reserves (G1)	Reserves (G2)	Total Reserves (Tonnes)	Grade (%)		
		From	To									Fe	SiO ₂	Al ₂ O ₃
S1	MHG 44	1.00	33.80	32.80	28.21	88.00	1345.6743		411334.31		411334.31	59.11	2.96	4.65
S2	MHGR-8	0.00	36.00	36.00	30.96	101.20	3097.8598		1088966.64		1088966.64	61.18	7.43	2.59
	MHGR-16	1.00	56.00	55.00	47.30	101.20	4143.3060		1456464.24		1456464.24	63.16	3.93	2.03
S3	MHGR-12	0.00	26.00	26.00	22.36	102.30	1346.8161		478581.86		478581.86	61.85	5.87	2.07
	MHG-41	0.00	19.20	19.20	16.51	102.30	1425.0321		506375.38		506375.38	60.69	3.78	7.01
	MHG-46	0.00	24.25	24.25	20.86	102.30	2332.5023		828838.70		828838.70	63.21	3.85	1.39
S4	MHGR-6	0.00	16.00	16.00	13.76	98.40	1228.2844		419823.11		419823.11	64.90	2.72	2.04
	MHGR-2	0.00	18.00	18.00	15.48	98.40	1096.1473		374659.13		374659.13	55.99	15.11	3.11
	MHGR-1	0.00	15.00	15.00	12.90	98.40	1523.6071		520763.32		520763.32	56.83	15.08	2.32
		55.00	57.00	2.00	1.72	98.40	219.9330		75172.29		75172.29	55.57	12.92	6.62
		64.00	72.00	8.00	6.88	98.40	560.9235		191721.60		191721.60	56.45	13.35	4.87
		76.00	82.00	6.00	5.16	98.40	409.4336		139942.90		139942.90	55.47	15.89	4.12
	MHGR-39	0.00	41.00	41.00	35.26	98.40	2660.8761		909477.70		909477.70	63.40	5.16	2.75
S5	MHGR-5	0.00	33.00	33.00	28.38	99.10	2338.3061		804910.00		804910.00	63.91	2.64	2.17
	MHG-27	27.45	31.15	3.70	3.18	99.10	808.0117		278140.10		278140.10	61.15	7.03	2.52
	MHGR-4	0.00	40.00	40.00	34.40	99.10	1123.1079		386604.98		386604.98	60.80	6.10	4.12
S6	MHGR 40	0.00	25.00	25.00	21.50	100.00	2222.1430		771870.26		771870.26	60.27	4.51	5.16
	MHGR 34	0.00	42.00	42.00	36.12	100.00	2655.8115		922506.75		922506.75	64.94	2.09	3.17
	MHGR 10	0.00	55.00	55.00	47.30	100.00	2530.2647		878897.56		878897.56	56.55	7.72	5.57

Section Number	Borehole Number	Intersection (m)		Diff (m)	True Width (m)	Average Sectional Influence (m)	Area G1 (Sq. m)	Area G2 (Sq. m)	Reserves (G1)	Reserves (G2)	Total Reserves (Tonnes)	Grade (%)		
		From	To									Fe	SiO ₂	Al ₂ O ₃
S7	MHGR 32	0.00	60.00	60.00	51.60	102.00	6391.5530		2264534.13		2264534.13	65.92	1.85	1.47
	MHG 47	0.00	41.40	41.40	35.60	102.00	3716.9079		1316904.48		1316904.48	57.67	7.87	2.32
	MHGR 31	1.00	59.00	58.00	49.88	102.00	4561.1900		1616034.54		1616034.54	65.35	2.46	2.11
	MHGR 21	0.00	76.00	76.00	65.36	102.00	7549.0450		2674634.80		2674634.80	64.62	2.05	2.76
S8	MHGR 30	0.00	42.00	42.00	36.12	100.20	3147.8395		1095601.47		1095601.47	64.50	1.24	1.96
	MHGR 14	0.00	52.00	52.00	44.72	100.20	4668.6991		1624934.69		1624934.69	65.58	1.79	1.18
	MHGR 11	0.00	75.00	75.00	64.50	100.20	7280.4969		2533967.54		2533967.54	64.06	3.12	1.10
	MHGR 25	2.00	90.00	88.00	75.68	100.20	11002.9957		3829578.44		3829578.44	57.60	6.11	6.94
S9	MHGR 28	21.00	30.00	9.00	7.74	101.50	1036.0841		365286.28		365286.28	56.47	1.48	5.40
		33.00	45.00	12.00	10.32	101.50	1353.4264		477169.84		477169.84	55.14	1.82	6.10
	MHGR 18	0.00	57.00	57.00	49.02	101.50	5388.5950		1899826.28		1899826.28	66.81	1.44	1.78
	MHG 43	0.00	45.20	45.20	38.87	101.50	5018.5093		1769347.27		1769347.27	66.88	1.19	1.67
	MHGR 7	0.00	89.00	89.00	76.54	101.50	8653.9978		3051090.76		3051090.76	58.59	5.64	6.15
S10	MHGR 33	0.00	60.00	60.00	51.60	98.10	5914.0385	3193.7035	2015233.90	1088268.12	3103502.01	65.72	1.64	2.37
	MHGR 36	0.00	10.00	10.00	8.60	98.10	614.5743		209418.82		209418.82	58.51	11.37	2.61
	MHGR 9	1.00	50.00	49.00	42.14	98.10	2224.5880		758037.87		758037.87	64.29	3.25	1.87
S11	MHGR 17	1.00	12.00	11.00	9.46	98.30	598.4874		204352.91		204352.91	55.24	1.89	7.68
		23.00	27.00	4.00	3.44	98.30	305.3804		104271.83		104271.83	59.75	1.50	4.00
		39.00	45.00	6.00	5.16	98.30	606.6604		207143.58		207143.58	56.12	1.39	6.90
	MHG 48	10.75	23.00	12.25	10.54	98.30	1633.7568		557844.60		557844.60	66.46	0.86	0.90
	MHG 42	0.00	35.50	35.50	30.53	98.30	2973.4813		1015292.16		1015292.16	65.31	1.24	3.95
	MHGR 23	0.00	8.00	8.00	6.88	98.30	1250.7571		427069.74		427069.74	60.75	3.28	9.19

Section Number	Borehole Number	Intersection (m)		Diff (m)	True Width (m)	Average Sectional Influence (m)	Area G1 (Sq. m)	Area G2 (Sq. m)	Reserves (G1)	Reserves (G2)	Total Reserves (Tonnes)	Grade (%)		
		From	To									Fe	SiO ₂	Al ₂ O ₃
S12	MHGR 19	17.00	19.00	2.00	1.72	104.00	175.0436		63234.18		63234.18	59.50	1.47	5.39
		25.00	43.00	18.00	15.48	104.00	1587.3367		573422.46		573422.46	55.64	1.53	6.65
	MHGR 29	0.00	47.00	47.00	40.42	104.00	3967.8981		1433395.89		1433395.89	64.12	0.79	2.60
	MHGR 24	0.00	97.00	97.00	83.42	104.00	8427.0149		3044243.63		3044243.63	66.76	1.17	2.27
	MHG 45	0.00	83.25	83.25	71.60	104.00	6663.8514		2407304.06		2407304.06	58.82	2.92	5.27
S13	MHGR 37	45.00	48.00	3.00	2.58	107.30	260.1038		96943.51		96943.51	55.65	1.20	6.67
	MHGR 20	0.00	66.00	66.00	56.76	107.30	8792.3443		3277002.05		3277002.05	65.92	1.63	2.25
Geological In-situ Reserves									52358172.53		53446440.64	62.75	3.40	3.25
Net Reserves (Tonnes)									47122355.27		48101796.58			
Net Reserves (Million Tonnes)											48.102			

CHAPTER-6

6.0.0 RELIABILITY OF ESTIMATION

6.1.0 FREQUENCY DISTRIBUTION

- 6.1.1 The entire primary sample data has been subjected to statistical evaluation and it is inferred that the frequency distribution is highly skewed as could be seen from the Text Plate-4, 5 and 6.

The statistical parameters estimated for primary sample (entire) data (3071 samples) is as follows:

No. of Samples	Fe	SiO ₂	Al ₂ O ₃
Mean	55.0	15.0	5.5
Standard deviation	0.05	0.107	0.163
Variance	0.002	0.01	0.026
Upper limit	1.000	1.007	1.011
Lower limit	1.000	0.9927	0.9895
Confidence interval at 90%			
Sichel's "T" estimator	1.000	1.010	1.020

- 6.1.2 The sample data 2248 nos. pertain to the ore zone (>45% Fe) have been subjected to statistical evaluation, the iron value distribution is log- normal as could be seen from the Text Plate-7, 8 and 9 The Sichel's "t" estimator is 59.162%,5.041% and 4.420 % respectively for Fe, SiO₂ and Al₂O₃.

The statistical parameters estimated for primary sample (zone) data (2248 no. of samples) is as follows:

No. of Samples	Fe	SiO ₂	Al ₂ O ₃
Mean	58.0	4.0	3.4
Standard deviation	0.03	0.279	0.230
Variance	0.006	0.078	0.053
Upper limit	1.013	1.015	1.011
Lower limit	0.9873	0.9852	0.9895
Confidence interval at 90%			
Sichel's "T" estimator	1.030	1.041	1.020

6.2.0 ACCURACY OF ANALYTICAL PROCEDURE

- 6.2.1 **Bias in Sampling:** A collection of samples may be representative of the entire ore body or only of some accessible portion of the ore body; more often it will be the latter.
- 6.2.2 Hence, the number and sites of samples will require correct assumption as to the ore characteristics and their distribution in the mineralised body.

6.2.3 **Natural Geological bias:** Zoning, leaching, secondary enrichment etc. causes difficulty. To avoid the bias associated with human factor, therefore, for more accurate and reliable results, a rich part and a lean part of the ore body are given an equal attention.

6.2.4 **Grade:** The grade estimates of the deposit are based on the results of samples of the boreholes. Each sample undergoes the process of sample preparation and analysis. Since, sampling and analysis are two complimentary links of quality estimation chain, the possible source of errors, if any, could be from the bias in sample preparation and inaccuracies in assaying or both. The plot of cumulative frequency for Fe, SiO₂ and Al₂O₃ radicals on log probability graph and table values obtained thereby have been produced in the Text Plate-6, 7 and 8 respectively.

6.2.5 **Mean:** The mean value obtained by statistical method as well as calculated values for three variables is given below:

Between S1-S13	Fe%	SiO ₂ %	Al ₂ O ₃ %
Statistical Method (entire data)	58.0	4.0	3.4
Calculated (45% Fe)	58.84	6.54	4.25
Sichel's "t" estimator (entire data)	59.030	7.581	5.261
Calculated (55% Fe)	62.75	3.40	3.25

6.2.6 **Check Sample Analysis:** In order to give reliability on the analysis, 103 nos. of samples have been subjected for check analysis and the details are given in the Annexure-VIII and Text Plate-3. However, on comparing both primary and check analysis the following observations were made and the same is given in Table-9.

Table-7: Comparison of Primary analysis and Check analysis

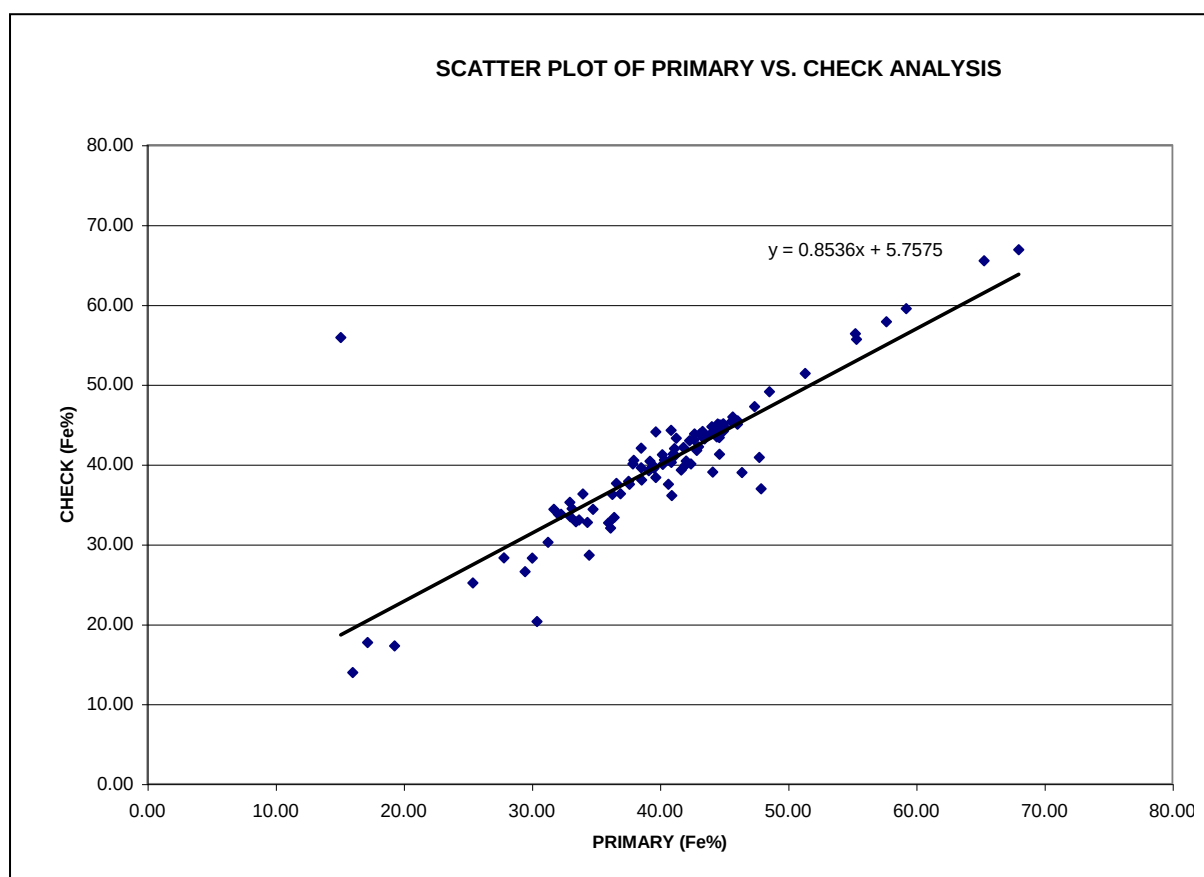
BH.No.	Sample No.	Depth (m)		Primary Fe%	Check Fe%	Difference + / -
		From	To			
MHGR-1	1/11	10.00	11.00	39.22	40.39	-1.17
	1/12	11.00	12.00	43.12	43.81	-0.69
	1/15	14.00	15.00	55.35	55.67	-0.32
	1/20	19.00	20.00	44.06	44.73	-0.67
	1/29	28.00	29.00	48.56	49.10	-0.54
	1/30	29.00	30.00	41.85	42.12	-0.27
	1/37	36.00	37.00	37.56	37.89	-0.33
	1/59	58.00	59.00	51.35	51.39	-0.04
	1/74	73.00	74.00	44.52	45.07	-0.55
MHGR-2	2/10	9.00	10.00	46.08	45.45	0.63
	2/11	10.00	11.00	44.96	45.08	-0.12
	2/21	20.00	21.00	44.99	44.72	0.27
	2/22	22.00	23.00	40.23	39.99	0.24
MHGR-3	3/1	0.00	1.00	17.19	17.71	-0.52

BH.No.	Sample No.	Depth (m)		Primary Fe%	Check Fe%	Difference + / -
		From	To			
MHGR-4	4/1	0.00	1.00	59.23	59.51	-0.28
	4/3	2.00	3.00	39.32	39.51	-0.19
	4/4	3.00	4.00	40.35	40.56	-0.21
	4/56	55.00	56.00	45.58	45.35	0.23
MHGR-5	5/32	31.00	32.00	44.41	44.02	0.39
	5/33	32.00	33.00	44.01	43.84	0.17
	5/34	33.00	34.00	43.02	42.21	0.81
MHGR-6	6/19	18.00	19.00	42.67	43.10	-0.43
	6/20	19.00	20.00	40.19	41.22	-1.03
	6/21	20.00	21.00	44.67	44.96	-0.29
	6/25	23.00	24.00	46.41	38.98	7.43
	6/30	29.00	30.00	44.37	44.51	-0.14
	6/31	30.00	31.00	41.03	41.30	-0.27
	6/32	32.00	33.00	44.78	44.93	-0.15
MHGR-7	7/75	74.00	75.00	27.84	28.29	-0.45
	7/91	90.00	91.00	47.39	47.24	0.15
	7/92	91.00	92.00	43.49	43.20	0.29
MHGR-8	8/10	9.00	10.00	65.31	65.50	-0.19
	8/25	24.00	25.00	41.67	39.28	2.39
	8/34	33.00	34.00	34.34	32.73	1.61
	8/38	37.00	38.00	44.13	39.04	5.09
	8/56	55.00	56.00	15.10	55.90	-40.80
	8/57	56.00	57.00	33.99	36.31	-2.32
MHGR-9	9/33	32.00	33.00	36.92	36.33	0.59
	9/52	51.00	52.00	40.89	40.25	0.64
	9/53	52.00	53.00	37.97	40.52	-2.55
	9/54	53.00	54.00	40.67	37.50	3.17
	9/55	54.00	55.00	46.05	45.04	1.01
	9/56	55.00	56.00	47.76	40.87	6.89
	9/62	61.00	62.00	33.01	33.43	-0.42
	9/81	80.00	81.00	68.01	66.89	1.12
	9/82	81.00	82.00	34.78	34.38	0.40
MHGR-10	10/41	39.00	41.00	32.98	35.25	-2.27
	10/42	41.00	43.00	32.08	33.75	-1.67
	10/46	47.00	49.00	31.73	34.38	-2.65
	10/49	52.00	53.00	57.68	57.87	-0.19
	10/50	53.00	54.00	55.26	56.38	-1.12
	10/51	54.00	55.00	44.16	44.06	0.10
	10/52	55.00	56.00	39.55	39.52	0.03
	10/54	57.00	58.00	38.57	38.05	0.52

BH.No.	Sample No.	Depth (m)		Primary Fe%	Check Fe%	Difference + / -
		From	To			
MHGR-11	11/77	76.00	77.00	43.62	43.53	0.09
	11/78	77.00	78.00	44.95	44.16	0.79
	11/79	78.00	79.00	45.11	44.56	0.55
MHGR-12	12/27	26.00	27.00	44.70	44.52	0.18
	12/29	28.00	29.00	38.54	39.57	-1.03
	12/33	32.00	33.00	39.69	44.07	-4.38
	12/40	39.00	40.00	44.56	44.36	0.20
	12/44	43.00	44.00	43.43	43.32	0.11
	12/47	46.00	47.00	30.05	28.27	1.78
MHGR-13	13/1	0.00	1.00	42.01	39.91	2.10
	13/2	1.00	2.00	39.68	38.35	1.33
	13/3	2.00	3.00	44.64	43.36	1.28
	13/4	3.00	4.00	42.31	42.97	-0.66
MHGR-14	14/53	52.00	53.00	42.05	40.41	1.64
	14/65	64.00	65.00	25.41	25.15	0.26
	14/66	65.00	66.00	33.70	33.04	0.66
	14/67	66.00	67.00	47.90	36.95	10.95
MHGR-15	15/1	0.00	1.00	33.45	32.83	0.62
	15/12	17.00	18.00	36.00	32.69	3.31
	15/16	19.00	20.00	30.41	20.33	10.08
MHGR-16	16/37	36.00	37.00	37.89	40.06	-2.17
	16/38	37.00	38.00	38.55	42.03	-3.48
	16/46	45.00	46.00	42.88	41.74	1.14
MHGR-26	26/1	0.00	1.00	39.14	39.22	-0.08
	26/2	1.00	2.00	40.77	40.48	0.29
	26/6	5.00	6.00	44.44	43.46	0.98
	26/11	10.00	11.00	36.15	32.03	4.12
	26/12	11.00	12.00	36.44	33.37	3.07
	26/13	12.00	13.00	34.48	28.65	5.83
	26/16	15.00	16.00	44.66	41.28	3.38
	26/26	26.00	27.00	45.69	45.95	-0.26
MHGR-28	28/4	3.00	4.00	36.29	36.25	0.04
	28/5	4.00	5.00	37.63	37.51	0.12
	28/8	7.00	8.00	41.14	41.97	-0.83
	28/11	10.00	11.00	43.33	44.12	-0.79
	28/17	16.00	17.00	40.93	36.11	4.82
	28/18	17.00	18.00	41.19	41.13	0.06
	28/21	20.00	21.00	29.49	26.57	2.92
	28/50	49.00	50.00	31.28	30.26	1.02
	28/51	50.00	51.00	36.61	37.63	-1.02
	28/55	54.00	55.00	39.56	39.73	-0.17

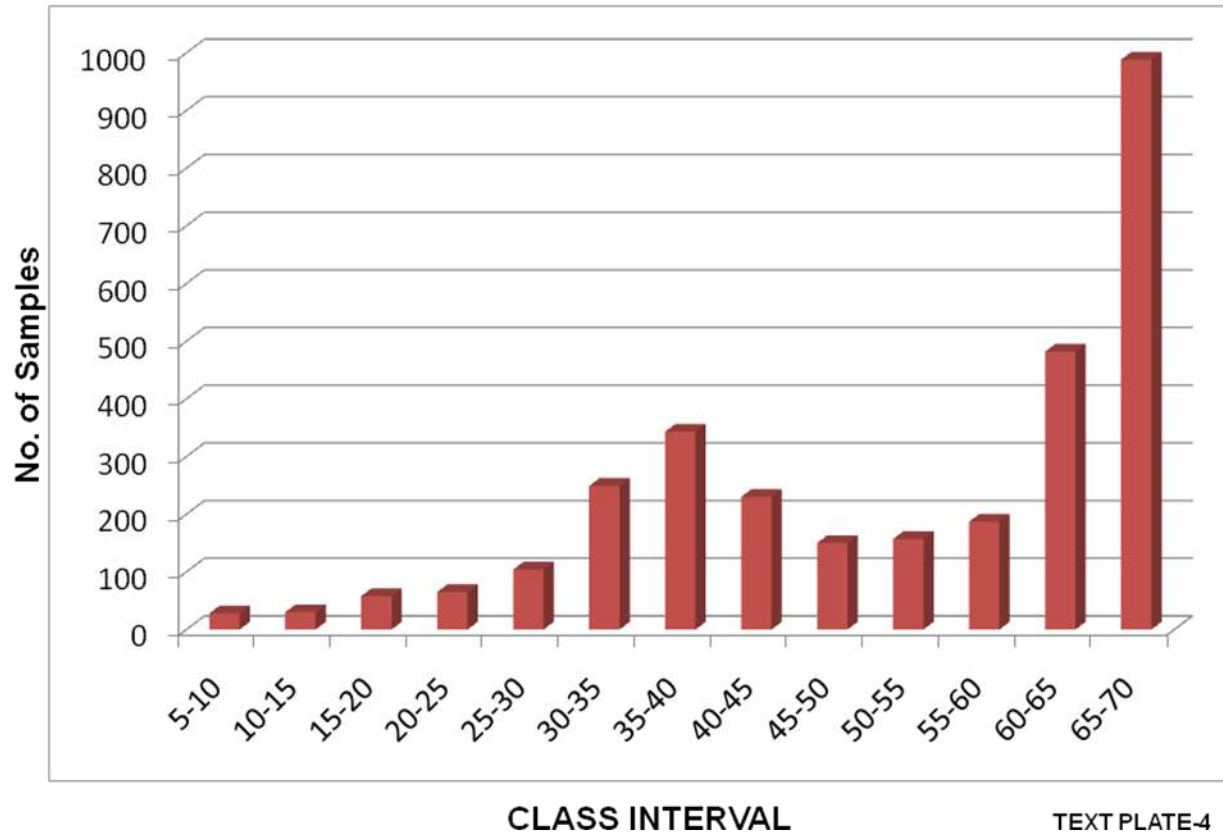
BH.No.	Sample No.	Depth (m)		Primary Fe%	Check Fe%	Difference + / -
		From	To			
MHGR-29	29/37	37.00	38.00	42.70	43.81	-1.11
	29/50	49.00	50.00	19.29	17.27	2.02
	29/51	50.00	51.00	41.28	43.28	-2.00
MHGR-30	30/44	43.00	44.00	42.43	40.07	2.36
	30/45	44.00	45.00	16.04	13.94	2.10
MHGR-31	31/57	56.00	57.00	32.29	33.76	-1.47
	31/63	62.00	63.00	33.16	34.45	-1.29
MHGR-33	33/61	60.00	61.00	40.88	44.27	-3.39

6.2.7 From the above table it could be enunciated that reproducibility of analysis and therefore the reliability on analytical results has been good.

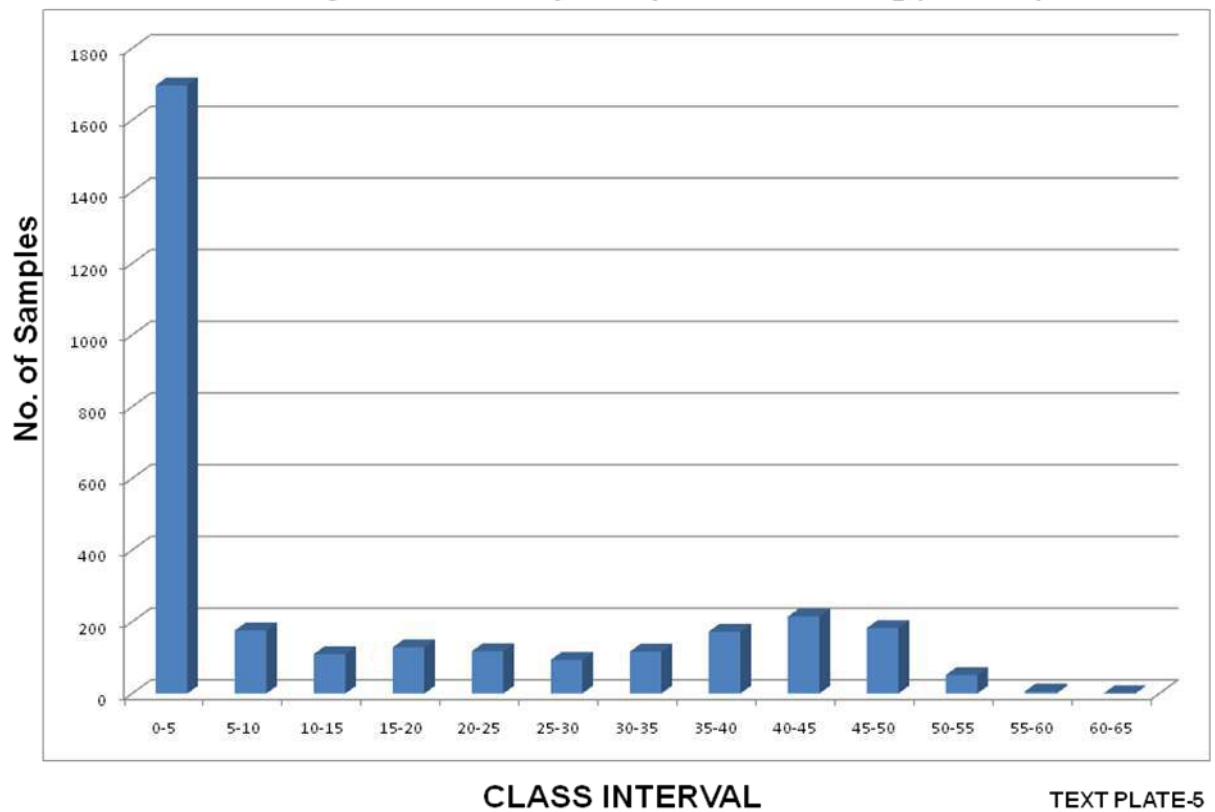


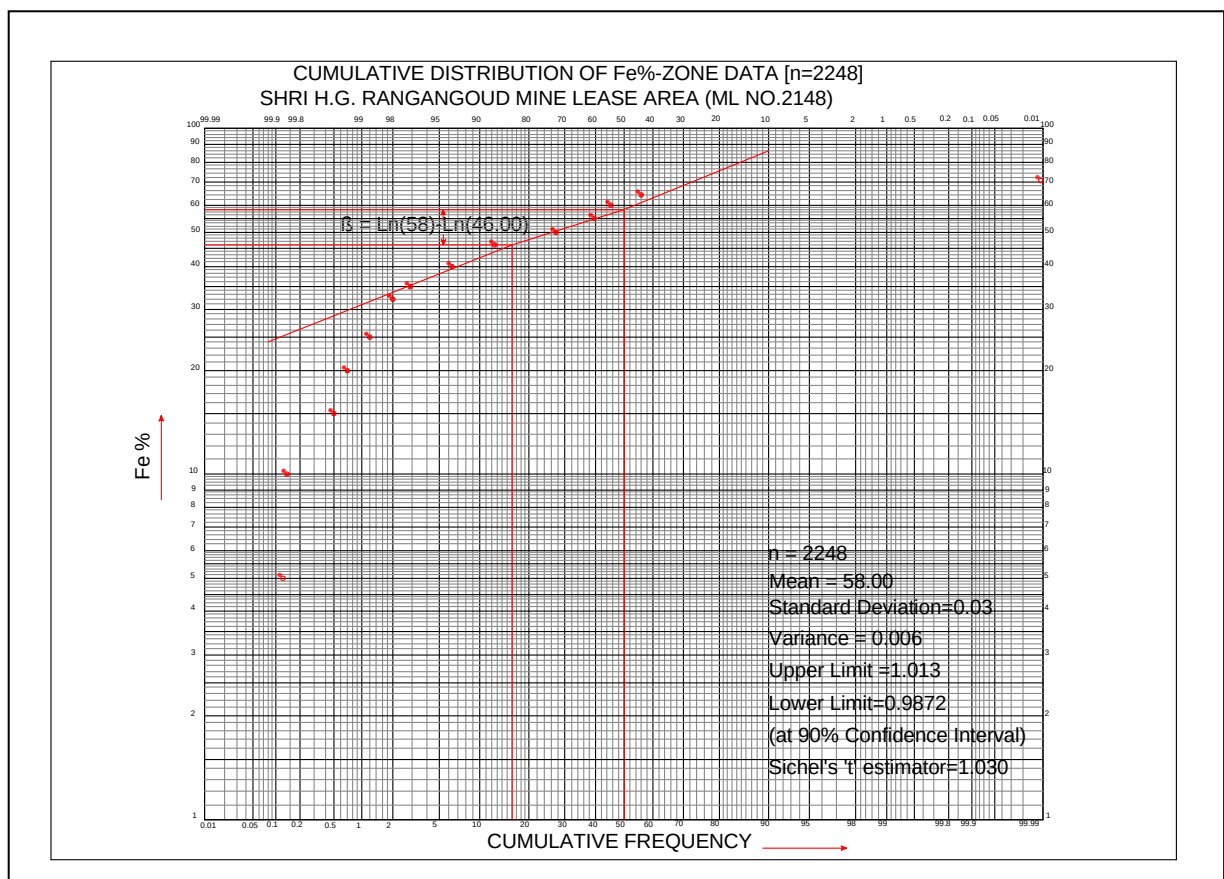
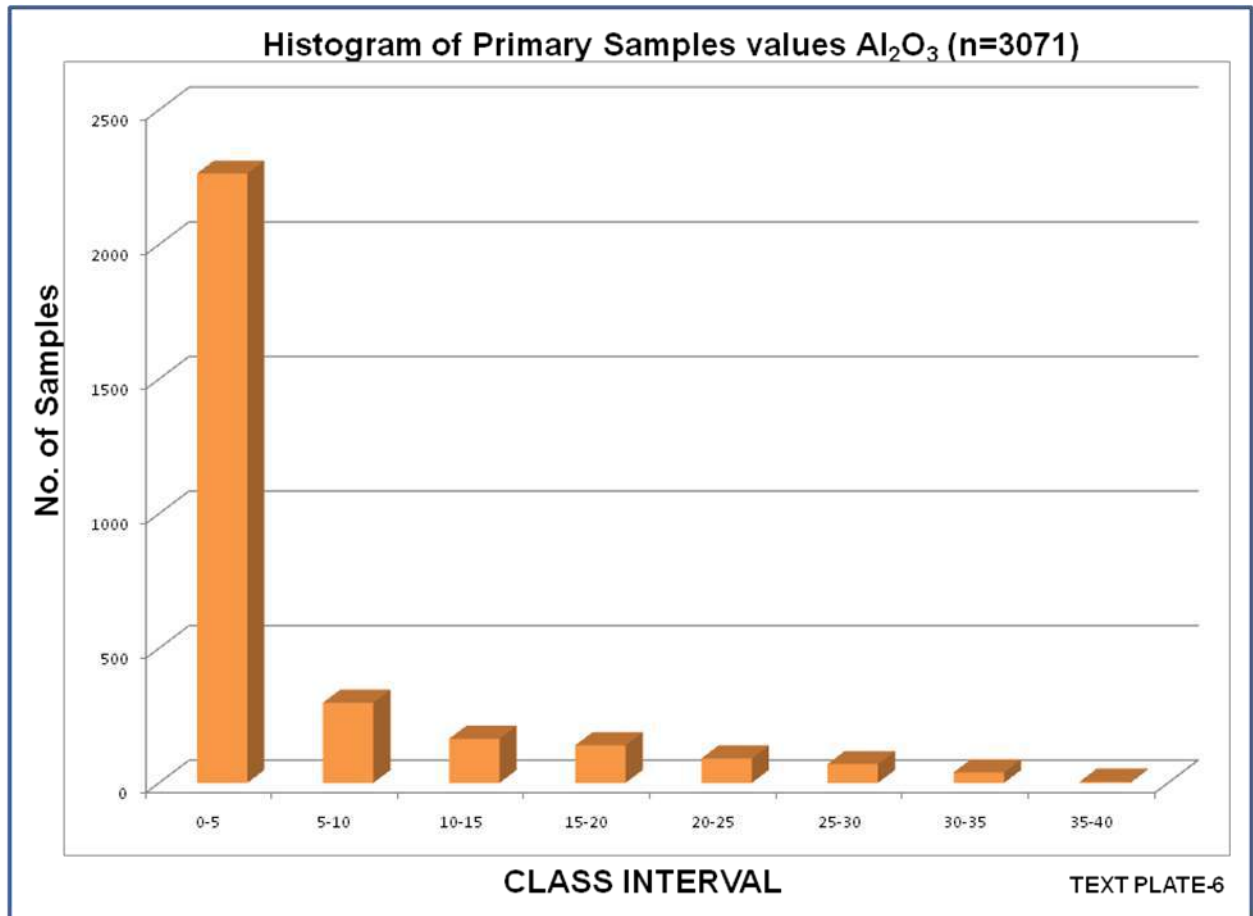
TEXT PLATE-3

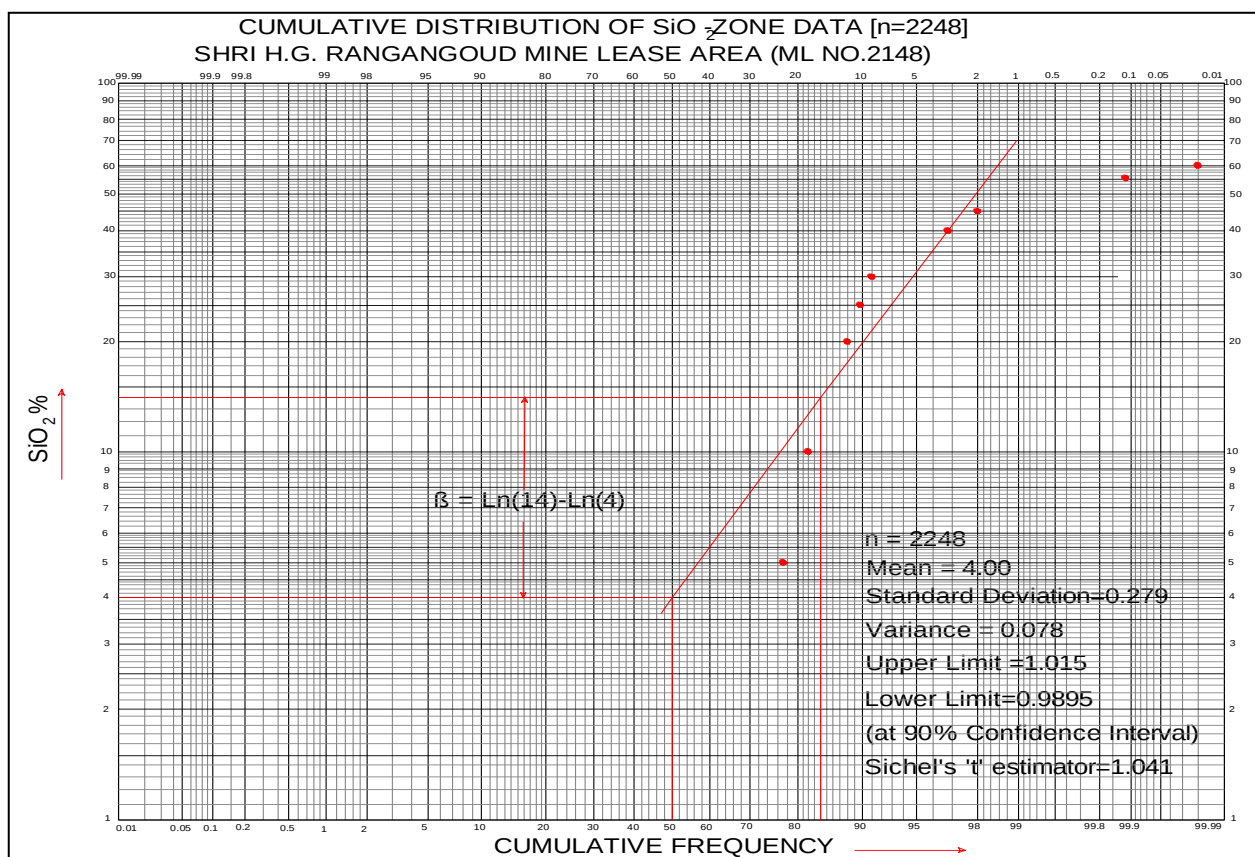
Histogram of Primary Samples values Fe (n=3071)



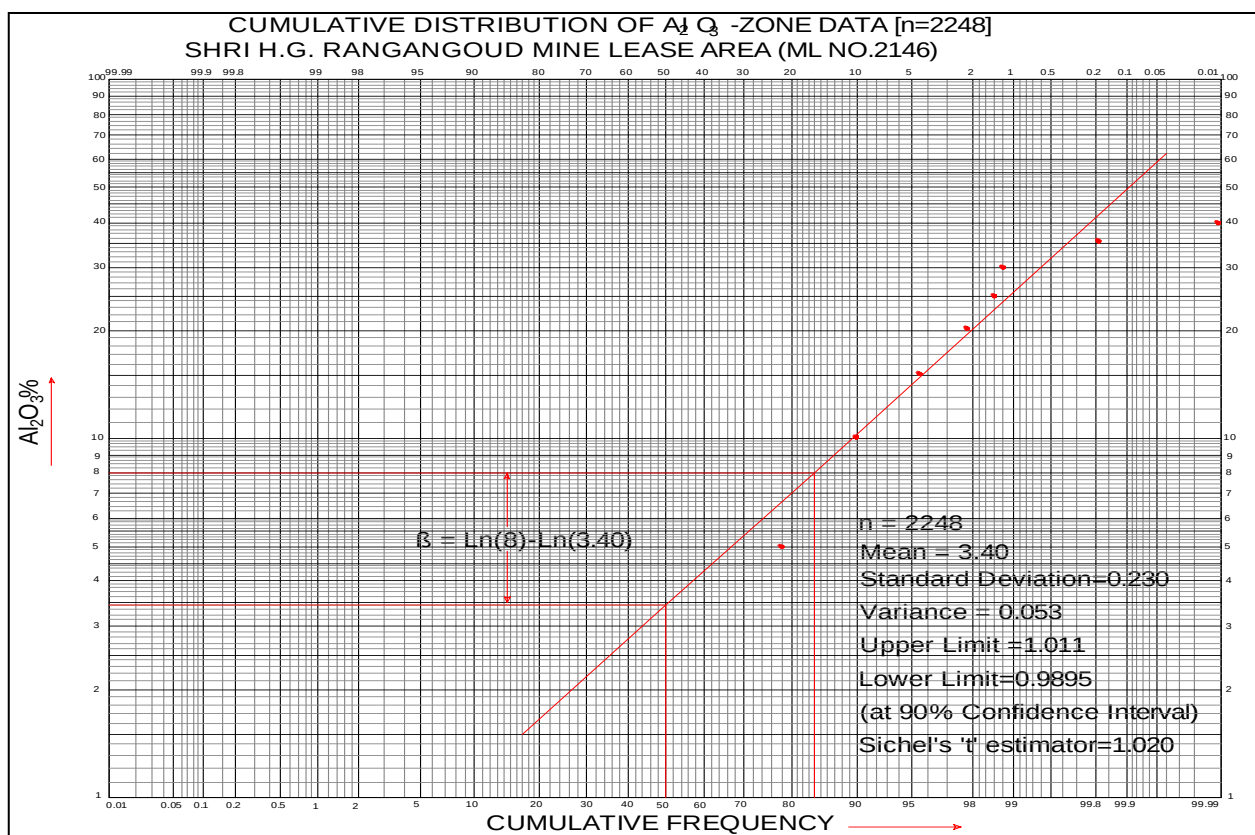
Histogram of Primary Samples values SiO₂ (n=3071)







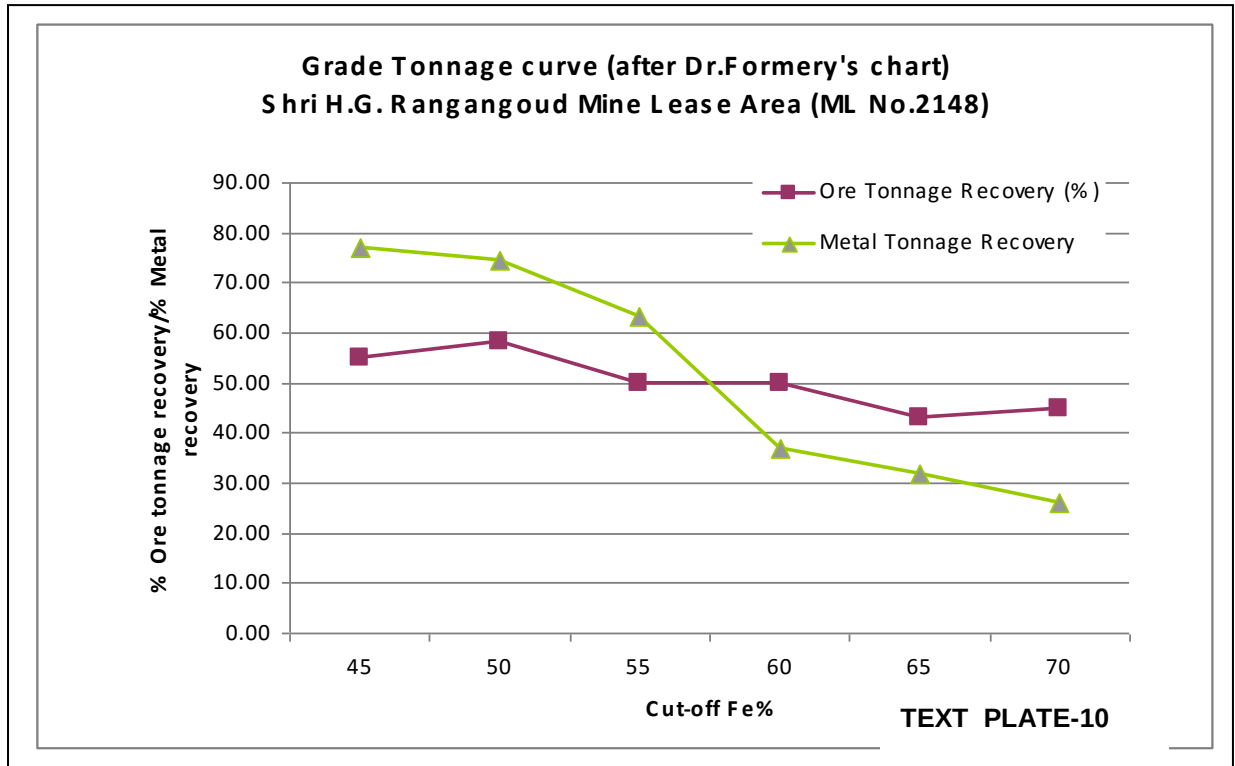
TEXT PLATE-8



TEXT PLATE-9

6.3.0 GRADE-TONNAGE CURVE

6.3.1 Block variance obtained (Text Plate-7), after the log normal probability plot, of cumulative frequency of zone value, with the help of Formery's chart ore tonnage recovery and metal tonnage recovery have been deduced and the same has been presented as Text Plate-10.



6.3.2 The step by step calculations have also been made for geo-statistical assessment of ore and metal recoveries and the same has been produced in the Table-10.

Table-8
Geo-statistical assessment of Ore tonnage and Metal recoveries

Class Interval	E=f/n	CE	(ExA) x 100	C (ExA) x 100	Expected Mean Grade	Ore reserve (mt)	Waste/ Ore	Metal (m.t)	% of Fe recovery
5-10	0.001	1.020	0.8	6130.0	60.09	63.33	1.00	38.054	100.00
10-15	0.003	1.019	3.9	6129.2	60.15	63.33	1.00	38.092	60.08
15-20	0.002	1.016	3.6	6125.3	60.28	63.33	1.00	38.175	60.27
20-25	0.005	1.014	11.5	6121.7	60.37	63.33	1.00	38.232	60.36
25-30	0.009	1.009	25.2	6110.2	60.25	63.33	1.00	38.156	60.25
30-35	0.01	1.00	33.0	6085.0	60.85	63.33	1.00	38.536	60.85
35-40	0.04	0.99	152.0	6052.0	61.13	62.69	0.01	38.322	61.13
40-45	0.05	0.95	215.0	5900.0	62.10	60.16	0.05	37.359	62.10
45-50	0.07	0.90	336.0	5685.0	63.16	56.99	0.11	35.994	63.15
50-55	0.07	0.83	371.0	5349.0	64.44	52.56	0.20	33.869	64.43
55-60	0.08	0.76	464.0	4978.0	65.50	48.13	0.31	31.525	65.50
60-65	0.22	0.68	1386.0	4514.0	66.38	43.06	0.47	28.583	66.38
65-70	0.46	0.46	3128.0	3128.0	68.00	29.13	1.17	19.808	67.99

It is inferred from the above study that

Quantity of Ore reserve tonnage

i) metal tonnage

ii) Metal average grade and

iii) Waste to ore ratio, which provides valuable information for mine planning decisions.

6.3.3 From the intercept of the tonnage curves as shown in the Text Plate-10, it is imperative that planning beyond 58.50% Fe cut-off may not be feasible for the mine planning.

CHAPTER-7

7.0.0 CONCLUSIONS AND RECOMMENDATIONS

7.1.0 CONCLUSIONS

- 7.1.1 Shri. H.G.Rangangoud Mine Lease Area (ML No.2148) is located on Ramgad range, Sandur schist belt in NNW-SSE direction with steep easterly dip of 75° - 85°. The deposit extends about 1080.88m strike length over an average wide area of 240.00m-370.00m.
- 7.1.2 Ore body looks like an elongated bands and continues up to 817.059m and extends further also (MHGR-7, MHG-44,46,47, MHGR-16, MHG-27, 34, MHG-47,42,41,MHGR-39,36, MHG-22, MHGR-17,12,10).
- 7.1.3 The rocks exposed are typical of iron formations with the haematitic ore, soft laminated ore, powdery ore, clay minerals and silica. The predominant ore minerals are haematite and limonite and goethite to some extent. The important non ore consists mostly of banded haematite quartzite rarely ferruginous shale and intrusive ferruginous clay.
- 7.1.4 Generally, the iron ore ranges from haematitic ore to laminated ore, powdery ore and blue dust. The siliceous ores have also been noticed.
- 7.1.5 Magnetic ore occur along 710.00m strike length between sections S1 – S7, over an average wide area of 83.45m with an average true thick of 35.50m. The study on composite analysis confirms the presence of magnetitic iron in the range of 1.16% to 67.23% and the ferrous iron ranges between 0.36% and 20.88%. The LOI ranges between 0.20 and 0.40 and GOI ranges between 1.30 and 11.50.
- 7.1.6 Owing to the sporadic (MHGR-1 and MHGR-2) nature of occurrence, the resources of magnetitic ore has not been made. However, by considering the continuity of magnetite mineralisation in boreholes MHGR-1 and MHGR-2, which are adjacent boreholes, an attempt has been made to estimate the magnetite resources. The ore resources estimated is 1.220 m.t with an average grade of 44.99% Fe.
- 7.1.7 The behavior of ore bands has been studied along NW-SE direction as well as along the foliation plane in N37°W-S37°E reveals that the ore body persistence and tendency of folding nature of the iron ore. The ore persists even beyond the explored depth of 817.059m RL (MHGR-24).
- 7.1.8 Based on the geological cross section, the net in-situ reserves of 63.331 m.t. of iron ore with 58.84% Fe, 6.54% SiO₂ and 4.25% Al₂O₃ at 45% Fe cut off has been estimated. The average true thickness of ore zone is 52.65m. The overall ratio of SiO₂: Al₂O₃ is 1.07.

7.1.9 At 55% Fe cut-off the net in-situ reserves estimated is 48.102 million tonnes with average grade of Fe 62.75%, SiO₂ 3.40%, Al₂O₃ 3.25%. The average true thickness of ore zone is 49.32m

7.1.10 Though the ore zone thickness is quite impressive at 45% Fe cut-off, an attempt has also been made to evaluate the ore resources at a planning cut-off of 35% Fe. The ore has been persistent over the entire strike length of 1300.40 m along the wide area of 240m – 370m with an average thickness of 60.19m and the ore resources estimated is 88.99 million tonnes with the grade of 53.0 % Fe, 13.95% SiO₂ and 4.53% Al₂O₃.

7.1.11 From the intercept of grade tonnage as shown in the Text Plate-, it is imperative that planning beyond 58.50% cut-off may not be feasible for the mine planning.

7.2.0 RECOMMENDATIONS

7.2.1 Shri. H.G.Rangangoud Mine Lease Area (ML No.2148) has marginal potential at 45% Fe cut off, which would be amenable to systematic scientific mining over the entire strike length of 1300.40m with average thickness of 52.65m having potential reserves of 63.331 million tonnes with an average grade of 58.84% Fe, 6.54% SiO₂ and 4.25% Al₂O₃.

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6	Economic Mineral Deposits Revised Edition	Mead L. Jensen and Alan M. Bateman	John liley and Sons New York 1951
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14	Mineral Year Book 2012		IBM
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 Shri S.N. Dhyani ASMO
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 Shri P. Keshav Rao Jr. Tech. (S&M)

PART –IV A
REPORTING OF MINERAL RESOURCES

Sl.no	Contents	Explanation
1	Title & Ownership	SHRI. H.G.RANGANGOUD MINE LEASE AREA (ML No.2148), RAMGAD RANGE, SANDUR SCHIST BELT, DISTRICT: BALLARI, KARNATAKA, GOVT. OF KARNATAKA Period of prospecting: February, 2016 to March 2016 Analysis completed on 06.05.2016.
2	Details of the area	Longitudes 76°03'23.8" and 76°32'05.0" and Latitudes 15°02'23.8" and 15°03'02.5". The block falls in Dharampur village of Ramgad range. The block is covered in Survey of India Topo sheet No.57 A/12. Lease area is 60.66 Hectares.
3	Infrastructure and environment	The mine lease area is 20 km from Sandur town which can be approached from Bellary, Hospet, Donimalai and from Toranagallu railway station.
4	Previous Exploration	Nil; while the mine area has been exploited for iron ore
5	Geology	The Sandur Schist Belt is known for its economic deposits of Iron and Manganese and studied in detail by many prominent workers like New Bold (1838), Foote (1895), Roy and Biswas (1983), Martin and Mukhopadhyay (1987 & 1993), Naqvi et.al. (1987) on various aspects like depositional environment, structure etc. Iron ore, banded ferruginous cherty quartzite, are intimately associated with gabbro of pre-tectonic and post tectonic origin. The hill ranges trend in NNW-SSE direction, which are similar to regional tectonic trend of the Sandur Schist Belt. The area has undergone two phases of deformation [F1 and F2] and metamorphism. The axial trace of F1 have NNW-SSE trend which is refolded by open F2 folds trending in ENW-WSE direction. The primary structure of banded iron ore formation is bedding and pene-contemporaneous faults; schistosity and fracture cleavage are also common. Repetition of iron ore bands, which cause the thickening of ore at places, are due to diastrophic folds.
6	Aerial/Ground geophysical /Geochemical data	--
7	Technological Investigation	Exploratory drilling at 100m x 100m (G1 / G2 level of UNFC)
8	Location of data points	Provided in the topographical and geological map on 1:2000 scale

Sl.no	Contents	Explanation
9	Sampling techniques	The core recovered by drilling was divided into two longitudinal halves. One half was taken for sampling, whereas the second half was kept for future reference [with DGM, Karnataka]. The first half was subjected to uniform size reduction of 1mm size. It is thoroughly mixed pounded and powdered to (-) 100 mesh size by pestle and mortar and then coned and quartered. 3 sample packets of 100 gram each have been prepared; out of the three, one packet was handed over to DGM, Karnataka and the other one has been labeled and sent to MECL laboratory for Fe, SiO₂ and Al₂O₃ analyses, whereas the third packet has preserved for future reference. The entire lot of chips and powder material were collected from boreholes drilled by Reverse Circulation drill. 50% mostly of chip samples have been thoroughly mixed to have the desired quantity of 500-600 gms. and pounded to (-)100 mesh size by progressive reduction, 3 sample packets of 200 gram each has been prepared; out of the three, one has been labeled and sent to MECL lab. for Fe, SiO₂ and Al₂O₃ analyses and the other packet was handed over to DGM, Karnataka, and the 3rd packet of the sample has been preserved for further studies at camp. Total no. of primary samples analysed is 3071. Check samples – 103 nos.
10	Drilling Technique and drill sampling employed	Exploratory core drilling - 579.70m (10 BHs) RC Drilling - 2701.00m (38 BHs) Total Drilling - 3280.70m (48 BHS)
11	Sub sampling techniques and sample preparation	As explained above at Sl.no.9.
12	Quality of assay data and laboratory tests	Assayed at MECL Lab. by MECL, Chemical Laboratory, Utilities Complex, Nagpur by XRF method.
13	Moisture	-
14	Bulk Density	Determined by 5 pits and the bulk density considered for computation of reserves is 3.50. However, specific gravity was also determined on 5 no. of samples at Lab.
15	Resource estimation techniques	Reserves have been estimated by geological cross section method. In order to delineate the ore and non-ore, the grade or threshold value of 45% Fe has been adopted, thus non ore above and below ore zones has been demarcated. The rule of gradual change or law of linear function has been applied [Constantine C. Popoff, 1965] along with the rule of nearest points for application of influence of half way between successive boreholes

Sl.no	Contents	Explanation																								
		At threshold cutoff of 45% Fe as stipulated by IBM, the mineralized zone within the lease hold area and the ore reserves are estimated. Estimation is also been made at 55% Fe cut-off <table><tr><th>Strike length (m)</th><th>Average thick (m)</th><th>Net Reserves (Million Tonnes)</th><th>Grade Fe%</th><th>Cut-off Fe%</th><th>Remarks</th></tr><tr><td>1300.40</td><td>52.65</td><td>63.330</td><td>58.84</td><td>45</td><td>Haematitic ore (S1-S13)</td></tr><tr><td>1300.40</td><td>49.32</td><td>48.102</td><td>62.75</td><td>55</td><td>Haematitic ore (S1-S13)</td></tr><tr><td>99.30</td><td>17.63</td><td>1.221</td><td>44.99</td><td>Based on Total Fe.</td><td>Magnetitic ore (S4-S4')</td></tr></table> Raw assay data and zone data have been subjected for statistical studies to derive various parameters including sichel's `t` estimator.	Strike length (m)	Average thick (m)	Net Reserves (Million Tonnes)	Grade Fe%	Cut-off Fe%	Remarks	1300.40	52.65	63.330	58.84	45	Haematitic ore (S1-S13)	1300.40	49.32	48.102	62.75	55	Haematitic ore (S1-S13)	99.30	17.63	1.221	44.99	Based on Total Fe.	Magnetitic ore (S4-S4')
Strike length (m)	Average thick (m)	Net Reserves (Million Tonnes)	Grade Fe%	Cut-off Fe%	Remarks																					
1300.40	52.65	63.330	58.84	45	Haematitic ore (S1-S13)																					
1300.40	49.32	48.102	62.75	55	Haematitic ore (S1-S13)																					
99.30	17.63	1.221	44.99	Based on Total Fe.	Magnetitic ore (S4-S4')																					
16	Further work	An approximately 55.00 ha falling in north-eastern side and south-eastern side of the block could also be assessed for resource estimation by exploratory drilling. So that, it is prudent to that the mines for auction as single block in the interest of scientific mining. (after joint inspection report) dtd.25.02.2016 of office of the commissioner, DMG-Karnataka, Bangalore. No.DMG/MLS/MECL/2015-16.																								
17	Annexure/enclosures to the report	MECL reports includes all the relevant maps, sections, logs, analytical reports & fields photos																								
18	Any other information	Though the ore zone thickness is quite appreciable and impressive at 45% Fe cut-off, an attempt has also been made to evaluate the ore resources at a planning cut-off of 35% Fe. The ore has been persistent over the entire strike length of 1300.40m along the wide area of 240m – 370m with an average thickness of 60.19m and the ore resources estimated is 88.99 million tonnes with the grade of 53.0 % Fe, 13.95% SiO ₂ and 4.53% Al ₂ O ₃ .																								

CERTIFICATE

This is to certify that the details exploration for iron ore has been carried out in Shri. H.G. Rangangoud Mine Lease Area (ML No.2148), district Ballari, Karnataka by Mineral Exploration Corporation Limited (MECL) on behalf of Department of Mines & Geology (DMG), Karnataka. The exploration has been done upto G1 and G2 level of UNFC and the report has been prepared in accordance with the Minerals (Evidence of Mineral Contents) Rule 2015 specified under Mineral Auction Rule, 2015. The duly filled in format Part-IV-A of the report as per MEMC Rule is attached herewith.

(Signature)
Mineral Exploration Corporation Limited
(CPSE under Ministry of Mines, Govt. of India
Nagpur, Maharashtra

ANNEXURE-II/1

**DETAILS OF SURVEY PARTICULARS OF BOREHOLES DRILLED BY MECL
SHRI. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA**

!SL !	BOREHOLE !	CO-ORDINATES		!REDUCED !	ANGLE !	BEARING !	TOTAL !	DATE OF !	DATE OF !
!NO. !	NO. !	!-----! !		LEVEL !	(DEG.) !	(DEG.) !	DEPTH !	COMMENCEMENT !	CLOSURE !
! !	! !	LATITUDE !	LONGITUDE !	(m) !	m) !	! !	! !	! !	! !
1	MHGR-1	1664272.484	664244.406	911.903			95.00	16/02/16	17/02/16
2	MHGR-2	1664235.615	664206.037	905.291			50.00	17/02/16	17/02/16
3	MHGR-3	1664218.847	664336.194	906.600			51.00	17/02/16	19/02/16
4	MHGR-4	1664285.418	664392.201	908.531			77.00	17/02/16	18/02/16
5	MHGR-5	1664104.087	664206.966	942.444			91.00	19/02/16	19/02/16
6	MHGR-6	1664170.330	664138.822	942.638			65.00	18/02/16	18/02/16
7	MHGR-7	1663947.487	664639.505	942.195			110.00	19/02/16	19/02/16
8	MHGR-8	1664360.760	664037.353	924.808			70.00	19/02/16	19/02/16
9	MHGR-9	1663888.553	664722.853	948.115			100.00	19/02/16	20/02/16
10	MHGR-10	1664191.625	664458.967	922.902			75.00	19/02/16	20/02/16
11	MHGR-11	1663947.814	664484.929	952.724			82.00	19/02/16	22/02/16
12	MHGR-12	1664268.211	664093.979	932.351			59.00	20/02/16	20/02/16
13	MHGR-13	1663555.117	664487.898	975.954			65.00	20/02/16	20/02/16
14	MHGR-14	1663896.746	664406.451	961.594			78.00	20/02/16	20/02/16
15	MHGR-15	1663482.105	664557.120	975.835			25.00	20/02/16	20/02/16
16	MHGR-16	1664413.627	664116.103	921.482			56.00	20/02/16	21/02/16
17	MHGR-17	1663609.344	664550.138	982.520			50.00	20/02/16	20/02/16
18	MHGR-18	1663820.987	664489.704	941.077			64.00	21/02/16	22/02/16
19	MHGR-19	1663554.644	664652.054	975.932	60	S50°W	70.00	21/02/16	22/02/16
20	MHGR-20	1663627.423	664879.972	926.581			72.00	22/02/16	22/02/16
21	MHGR-21	1664092.520	664495.073	942.203			90.00	21/02/16	22/02/16
22	MHG-22	1664145.652	664406.225	912.851			83.30	20/02/16	29/02/16
23	MHGR-23	1663794.774	664770.278	921.112			77.00	22/02/16	23/02/16
24	MHGR-24	1663667.740	664775.208	922.059			105.00	22/02/16	25/02/16
25	MHGR-25	1664014.228	664559.338	941.628	60	S50°W	97.00	22/02/16	22/02/16

ANNEXURE-II/2

!SL !	BOREHOLE !	CO-ORDINATES		!REDUCED !	ANGLE !	BEARING !	TOTAL !	DATE OF !	DATE OF !
!NO. !	NO. !	!-----! !		LEVEL !	(DEG.) !	(DEG.) !	DEPTH !	COMMENCEMENT !	CLOSURE !
! !	! !	LATITUDE !	LONGITUDE !	(m) !	m) !	! !	! !	! !	! !
26	MHGR-26	1663651.200	664449.427	968.337	60	S50°W	55.00	23/02/16	23/02/16
27	MHG-27	1664165.409	664276.738	907.639			52.30	23/02/16	29/02/16
28	MHGR-28	1663754.176	664412.986	962.158	60	S50°W	80.00	23/02/16	23/02/16
29	MHGR-29	1663610.379	664697.339	950.016			80.00	23/02/16	23/02/16
30	MHGR-30	1663838.056	664358.619	965.726			61.00	24/02/16	24/02/16
31	MHGR-31	1664044.294	664448.413	947.708			92.00	24/02/16	24/02/16
32	MHGR-32	1663942.241	664322.968	949.318			70.00	24/02/16	24/02/16
33	MHGR-33	1663710.868	664522.570	961.658			85.00	24/02/16	24/02/16
34	MHGR-34	1664085.003	664338.632	933.054			70.00	24/02/16	24/02/16
35	MHGR-35	1663440.505	664656.910	974.559			60.00	25/02/16	25/02/16
36	MHGR-36	1663860.831	664675.029	923.105			60.00	25/02/16	25/02/16
37	MHGR-37	1663496.612	664732.306	976.292			70.00	25/02/16	26/02/16
38	MHGR-38	1663543.299	664795.987	940.793			45.00	25/02/16	26/02/16
39	MHGR-39	1664321.925	664327.260	900.008			50.00	25/02/16	26/02/16
40	MHGR-40	1664056.173	664279.430	942.522			49.00	26/02/16	26/02/16
41	MHG-41	1664316.597	664156.112	901.863			38.20	28/02/16	29/02/16
42	MHG-42	1663737.844	664698.673	919.882			63.40	01/03/16	07/03/16
43	MHG-43	1663875.459	664559.270	927.985			60.50	01/03/16	02/03/16
44	MHG-44	1664459.062	664005.888	918.020			44.00	02/03/16	06/03/16
45	MHG-45	1663741.602	664847.119	931.286			85.00	03/03/16	07/03/16
46	MHG-46	1664365.451	664193.340	912.749			36.00	07/03/16	09/03/16
47	MHG-47	1663989.760	664378.688	951.778			43.00	08/03/16	09/03/16
48	MHG-48	1663668.843	664613.788	962.328			74.00	09/03/16	12/03/16

ANNEXURE-IIIB/1

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-1

LATITUDE : 1664272.484
 LONGITUDE : 664244.406
 REDUCED LEVEL (M): 911.903

DATE OF COMMENCEMENT : 16/02/16
 DATE OF CLOSURE : 17/02/16
 DEPTH DRILLED (M) : 95.00

! DEPTH (M) !	THICK-! !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %		!
! FROM ! TO !	! (m) !		!	!	!	!		!
0.00	1.00	1.00	POWDERY ORE	DARK GREY	62.67	3.05	3.59	
1.00	2.00	1.00	POWDERY ORE	DARK GREY	62.31	5.28	2.42	
2.00	3.00	1.00	POWDERY ORE	DARK GREY	63.85	3.06	2.55	
3.00	4.00	1.00	POWDERY ORE	DARK GREY	64.36	3.44	3.10	
4.00	5.00	1.00	POWDERY ORE	DARK GREY	63.85	4.23	3.35	
5.00	6.00	1.00	POWDERY ORE	DARK GREY	64.53	3.21	2.84	
6.00	7.00	1.00	POWDERY ORE	DARK GREY	64.26	4.23	1.98	
7.00	8.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	55.93	18.58	1.28	
8.00	9.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	46.44	30.27	3.13	
9.00	10.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	52.58	23.22	1.32	
10.00	11.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	39.22	41.49	1.90	
11.00	12.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	43.12	37.26	0.95	
12.00	13.00	1.00	HAEMATITIC ORE	CHERRY RED	54.99	18.97	1.96	
13.00	14.00	1.00	HAEMATITIC ORE	CHERRY RED	59.02	11.83	1.83	
14.00	15.00	1.00	HAEMATITIC ORE	CHERRY RED	55.35	18.03	2.63	
15.00	16.00	1.00	SILICEOUS IRON ORE	DARK BROWN	39.07	41.34	0.89	
16.00	17.00	1.00	SILICEOUS IRON ORE	DARK BROWN	38.32	42.97	0.58	
17.00	18.00	1.00	SILICEOUS IRON ORE	DARK BROWN	42.03	38.15	1.02	
18.00	19.00	1.00	SILICEOUS IRON ORE	DARK BROWN	39.23	41.81	1.29	
19.00	20.00	1.00	SILICEOUS IRON ORE	DARK BROWN	44.06	35.85	0.81	
20.00	21.00	1.00	SILICEOUS IRON ORE	DARK BROWN	45.35	34.05	0.99	
21.00	22.00	1.00	SILICEOUS IRON ORE	DARK BROWN	35.33	48.17	0.74	
22.00	23.00	1.00	SILICEOUS IRON ORE	DARK BROWN	37.32	45.55	0.73	
23.00	24.00	1.00	SILICEOUS IRON ORE	DARK BROWN	41.52	39.50	0.80	

ANNEXURE - IIIB/2

BOREHOLE NO:MHGR-1

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	SILICEOUS IRON ORE	DARK BROWN	40.87	40.11	0.78
25.00	26.00	1.00	SILICEOUS IRON ORE	DARK BROWN	36.40	45.93	0.86
26.00	27.00	1.00	SILICEOUS IRON ORE	DARK BROWN	32.33	51.29	0.56
27.00	28.00	1.00	SILICEOUS IRON ORE	DARK BROWN	40.45	40.65	1.03
28.00	29.00	1.00	POWDERY ORE	DARK GREY	48.56	14.36	14.23
29.00	30.00	1.00	FERRUGINOUS CLAY	YELLOWISH BROWN	41.85	18.46	17.56
30.00	31.00	1.00	FERRUGINOUS CLAY	YELLOWISH BROWN	24.86	27.11	22.28
31.00	32.00	1.00	FERRUGINOUS CLAY	YELLOWISH BROWN	22.35	28.81	23.98
32.00	33.00	1.00	FERRUGINOUS CLAY	YELLOWISH BROWN	25.69	26.33	21.94
33.00	34.00	1.00	SILICEOUS IRON ORE	DARK GREY	40.69	31.24	6.97
34.00	35.00	1.00	SILICEOUS IRON ORE	DARK GREY	37.91	39.25	4.47
35.00	36.00	1.00	SILICEOUS IRON ORE	DARK GREY	36.19	41.38	4.34
36.00	37.00	1.00	SILICEOUS IRON ORE	DARK GREY	37.56	40.00	4.28
37.00	38.00	1.00	SILICEOUS IRON ORE	DARK GREY	47.59	21.93	4.62
38.00	39.00	1.00	SILICEOUS IRON ORE	DARK GREY	51.76	19.77	2.33
39.00	40.00	1.00	SILICEOUS IRON ORE	DARK GREY	37.27	40.70	2.49
40.00	41.00	1.00	SILICEOUS IRON ORE	DARK GREY	30.90	50.71	1.56
41.00	42.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	34.55	28.87	12.59
42.00	43.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	31.96	23.76	17.45
43.00	44.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	32.51	22.57	17.54
44.00	45.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	32.07	24.26	17.02
45.00	46.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	18.37	32.67	20.76
46.00	47.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	24.40	26.65	21.60
47.00	48.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	23.60	26.97	22.08
48.00	49.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	21.29	31.62	18.19
49.00	50.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	18.89	34.03	16.30
50.00	51.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	20.99	32.92	14.82
51.00	52.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	24.28	28.46	18.18
52.00	53.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	24.89	28.63	17.03
53.00	54.00	1.00	POWDERY ORE	DARK GREY	52.42	12.12	10.75
54.00	55.00	1.00	POWDERY ORE	DARK GREY	51.60	12.80	11.85

ANNEXURE - IIIB/3

BOREHOLE NO:MHGR-1

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
55.00	56.00	1.00	POWDERY ORE	DARK GREY	55.60	13.12	6.38
56.00	57.00	1.00	POWDERY ORE	DARK GREY	55.54	12.72	6.86
57.00	58.00	1.00	POWDERY ORE	DARK GREY	54.80	12.63	7.50
58.00	59.00	1.00	POWDERY ORE	DARK GREY	51.35	15.40	8.40
59.00	60.00	1.00	FERRUGINOUS CLAY	YELLOWISH GREEN	25.69	33.17	12.19
60.00	61.00	1.00	FERRUGINOUS CLAY	YELLOWISH GREEN	24.34	35.89	12.43
61.00	62.00	1.00	FERRUGINOUS CLAY	YELLOWISH GREEN	25.67	35.96	12.83
62.00	63.00	1.00	FERRUGINOUS CLAY	YELLOWISH GREEN	25.43	33.40	13.52
63.00	64.00	1.00	FERRUGINOUS CLAY	YELLOWISH GREEN	45.06	19.51	9.22
64.00	65.00	1.00	POWDERY ORE	STEEL GREY	55.69	13.53	5.68
65.00	66.00	1.00	POWDERY ORE	STEEL GREY	54.02	14.81	5.83
66.00	67.00	1.00	POWDERY ORE	STEEL GREY	57.48	10.20	5.38
67.00	68.00	1.00	POWDERY ORE	STEEL GREY	59.68	8.66	5.13
68.00	69.00	1.00	POWDERY ORE	STEEL GREY	52.25	20.95	3.62
69.00	70.00	1.00	POWDERY ORE	STEEL GREY	57.67	13.06	4.31
70.00	71.00	1.00	POWDERY ORE	BLUISH GREY	57.19	14.03	4.08
71.00	72.00	1.00	POWDERY ORE	BLUISH GREY	57.65	11.57	4.93
72.00	73.00	1.00	POWDERY ORE	DARK GREY	39.52	41.85	1.37
73.00	74.00	1.00	POWDERY ORE	DARK GREY	44.52	34.18	1.96
74.00	75.00	1.00	POWDERY ORE	DARK GREY	45.95	30.50	3.68
75.00	76.00	1.00	POWDERY ORE	DARK GREY	47.35	29.05	3.06
76.00	77.00	1.00	POWDERY ORE	STEEL GREY	55.88	15.06	4.61
77.00	78.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	55.59	15.56	4.21
78.00	79.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	56.93	13.32	4.13
79.00	80.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	53.02	20.61	3.09
80.00	81.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	55.95	15.03	4.00
81.00	82.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	55.44	15.75	4.71
82.00	83.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	35.38	43.40	3.23
83.00	84.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	40.66	39.60	1.40
84.00	85.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	40.51	40.46	1.39
85.00	86.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	41.23	39.79	0.94

ANNEXURE - IIIB/4

BOREHOLE NO:MHGR-1

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
86.00	87.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	40.47	40.77	0.94	MAGNETIC
87.00	88.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	42.91	36.84	1.02	MAGNETIC
88.00	89.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	43.26	36.56	1.14	MAGNETIC
89.00	90.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	42.48	37.70	1.41	MAGNETIC
90.00	91.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	41.29	39.35	0.98	MAGNETIC
91.00	92.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	40.49	40.09	0.99	MAGNETIC
92.00	93.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	41.90	39.02	0.80	MAGNETIC
93.00	94.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	37.44	43.89	1.18	MAGNETIC
94.00	95.00	1.00	BANDED MAGNETITE QUARTZITE	GREY BROWN	39.92	40.36	0.97	MAGNETIC

ANNEXURE - IIIB/5

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-2

LATITUDE : 1664235.615
 LONGITUDE : 664206.037
 REDUCED LEVEL (M): 905.291

DATE OF COMMENCEMENT : 17/02/16
 DATE OF CLOSURE : 17/02/16
 DEPTH DRILLED (M) : 50.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	HAEMATITIC ORE	DARK BROWN	64.79	2.61	3.02	
1.00	2.00	1.00	HAEMATITIC ORE	DARK BROWN	64.96	3.40	3.31	
2.00	3.00	1.00	POWDERY ORE	STEEL GREY	64.28	2.83	4.83	
3.00	4.00	1.00	POWDERY ORE	STEEL GREY	64.29	2.34	5.45	
4.00	5.00	1.00	POWDERY ORE	STEEL GREY	66.41	2.00	2.51	
5.00	6.00	1.00	POWDERY ORE	STEEL GREY	66.32	2.38	2.42	
6.00	7.00	1.00	POWDERY ORE	STEEL GREY	64.53	2.22	4.38	
7.00	8.00	1.00	POWDERY ORE	STEEL GREY	61.34	7.81	4.04	
8.00	9.00	1.00	POWDERY ORE	STEEL GREY	62.14	6.67	4.30	
9.00	10.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	46.08	31.80	1.66	
10.00	11.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	44.96	33.08	2.15	
11.00	12.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	32.79	44.49	2.38	
12.00	13.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.57	39.85	2.42	
13.00	14.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	42.95	30.68	2.00	
14.00	15.00	1.00	POWDERY ORE	STEEL GREY	57.16	11.77	3.45	
15.00	16.00	1.00	POWDERY ORE	STEEL GREY	52.10	20.43	3.16	
16.00	17.00	1.00	POWDERY ORE	STEEL GREY	57.37	12.81	2.41	
17.00	18.00	1.00	POWDERY ORE	STEEL GREY	55.80	14.88	2.14	
18.00	19.00	1.00	POWDERY ORE	STEEL GREY	54.24	17.02	1.78	
19.00	20.00	1.00	POWDERY ORE	STEEL GREY	52.40	18.65	1.34	
20.00	21.00	1.00	POWDERY ORE	STEEL GREY	44.99	31.24	1.17	
21.00	22.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	40.23	37.66	0.72	MAGNETIC
22.00	23.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	33.21	47.20	0.71	MAGNETIC
23.00	24.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	33.87	46.05	0.73	MAGNETIC

ANNEXURE - IIIB/6

BOREHOLE NO:MHGR-2

DEPTH (M)		THICK- NESS	LITHOLOGY	COLOR DETAILS		Fe	SiO ₂	Al ₂ O ₃	REMARKS
FROM	TO	(m)				%	%	%	
24.00	25.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	BROWN	37.19	40.78	0.82	MAGNETIC
25.00	26.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	BROWN	35.82	42.98	0.71	MAGNETIC
26.00	27.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	BROWN	31.99	48.67	0.72	MAGNETIC
27.00	28.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	BROWN	36.24	41.99	0.87	MAGNETIC
28.00	29.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	BROWN	33.75	47.06	0.76	MAGNETIC
29.00	30.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	36.25	40.45	0.92	MAGNETIC
30.00	31.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	35.09	45.72	0.78	MAGNETIC
31.00	32.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	37.11	42.73	0.83	MAGNETIC
32.00	33.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	36.36	40.71	0.90	MAGNETIC
33.00	34.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	33.18	44.89	0.85	MAGNETIC
34.00	35.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	34.03	43.04	0.82	MAGNETIC
35.00	36.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	34.15	42.73	0.81	MAGNETIC
36.00	37.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	36.10	40.66	0.86	MAGNETIC
37.00	38.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	36.11	40.76	0.94	MAGNETIC
38.00	39.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	35.29	41.82	0.85	MAGNETIC
39.00	40.00	1.00	SILICEOUS IRON ORE	LIGHT	GREY	35.36	41.30	1.07	MAGNETIC
40.00	41.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	GREY	31.16	43.60	0.85	MAGNETIC
41.00	42.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	GREY	32.01	43.03	1.17	MAGNETIC
42.00	43.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	GREY	31.31	44.67	1.01	MAGNETIC
43.00	44.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	GREY	32.07	43.97	1.03	MAGNETIC
44.00	45.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	GREY	32.96	44.14	1.47	MAGNETIC
45.00	46.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	GREY	41.73	36.82	3.25	MAGNETIC
46.00	47.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	GREY	33.47	43.59	1.70	MAGNETIC
47.00	48.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	GREY	32.90	44.33	1.96	MAGNETIC
48.00	49.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	GREY	32.64	44.57	1.97	MAGNETIC
49.00	50.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT	GREY	36.68	38.30	2.09	MAGNETIC

ANNEXURE-IIIIB/7

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-3

LATITUDE : 1664218.847
 LONGITUDE : 664336.194
 REDUCED LEVEL (M): 906.600

DATE OF COMMENCEMENT : 17/02/16
 DATE OF CLOSURE : 19/02/16
 DEPTH DRILLED (M) : 51.00

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	! NESS !		!	! %	! %	! %		!
! FROM ! TO	! (m) !		!	!	!	!		!
0.00	1.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	17.19	32.28	26.79	SAMPLE DEPTH : 0.00-3.00m
1.00	2.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
2.00	3.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
3.00	4.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	21.92	29.12	25.72	SAMPLE DEPTH : 3.00-6.00m
4.00	5.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
5.00	6.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
6.00	7.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	12.64	35.36	28.28	SAMPLE DEPTH : 6.00-9.00m
7.00	8.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
8.00	9.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
9.00	10.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	13.16	34.25	26.53	SAMPLE DEPTH : 9.00-11.00m
10.00	11.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
11.00	12.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	39.18	17.11	15.73	SAMPLE DEPTH : 11.00-14.00m
12.00	13.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
13.00	14.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
14.00	15.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	36.17	18.28	15.77	SAMPLE DEPTH : 14.00-16.00m
15.00	16.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
16.00	17.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	27.56	24.00	19.94	SAMPLE DEPTH : 16.00-18.00m
17.00	18.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
18.00	19.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	35.15	18.82	15.81	
19.00	20.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	37.97	16.53	13.50	
20.00	21.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	37.82	17.11	14.22	
21.00	22.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	40.21	15.11	13.11	
22.00	23.00	1.00	BHQ	LIGHT BROWN	17.93	29.97	23.96	SAMPLE DEPTH : 22.00-25.00m
23.00	24.00	1.00	BHQ	LIGHT BROWN				

ANNEXURE - IIIB/8

BOREHOLE NO:MHGR-3

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)					
24.00	25.00	1.00	BHQ				
25.00	26.00	1.00	BHQ	30.76	22.57	19.53	SAMPLE DEPTH : 25.00-27.00m
26.00	27.00	1.00	BHQ				
27.00	28.00	1.00	BHQ	26.47	24.56	20.27	SAMPLE DEPTH : 27.00-29.00m
28.00	29.00	1.00	BHQ				
29.00	30.00	1.00	BHQ	31.91	21.65	16.56	SAMPLE DEPTH : 29.00-32.00m
30.00	31.00	1.00	BHQ				
31.00	32.00	1.00	BHQ				
32.00	33.00	1.00	FERRUGINOUS SHALE	34.66	20.17	13.82	
33.00	34.00	1.00	FERRUGINOUS SHALE	33.29	23.30	13.12	SAMPLE DEPTH : 33.00-35.00m
34.00	35.00	1.00	FERRUGINOUS SHALE				
35.00	36.00	1.00	FERRUGINOUS SHALE	30.45	25.16	11.52	
36.00	37.00	1.00	FERRUGINOUS SHALE	31.04	24.66	14.73	SAMPLE DEPTH : 36.00-39.00m
37.00	38.00	1.00	FERRUGINOUS SHALE				
38.00	39.00	1.00	LIMONITIC SHALE				
39.00	40.00	1.00	LIMONITIC SHALE	33.41	21.78	16.05	
40.00	41.00	1.00	LIMONITIC SHALE	37.94	19.11	13.76	SAMPLE DEPTH : 40.00-42.00m
41.00	42.00	1.00	LIMONITIC SHALE				
42.00	43.00	1.00	LIMONITIC SHALE	38.76	19.81	12.08	SAMPLE DEPTH : 42.00-45.00m
43.00	44.00	1.00	LIMONITIC SHALE				
44.00	45.00	1.00	LIMONITIC SHALE				
45.00	46.00	1.00	BHQ	35.24	42.51	3.13	
46.00	47.00	1.00	BHQ	34.70	44.93	2.99	
47.00	48.00	1.00	BHQ	33.17	47.38	2.84	
48.00	49.00	1.00	BHQ	37.39	44.27	1.46	
49.00	50.00	1.00	BHQ	33.38	47.70	2.61	
50.00	51.00	1.00	BHQ	24.06	61.89	1.41	

ANNEXURE - IIIB/9

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-4

LATITUDE : 1664285.418
 LONGITUDE : 664392.201
 REDUCED LEVEL (M): 908.531

DATE OF COMMENCEMENT : 17/02/16
 DATE OF CLOSURE : 18/02/16
 DEPTH DRILLED (M) : 77.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	HAEMATITIC ORE	DARK BROWN	59.23	5.71	4.08	
1.00	2.00	1.00	HAEMATITIC ORE	DARK BROWN	57.39	6.61	5.19	
2.00	3.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	39.32	18.24	11.59	
3.00	4.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	40.35	17.17	11.66	
4.00	5.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	46.51	13.59	9.34	
5.00	6.00	1.00	POWDERY ORE	DARK GREY	57.19	6.21	4.74	
6.00	7.00	1.00	POWDERY ORE	DARK GREY	63.83	2.29	1.95	
7.00	8.00	1.00	POWDERY ORE	DARK GREY	64.31	1.97	1.71	
8.00	9.00	1.00	POWDERY ORE	DARK GREY	63.68	2.47	1.89	
9.00	10.00	1.00	POWDERY ORE	DARK GREY	64.75	1.80	1.41	
10.00	11.00	1.00	POWDERY ORE	DARK GREY	61.68	4.09	4.31	
11.00	12.00	1.00	POWDERY ORE	DARK GREY	60.03	5.40	6.13	
12.00	13.00	1.00	POWDERY ORE	DARK GREY	61.88	5.11	5.22	
13.00	14.00	1.00	POWDERY ORE	DARK GREY	61.91	4.98	5.68	
14.00	15.00	1.00	POWDERY ORE	DARK GREY	65.20	2.57	2.80	
15.00	16.00	1.00	POWDERY ORE	DARK GREY	64.88	2.77	3.08	
16.00	17.00	1.00	POWDERY ORE	DARK GREY	63.63	2.15	5.15	
17.00	18.00	1.00	POWDERY ORE	DARK GREY	63.05	4.40	4.97	
18.00	19.00	1.00	POWDERY ORE	DARK GREY	65.91	2.22	2.01	
19.00	20.00	1.00	POWDERY ORE	DARK GREY	65.70	2.51	2.29	
20.00	21.00	1.00	POWDERY ORE	DARK GREY	64.31	3.71	3.15	
21.00	22.00	1.00	POWDERY ORE	DARK GREY	64.12	3.74	3.73	
22.00	23.00	1.00	POWDERY ORE	DARK GREY	64.86	3.46	2.92	
23.00	24.00	1.00	POWDERY ORE	DARK GREY	62.72	4.25	4.23	

BOREHOLE NO:MHGR-4

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	POWDERY ORE	DARK GREY	63.43	3.53	5.05
25.00	26.00	1.00	POWDERY ORE	DARK GREY	64.06	3.43	4.73
26.00	27.00	1.00	POWDERY ORE	DARK GREY	63.58	3.82	5.07
27.00	28.00	1.00	POWDERY ORE	DARK GREY	63.94	3.74	3.00
28.00	29.00	1.00	POWDERY ORE	DARK GREY	63.54	3.64	4.94
29.00	30.00	1.00	POWDERY ORE	DARK GREY	63.52	3.73	5.08
30.00	31.00	1.00	POWDERY ORE	DARK GREY	63.27	4.06	4.79
31.00	32.00	1.00	POWDERY ORE	DARK GREY	63.97	3.95	3.06
32.00	33.00	1.00	POWDERY ORE	DARK GREY	63.73	4.55	2.47
33.00	34.00	1.00	POWDERY ORE	DARK GREY	62.23	6.11	2.79
34.00	35.00	1.00	POWDERY ORE	DARK GREY	64.53	3.22	3.92
35.00	36.00	1.00	POWDERY ORE	DARK GREY	63.45	5.12	3.30
36.00	37.00	1.00	POWDERY ORE	DARK GREY	57.94	13.30	2.81
37.00	38.00	1.00	POWDERY ORE	DARK GREY	52.24	22.03	1.96
38.00	39.00	1.00	POWDERY ORE	DARK GREY	57.29	13.22	1.25
39.00	40.00	1.00	POWDERY ORE	DARK GREY	55.01	19.33	1.29
40.00	41.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	49.64	25.82	0.94
41.00	42.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	48.48	27.11	0.95
42.00	43.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	52.52	17.92	1.12
43.00	44.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	46.11	28.94	1.14
44.00	45.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	46.36	26.81	1.37
45.00	46.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	41.35	34.18	1.11
46.00	47.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	43.52	31.65	1.45
47.00	48.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.49	39.46	0.95
48.00	49.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.72	37.80	1.14
49.00	50.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	36.27	44.08	0.93
50.00	51.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	41.07	37.08	1.21
51.00	52.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.97	40.21	0.95
52.00	53.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.95	39.07	1.27
53.00	54.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.14	32.98	5.23
54.00	55.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	41.95	38.59	1.29

BOREHOLE NO:MHGR-4

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	45.58	29.02	1.60	
56.00	57.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.01	38.59	1.36	
57.00	58.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.40	41.33	1.12	
58.00	59.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.50	36.64	2.46	
59.00	60.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	47.58	28.36	2.71	
60.00	61.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	36.78	43.40	1.25	
61.00	62.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.25	39.36	2.27	
62.00	63.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	48.89	27.79	2.10	
63.00	64.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.69	44.48	1.39	
64.00	65.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	34.66	39.00	5.03	MAGNETITC
65.00	66.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	41.85	33.09	1.80	MAGNETITC
66.00	67.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	35.63	42.91	1.03	MAGNETITC
67.00	68.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	34.51	43.49	0.84	MAGNETITC
68.00	69.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	34.93	43.33	0.88	MAGNETITC
69.00	70.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	35.44	43.10	0.69	MAGNETITC
70.00	71.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	35.38	43.24	0.73	MAGNETITC
71.00	72.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	35.45	41.04	0.65	MAGNETITC
72.00	73.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	31.85	46.14	0.60	MAGNETITC
73.00	74.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	36.91	41.92	0.83	MAGNETITC
74.00	75.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	41.04	37.62	1.02	MAGNETITC
75.00	76.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	34.26	44.16	0.66	MAGNETITC
76.00	77.00	1.00	BANDED MAGNETITE QUARTZITE	DARK BROWN	37.03	40.54	0.67	MAGNETITC

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-5

LATITUDE : 1664104.087
 LONGITUDE : 664206.966
 REDUCED LEVEL (M): 942.444

DATE OF COMMENCEMENT : 19/02/16
 DATE OF CLOSURE : 19/02/16
 DEPTH DRILLED (M) : 91.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	POWDERY ORE	DARK GREY	64.09	2.95	2.21	
1.00	2.00	1.00	POWDERY ORE	DARK GREY	61.90	2.85	3.46	
2.00	3.00	1.00	POWDERY ORE	DARK GREY	62.24	2.76	4.44	
3.00	4.00	1.00	POWDERY ORE	DARK GREY	64.36	2.41	2.26	
4.00	5.00	1.00	POWDERY ORE	DARK GREY	64.42	2.59	2.04	
5.00	6.00	1.00	POWDERY ORE	DARK GREY	63.87	2.41	2.19	
6.00	7.00	1.00	HAEMATITIC ORE	DARK BROWN	63.94	2.29	2.03	
7.00	8.00	1.00	HAEMATITIC ORE	DARK BROWN	64.11	2.17	2.16	
8.00	9.00	1.00	HAEMATITIC ORE	DARK BROWN	64.38	1.39	2.29	
9.00	10.00	1.00	HAEMATITIC ORE	DARK BROWN	62.89	2.54	2.61	
10.00	11.00	1.00	HAEMATITIC ORE	DARK BROWN	64.32	1.39	2.45	
11.00	12.00	1.00	HAEMATITIC ORE	DARK BROWN	64.62	1.17	2.39	
12.00	13.00	1.00	HAEMATITIC ORE	DARK BROWN	62.51	4.14	2.15	
13.00	14.00	1.00	HAEMATITIC ORE	DARK BROWN	63.03	2.10	2.79	
14.00	15.00	1.00	HAEMATITIC ORE	DARK BROWN	62.18	1.88	3.59	
15.00	16.00	1.00	SOFT LAMINATED ORE	DARK GREY	65.12	1.92	1.76	
16.00	17.00	1.00	SOFT LAMINATED ORE	DARK GREY	65.17	1.19	1.69	
17.00	18.00	1.00	HAEMATITIC ORE	DARK BROWN	65.90	1.02	1.13	
18.00	19.00	1.00	HAEMATITIC ORE	DARK BROWN	64.90	2.01	1.30	
19.00	20.00	1.00	HAEMATITIC ORE	DARK BROWN	64.12	1.94	1.42	
20.00	21.00	1.00	POWDERY ORE	DARK GREY	64.01	2.83	1.30	
21.00	22.00	1.00	POWDERY ORE	DARK GREY	64.76	1.73	1.90	
22.00	23.00	1.00	POWDERY ORE	DARK GREY	63.98	2.13	2.10	
23.00	24.00	1.00	POWDERY ORE	DARK GREY	64.67	2.45	1.06	

BOREHOLE NO:MHGR-5

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	POWDERY ORE	DARK GREY	66.60	1.39	1.29
25.00	26.00	1.00	POWDERY ORE	DARK GREY	66.85	2.04	1.32
26.00	27.00	1.00	POWDERY ORE	DARK GREY	64.88	2.90	2.54
27.00	28.00	1.00	POWDERY ORE	DARK GREY	61.07	7.47	2.92
28.00	29.00	1.00	POWDERY ORE	DARK GREY	62.36	5.40	2.25
29.00	30.00	1.00	POWDERY ORE	DARK GREY	60.20	7.74	2.08
30.00	31.00	1.00	POWDERY ORE	DARK GREY	54.71	15.45	1.58
31.00	32.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	44.41	30.46	0.88
32.00	33.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	44.01	31.36	0.95
33.00	34.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	43.02	34.77	0.80
34.00	35.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	41.21	36.02	0.88
35.00	36.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.98	39.40	0.79
36.00	37.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.60	35.93	0.89
37.00	38.00	1.00	SILICEOUS IRON ORE	STEEL GREY	37.28	42.38	1.21
38.00	39.00	1.00	POWDERY ORE	STEEL GREY	43.18	34.05	0.93
39.00	40.00	1.00	POWDERY ORE	STEEL GREY	34.64	45.95	0.76
40.00	41.00	1.00	POWDERY ORE	STEEL GREY	42.04	37.93	0.75
41.00	42.00	1.00	POWDERY ORE	STEEL GREY	39.69	40.70	0.70
42.00	43.00	1.00	POWDERY ORE	STEEL GREY	37.34	43.19	0.85
43.00	44.00	1.00	POWDERY ORE	STEEL GREY	37.82	42.64	0.92
44.00	45.00	1.00	POWDERY ORE	STEEL GREY	36.02	44.64	0.56
45.00	46.00	1.00	POWDERY ORE	STEEL GREY	38.84	43.02	0.68
46.00	47.00	1.00	POWDERY ORE	STEEL GREY	35.40	45.60	0.60
47.00	48.00	1.00	POWDERY ORE	STEEL GREY	35.11	46.29	0.89
48.00	49.00	1.00	POWDERY ORE	STEEL GREY	43.94	36.04	0.79
49.00	50.00	1.00	POWDERY ORE	STEEL GREY	38.91	41.07	0.73
50.00	51.00	1.00	POWDERY ORE	STEEL GREY	37.47	42.46	0.61
51.00	52.00	1.00	POWDERY ORE	STEEL GREY	36.19	44.72	0.59
52.00	53.00	1.00	POWDERY ORE	STEEL GREY	37.82	43.53	0.64
53.00	54.00	1.00	POWDERY ORE	STEEL GREY	38.34	41.89	0.65
54.00	55.00	1.00	POWDERY ORE	STEEL GREY	37.50	43.06	0.58

BOREHOLE NO:MHGR-5

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	33.60	48.48	0.56	
56.00	57.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.05	46.51	0.58	
57.00	58.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.17	41.72	0.57	
58.00	59.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.11	42.29	0.58	
59.00	60.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.40	39.34	0.49	
60.00	61.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.82	42.11	0.48	
61.00	62.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.70	42.33	0.63	
62.00	63.00	1.00	BHQ	LIGHT GREY	32.26	48.95	0.70	
63.00	64.00	1.00	BHQ	LIGHT GREY	34.44	46.27	0.84	
64.00	65.00	1.00	BHQ	LIGHT GREY	31.58	49.48	0.81	
65.00	66.00	1.00	BHQ	LIGHT GREY	30.08	50.94	0.71	
66.00	67.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	35.34	46.09	0.63	
67.00	68.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	36.22	45.15	0.61	
68.00	69.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	34.33	46.22	1.44	
69.00	70.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	34.88	45.49	0.93	
70.00	71.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	30.10	51.33	0.88	
71.00	72.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	29.62	52.28	0.95	
72.00	73.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	32.66	48.94	0.95	
73.00	74.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	34.91	46.56	0.83	
74.00	75.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	33.41	48.44	0.79	
75.00	76.00	1.00	BHQ	LIGHT GREY	35.17	46.58	0.88	
76.00	77.00	1.00	BHQ	LIGHT GREY	32.59	47.98	1.30	
77.00	78.00	1.00	BHQ	LIGHT GREY	34.73	47.80	0.56	
78.00	79.00	1.00	BHQ	LIGHT GREY	37.77	44.18	0.49	
79.00	80.00	1.00	BHQ	LIGHT GREY	38.46	42.29	0.53	
80.00	81.00	1.00	BHQ	LIGHT GREY	36.92	45.51	0.53	
81.00	82.00	1.00	BHQ	LIGHT GREY	37.54	42.22	0.74	
82.00	83.00	1.00	BHQ	LIGHT BROWN	37.02	43.26	0.71	
83.00	84.00	1.00	BHQ	LIGHT BROWN	32.78	47.72	0.62	
84.00	85.00	1.00	BHQ	LIGHT BROWN	33.15	45.03	1.66	
85.00	86.00	1.00	BHQ	LIGHT BROWN	31.84	49.48	1.02	

BOREHOLE NO:MHGR-5

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
86.00	87.00	1.00	BHQ	LIGHT BROWN	29.48	51.49	0.80	
87.00	88.00	1.00	BHQ	LIGHT GREY	34.12	47.69	0.57	
88.00	89.00	1.00	BHQ	LIGHT GREY	33.26	48.48	0.57	
89.00	90.00	1.00	BHQ	LIGHT GREY	31.91	49.65	0.78	
90.00	91.00	1.00	BHQ	LIGHT GREY	31.00	49.57	0.65	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-6

LATITUDE : 1664170.330
LONGITUDE : 664138.822
REDUCED LEVEL (M): 942.638

DATE OF COMMENCEMENT : 18/02/16
DATE OF CLOSURE : 18/02/16
DEPTH DRILLED (M) : 65.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	POWDERY ORE	DARK GREY	64.04	2.19	3.48	
1.00	2.00	1.00	POWDERY ORE	DARK GREY	65.24	1.95	1.92	
2.00	3.00	1.00	POWDERY ORE	DARK GREY	64.41	2.95	1.85	
3.00	4.00	1.00	POWDERY ORE	DARK GREY	66.80	1.26	1.44	
4.00	5.00	1.00	POWDERY ORE	DARK GREY	63.38	3.95	3.64	
5.00	6.00	1.00	POWDERY ORE	DARK GREY	62.75	4.09	3.13	
6.00	7.00	1.00	POWDERY ORE	DARK GREY	64.72	3.69	2.13	
7.00	8.00	1.00	POWDERY ORE	DARK GREY	66.69	1.50	1.40	
8.00	9.00	1.00	POWDERY ORE	DARK GREY	66.22	2.67	1.17	
9.00	10.00	1.00	POWDERY ORE	DARK GREY	67.66	1.12	0.94	
10.00	11.00	1.00	POWDERY ORE	DARK GREY	65.32	2.83	0.76	
11.00	12.00	1.00	POWDERY ORE	DARK GREY	65.55	1.95	0.82	
12.00	13.00	1.00	POWDERY ORE	DARK GREY	66.45	0.96	0.75	
13.00	14.00	1.00	POWDERY ORE	DARK GREY	61.19	5.06	5.43	
14.00	15.00	1.00	POWDERY ORE	DARK GREY	64.09	2.93	2.25	
15.00	16.00	1.00	POWDERY ORE	DARK GREY	63.89	4.35	1.50	
16.00	17.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	48.84	26.54	1.49	
17.00	18.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	47.82	27.02	1.30	
18.00	19.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	42.67	33.67	1.17	
19.00	20.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.19	37.68	1.05	
20.00	21.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	44.67	33.60	0.95	
21.00	22.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	51.46	20.82	1.45	
22.00	23.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	54.98	17.12	1.41	
23.00	24.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	46.41	32.06	1.02	

BOREHOLE NO:MHGR-6

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.13	42.02	0.75
25.00	26.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.63	45.75	1.02
26.00	27.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.36	38.34	0.95
27.00	28.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	36.71	44.86	0.82
28.00	29.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	41.04	39.44	0.76
29.00	30.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	44.37	35.14	0.69
30.00	31.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	41.03	38.39	0.79
31.00	32.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	44.78	33.82	0.82
32.00	33.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	44.23	35.39	0.96
33.00	34.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.53	41.00	0.76
34.00	35.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.06	40.66	0.81
35.00	36.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	42.54	37.40	0.87
36.00	37.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.93	40.36	1.32
37.00	38.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.23	44.44	1.28
38.00	39.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.45	40.93	0.67
39.00	40.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	43.97	36.10	0.68
40.00	41.00	1.00	BHQ	DARK BROWN	35.77	47.24	0.66
41.00	42.00	1.00	BHQ	DARK BROWN	39.59	41.24	0.60
42.00	43.00	1.00	BHQ	DARK BROWN	34.97	46.38	0.63
43.00	44.00	1.00	BHQ	DARK BROWN	34.95	45.89	0.66
44.00	45.00	1.00	BHQ	DARK BROWN	33.53	48.53	0.59
45.00	46.00	1.00	BHQ	DARK BROWN	26.73	55.46	0.77
46.00	47.00	1.00	BHQ	DARK BROWN	28.51	52.99	1.66
47.00	48.00	1.00	BHQ	DARK BROWN	30.46	51.36	1.03
48.00	49.00	1.00	BHQ	DARK BROWN	35.79	46.40	0.73
49.00	50.00	1.00	BHQ	DARK BROWN	37.25	44.65	0.75
50.00	51.00	1.00	BHQ	DARK BROWN	35.11	45.76	1.51
51.00	52.00	1.00	BHQ	DARK BROWN	32.71	49.81	0.78
52.00	53.00	1.00	BHQ	DARK BROWN	32.68	48.72	0.87
53.00	54.00	1.00	BHQ	DARK BROWN	30.74	51.06	0.70
54.00	55.00	1.00	BHQ	DARK BROWN	34.55	47.37	0.74

BOREHOLE NO:MHGR-6

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	BHQ	DARK BROWN	36.10	45.32	1.87	
56.00	57.00	1.00	BHQ	DARK BROWN	36.89	45.33	0.77	
57.00	58.00	1.00	BHQ	DARK BROWN	38.82	42.13	0.73	
58.00	59.00	1.00	BHQ	DARK BROWN	36.19	45.24	0.56	
59.00	60.00	1.00	BHQ	DARK BROWN	30.72	51.81	0.59	
60.00	61.00	1.00	BHQ	DARK BROWN	30.78	50.09	2.13	
61.00	62.00	1.00	BHQ	DARK BROWN	29.71	52.87	0.95	
62.00	63.00	1.00	BHQ	DARK BROWN	32.99	49.72	0.72	
63.00	64.00	1.00	BHQ	DARK BROWN	31.42	51.83	0.70	
64.00	65.00	1.00	BHQ	DARK BROWN	36.43	44.46	0.68	

ANNEXURE - IIIB/19

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-7

LATITUDE : 1663947.487
LONGITUDE : 664639.505
REDUCED LEVEL (M): 942.195

DATE OF COMMENCEMENT : 19/02/16
DATE OF CLOSURE : 19/02/16
DEPTH DRILLED (M) : 110.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	FLOAT ORE	DARK BROWN	57.70	1.75	6.29	
1.00	2.00	1.00	FLOAT ORE	DARK BROWN	56.38	2.90	9.09	
2.00	3.00	1.00	FLOAT ORE	DARK BROWN	57.14	2.37	8.56	
3.00	4.00	1.00	HAEMATITIC ORE	DARK BROWN	66.60	1.69	1.58	
4.00	5.00	1.00	HAEMATITIC ORE	DARK BROWN	60.30	1.29	3.40	
5.00	6.00	1.00	HAEMATITIC ORE	DARK BROWN	59.47	1.65	3.39	
6.00	7.00	1.00	HAEMATITIC ORE	DARK BROWN	61.80	1.23	2.60	
7.00	8.00	1.00	HAEMATITIC ORE	DARK BROWN	62.40	0.82	2.51	
8.00	9.00	1.00	HAEMATITIC ORE	DARK BROWN	62.55	1.20	2.26	
9.00	10.00	1.00	HAEMATITIC ORE	DARK BROWN	56.12	8.75	2.22	
10.00	11.00	1.00	HAEMATITIC ORE	DARK BROWN	60.92	0.93	2.59	
11.00	12.00	1.00	HAEMATITIC ORE	DARK BROWN	59.10	1.02	3.00	
12.00	13.00	1.00	HAEMATITIC ORE	DARK BROWN	58.37	0.77	3.36	
13.00	14.00	1.00	HAEMATITIC ORE	DARK BROWN	59.50	0.72	2.53	
14.00	15.00	1.00	HAEMATITIC ORE	DARK BROWN	58.50	1.44	2.40	
15.00	16.00	1.00	HAEMATITIC ORE	DARK BROWN	57.78	1.34	2.67	
16.00	17.00	1.00	HAEMATITIC ORE	DARK BROWN	59.21	1.06	2.50	
17.00	18.00	1.00	HAEMATITIC ORE	DARK BROWN	61.41	0.71	2.36	
18.00	19.00	1.00	POWDERY ORE	STEEL GREY	63.97	0.66	2.43	WITH HAEMATITE ORE CHIPS
19.00	20.00	1.00	POWDERY ORE	STEEL GREY	63.83	0.77	2.72	WITH HAEMATITE ORE CHIPS
20.00	21.00	1.00	POWDERY ORE	STEEL GREY	65.14	0.70	2.59	WITH HAEMATITE ORE CHIPS
21.00	22.00	1.00	POWDERY ORE	STEEL GREY	66.91	1.11	1.72	WITH HAEMATITE ORE CHIPS
22.00	23.00	1.00	POWDERY ORE	STEEL GREY	68.25	0.68	1.07	WITH HAEMATITE ORE CHIPS
23.00	24.00	1.00	POWDERY ORE	STEEL GREY	66.75	1.26	1.52	WITH HAEMATITE ORE CHIPS

BOREHOLE NO:MHGR-7

DEPTH (M)		THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe	SiO ₂	Al ₂ O ₃	REMARKS		
FROM	TO	(m)			%	%	%			
24.00	25.00	1.00	POWDERY ORE	STEEL GREY	65.93	1.74	1.46	WITH	HAEMATITE	ORE CHIPS
25.00	26.00	1.00	POWDERY ORE	STEEL GREY	66.06	0.72	1.69	WITH	HAEMATITE	ORE CHIPS
26.00	27.00	1.00	POWDERY ORE	STEEL GREY	66.59	0.69	1.64	WITH	HAEMATITE	ORE CHIPS
27.00	28.00	1.00	POWDERY ORE	STEEL GREY	64.26	0.62	2.42	WITH	HAEMATITE	ORE CHIPS
28.00	29.00	1.00	HAEMATITIC ORE	CHERRY RED	66.18	0.65	1.62	WITH	HAEMATITE	ORE CHIPS
29.00	30.00	1.00	HAEMATITIC ORE	CHERRY RED	66.08	1.01	1.30			
30.00	31.00	1.00	HAEMATITIC ORE	CHERRY RED	64.29	0.68	2.58			
31.00	32.00	1.00	BLUE DUST	DARK BLUE	68.18	0.52	0.87			
32.00	33.00	1.00	BLUE DUST	DARK BLUE	68.66	0.50	0.84			
33.00	34.00	1.00	BLUE DUST	DARK BLUE	68.27	0.61	0.81			
34.00	35.00	1.00	BLUE DUST	DARK BLUE	68.47	0.51	0.64			
35.00	36.00	1.00	BLUE DUST	DARK BLUE	68.33	0.52	0.62			
36.00	37.00	1.00	BLUE DUST	DARK BLUE	68.77	0.53	0.67			
37.00	38.00	1.00	BLUE DUST	DARK BLUE	68.79	0.53	0.68			
38.00	39.00	1.00	POWDERY ORE	STEEL GREY	67.03	0.62	1.04			
39.00	40.00	1.00	POWDERY ORE	STEEL GREY	64.65	1.84	1.28			
40.00	41.00	1.00	POWDERY ORE	STEEL GREY	67.36	0.79	1.00			
41.00	42.00	1.00	POWDERY ORE	STEEL GREY	67.54	0.62	0.74			
42.00	43.00	1.00	POWDERY ORE	STEEL GREY	68.57	0.68	0.62			
43.00	44.00	1.00	POWDERY ORE	STEEL GREY	68.00	0.90	0.71			
44.00	45.00	1.00	POWDERY ORE	STEEL GREY	68.28	0.62	0.85			
45.00	46.00	1.00	POWDERY ORE	STEEL GREY	68.76	0.58	0.77			
46.00	47.00	1.00	POWDERY ORE	STEEL GREY	67.33	0.68	0.93			
47.00	48.00	1.00	POWDERY ORE	STEEL GREY	67.59	0.65	1.18			
48.00	49.00	1.00	POWDERY ORE	STEEL GREY	65.62	0.78	1.33			
49.00	50.00	1.00	POWDERY ORE	STEEL GREY	66.20	1.14	1.28			
50.00	51.00	1.00	POWDERY ORE	STEEL GREY	67.39	0.98	2.05			
51.00	52.00	1.00	POWDERY ORE	STEEL GREY	68.55	0.79	0.91			
52.00	53.00	1.00	POWDERY ORE	STEEL GREY	64.69	2.14	4.75			
53.00	54.00	1.00	POWDERY ORE	STEEL GREY	56.79	7.49	10.62			
54.00	55.00	1.00	POWDERY ORE	STEEL GREY	61.50	1.53	4.70			

ANNEXURE - IIIB/21

BOREHOLE NO:MHGR-7

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	BLUE DUST	DARK BLUE	67.63	1.02	1.27	
56.00	57.00	1.00	BLUE DUST	DARK BLUE	67.30	1.58	1.06	
57.00	58.00	1.00	BLUE DUST	DARK BLUE	67.97	0.83	1.04	
58.00	59.00	1.00	BLUE DUST	DARK BLUE	67.14	0.90	1.58	
59.00	60.00	1.00	BLUE DUST	DARK BLUE	67.37	1.02	2.09	
60.00	61.00	1.00	POWDERY ORE	STEEL GREY	65.97	2.98	1.28	
61.00	62.00	1.00	POWDERY ORE	STEEL GREY	67.58	0.92	1.10	
62.00	63.00	1.00	POWDERY ORE	STEEL GREY	67.62	0.97	1.04	
63.00	64.00	1.00	POWDERY ORE	STEEL GREY	68.04	1.07	1.40	
64.00	65.00	1.00	POWDERY ORE	STEEL GREY	66.13	2.47	2.59	
65.00	66.00	1.00	POWDERY ORE	STEEL GREY	66.56	2.00	2.65	
66.00	67.00	1.00	POWDERY ORE	STEEL GREY	66.89	1.90	2.24	
67.00	68.00	1.00	POWDERY ORE	STEEL GREY	67.35	1.50	1.68	
68.00	69.00	1.00	POWDERY ORE	STEEL GREY	65.75	2.51	3.09	
69.00	70.00	1.00	POWDERY ORE	STEEL GREY	66.38	2.29	2.60	
70.00	71.00	1.00	POWDERY ORE	STEEL GREY	67.04	1.62	2.05	
71.00	72.00	1.00	POWDERY ORE	STEEL GREY	67.74	1.14	1.18	
72.00	73.00	1.00	POWDERY ORE	STEEL GREY	67.73	1.35	1.37	
73.00	74.00	1.00	POWDERY ORE	STEEL GREY	67.13	1.53	1.61	
74.00	75.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR	27.84	26.56	30.54	SAMPLE DEPTH : 74.00-76.00m
75.00	76.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR				
76.00	77.00	1.00	CLAY	GREYISH WHITE-BR	8.96	39.22	34.90	SAMPLE DEPTH : 76.00-78.00m
77.00	78.00	1.00	CLAY	GREYISH WHITE-BR				
78.00	79.00	1.00	CLAY	GREYISH WHITE-BR	7.25	40.51	35.90	SAMPLE DEPTH : 78.00-80.00m
79.00	80.00	1.00	CLAY	GREYISH WHITE-BR				
80.00	81.00	1.00	CLAY	GREYISH WHITE-BR	6.65	40.71	35.44	SAMPLE DEPTH : 80.00-82.00m
81.00	82.00	1.00	CLAY	GREYISH WHITE-BR				
82.00	83.00	1.00	CLAY	GREYISH WHITE-BR	7.18	40.14	34.96	SAMPLE DEPTH : 82.00-84.00m
83.00	84.00	1.00	CLAY	GREYISH WHITE-BR				
84.00	85.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR	37.25	18.76	26.83	
85.00	86.00	1.00	SILICEOUS IRON ORE	DARK GREY	63.39	2.43	6.20	OCC.HAEMATITE PIECES

ANNEXURE - IIIB/22

BOREHOLE NO:MHGR-7

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
86.00	87.00	1.00	SILICEOUS IRON ORE	DARK GREY	58.43	1.74	5.62	OCC. HAEMATITE PIECES
87.00	88.00	1.00	SILICEOUS IRON ORE	DARK GREY	65.49	2.10	1.80	OCC. HAEMATITE PIECES
88.00	89.00	1.00	SILICEOUS IRON ORE	DARK GREY	64.42	3.52	2.50	OCC. HAEMATITE PIECES
89.00	90.00	1.00	SILICEOUS IRON ORE	DARK GREY	53.07	18.56	1.48	OCC. HAEMATITE PIECES
90.00	91.00	1.00	SILICEOUS IRON ORE	DARK GREY	47.39	27.07	1.56	OCC. HAEMATITE PIECES
91.00	92.00	1.00	SILICEOUS IRON ORE	DARK GREY	43.49	33.29	1.61	
92.00	93.00	1.00	SILICEOUS IRON ORE	DARK GREY	41.15	38.90	1.66	
93.00	94.00	1.00	SILICEOUS IRON ORE	DARK GREY	39.50	40.72	1.20	
94.00	95.00	1.00	SILICEOUS IRON ORE	DARK GREY	30.34	52.60	0.94	
95.00	96.00	1.00	SILICEOUS IRON ORE	DARK GREY	35.92	46.59	1.73	
96.00	97.00	1.00	SILICEOUS IRON ORE	DARK GREY	37.29	43.62	1.35	
97.00	98.00	1.00	SILICEOUS IRON ORE	DARK GREY	37.64	42.65	1.28	
98.00	99.00	1.00	SILICEOUS IRON ORE	DARK GREY	35.28	47.19	1.50	
99.00	100.00	1.00	SILICEOUS IRON ORE	DARK GREY	36.14	46.57	1.46	
100.00	101.00	1.00	SILICEOUS IRON ORE	DARK GREY	31.02	50.78	1.98	
101.00	102.00	1.00	SILICEOUS IRON ORE	DARK GREY	35.19	47.07	1.78	
102.00	103.00	1.00	SILICEOUS IRON ORE	DARK GREY	37.46	42.95	1.34	
103.00	104.00	1.00	SILICEOUS IRON ORE	DARK GREY	40.94	37.22	1.46	
104.00	105.00	1.00	SILICEOUS IRON ORE	DARK GREY	39.50	38.65	1.28	
105.00	106.00	1.00	SILICEOUS IRON ORE	DARK GREY	38.07	42.25	1.70	
106.00	107.00	1.00	SILICEOUS IRON ORE	DARK GREY	39.35	40.13	1.58	
107.00	108.00	1.00	SILICEOUS IRON ORE	DARK GREY	39.00	40.38	1.50	
108.00	109.00	1.00	SILICEOUS IRON ORE	DARK GREY	37.30	43.38	1.49	
109.00	110.00	1.00	SILICEOUS IRON ORE	DARK GREY	46.76	27.78	1.56	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-8

LATITUDE : 1664360.760
 LONGITUDE : 664037.353
 REDUCED LEVEL (M): 924.808

DATE OF COMMENCEMENT : 19/02/16
 DATE OF CLOSURE : 19/02/16
 DEPTH DRILLED (M) : 70.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS !	!		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	POWDERY ORE	GREY	60.14	4.24	3.57	
1.00	2.00	1.00	POWDERY ORE	GREY	63.49	2.56	2.04	
2.00	3.00	1.00	POWDERY ORE	GREY	64.05	2.20	1.78	
3.00	4.00	1.00	POWDERY ORE	GREY	65.17	1.84	1.78	
4.00	5.00	1.00	POWDERY ORE	GREY	65.60	1.48	1.53	
5.00	6.00	1.00	POWDERY ORE	GREY	65.60	1.10	1.27	
6.00	7.00	1.00	POWDERY ORE	GREY	66.57	1.18	1.78	
7.00	8.00	1.00	POWDERY ORE	DARK GREY	64.21	1.32	1.27	
8.00	9.00	1.00	POWDERY ORE	DARK GREY	65.31	1.44	2.04	
9.00	10.00	1.00	POWDERY ORE	DARK GREY	65.31	1.18	1.78	
10.00	11.00	1.00	POWDERY ORE	DARK GREY	65.31	1.70	1.27	
11.00	12.00	1.00	POWDERY ORE	DARK GREY	59.86	2.18	3.31	
12.00	13.00	1.00	POWDERY ORE	DARK GREY	64.89	1.50	2.04	
13.00	14.00	1.00	POWDERY ORE	DARK GREY	63.63	0.18	5.35	
14.00	15.00	1.00	POWDERY ORE	DARK GREY	65.45	2.40	2.80	
15.00	16.00	1.00	POWDERY ORE	DARK GREY	65.73	1.18	2.04	
16.00	17.00	1.00	POWDERY ORE	DARK GREY	65.31	1.44	3.82	
17.00	18.00	1.00	POWDERY ORE	DARK GREY	65.87	1.72	2.55	
18.00	19.00	1.00	POWDERY ORE	DARK GREY	58.18	11.38	3.31	
19.00	20.00	1.00	POWDERY ORE	DARK GREY	67.13	1.26	2.55	
20.00	21.00	1.00	POWDERY ORE	DARK GREY	66.29	1.68	1.78	
21.00	22.00	1.00	BANDED MAGNETITE QUARTZITE	GREY	59.30	10.78	2.55	MAGNETIC
22.00	23.00	1.00	BANDED MAGNETITE QUARTZITE	GREY	56.64	15.18	2.04	MAGNETIC
23.00	24.00	1.00	BANDED MAGNETITE QUARTZITE	GREY	53.15	18.54	3.06	MAGNETIC

BOREHOLE NO:MHGR-8

DEPTH (M)		THICK- NESS	LITHOLOGY		COLOR DETAILS	Fe	SiO ₂	Al ₂ O ₃	REMARKS
FROM	TO	(m)				%	%	%	
24.00	25.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	41.67	35.60	2.29	MAGNETIC
25.00	26.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	59.58	10.58	3.06	MAGNETIC
26.00	27.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	63.92	4.82	2.57	MAGNETIC
27.00	28.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	64.89	3.24	2.55	MAGNETIC
28.00	29.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	65.73	2.78	2.04	MAGNETIC
29.00	30.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	63.92	4.58	3.82	MAGNETIC
30.00	31.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	63.64	4.56	3.82	MAGNETIC
31.00	32.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	59.86	8.70	4.59	MAGNETIC
32.00	33.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	49.23	25.22	4.33	MAGNETIC
33.00	34.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	34.34	48.90	1.27	MAGNETIC
34.00	35.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	54.40	18.82	1.78	MAGNETIC
35.00	36.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	59.16	10.10	3.82	MAGNETIC
36.00	37.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	45.29	32.40	1.53	MAGNETIC
37.00	38.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	44.13	35.70	0.76	MAGNETIC
38.00	39.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	42.65	37.56	1.02	MAGNETIC
39.00	40.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	34.55	47.16	2.04	MAGNETIC
40.00	41.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	38.86	38.50	2.29	MAGNETIC
41.00	42.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	41.38	32.50	2.55	MAGNETIC
42.00	43.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	38.32	38.28	1.27	MAGNETIC
43.00	44.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	42.23	36.88	1.27	MAGNETIC
44.00	45.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	37.48	37.20	1.78	MAGNETIC
45.00	46.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	41.61	38.50	1.27	MAGNETIC
46.00	47.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	43.64	32.38	1.53	MAGNETIC
47.00	48.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	42.09	38.14	0.76	MAGNETIC
48.00	49.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	45.31	31.68	1.53	MAGNETIC
49.00	50.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	41.82	21.32	1.27	MAGNETIC
50.00	51.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	42.79	24.42	1.27	MAGNETIC
51.00	52.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	43.49	29.12	1.78	MAGNETIC
52.00	53.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	40.27	38.40	0.76	MAGNETIC
53.00	54.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	42.02	38.12	1.53	MAGNETIC
54.00	55.00	1.00	BANDED	MAGNETITE QUARTZITE	GREY	54.26	15.80	1.53	MAGNETIC

ANNEXURE - IIIB/25

BOREHOLE NO:MHGR-8

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	15.10	42.44	19.63	
56.00	57.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	33.99	18.14	16.32	SAMPLE DEPTH : 56.00-58.00m
57.00	58.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
58.00	59.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	26.43	10.10	21.93	SAMPLE DEPTH : 58.00-60.00m
59.00	60.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
60.00	61.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	23.22	8.70	20.91	SAMPLE DEPTH : 60.00-62.00m
61.00	62.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
62.00	63.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	16.78	5.68	21.42	SAMPLE DEPTH : 62.00-64.00m
63.00	64.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
64.00	65.00	1.00	CLAY	YELLOWISH BROWN	17.20	38.12	20.15	SAMPLE DEPTH : 64.00-66.00m
65.00	66.00	1.00	CLAY	YELLOWISH BROWN				
66.00	67.00	1.00	CLAY	YELLOWISH BROWN	18.68	38.22	17.34	SAMPLE DEPTH : 66.00-68.00m
67.00	68.00	1.00	CLAY	YELLOWISH BROWN				
68.00	69.00	1.00	CLAY	YELLOWISH BROWN	19.86	36.42	18.87	SAMPLE DEPTH : 68.00-70.00m
69.00	70.00	1.00	CLAY	YELLOWISH BROWN				

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-9

LATITUDE : 1663888.553
 LONGITUDE : 664722.853
 REDUCED LEVEL (M): 948.115

DATE OF COMMENCEMENT : 19/02/16
 DATE OF CLOSURE : 20/02/16
 DEPTH DRILLED (M) : 100.00

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	! NESS !		!	! %	! %	! %		!
! FROM ! TO	! (m) !		!	!	!	!		!
0.00	1.00	1.00	HAEMATITIC ORE	DARK BROWN	49.65	18.14	4.84	
1.00	2.00	1.00	HAEMATITIC ORE	DARK BROWN	59.86	6.94	3.06	
2.00	3.00	1.00	SHALY ORE	YELLOWISH BROWN	58.74	8.70	3.57	
3.00	4.00	1.00	SHALY ORE	YELLOWISH BROWN	54.97	5.68	7.65	
4.00	5.00	1.00	SHALY ORE	YELLOWISH BROWN	59.30	5.46	4.84	
5.00	6.00	1.00	SHALY ORE	DARK BROWN	55.94	9.22	6.12	
6.00	7.00	1.00	SHALY ORE	DARK BROWN	53.70	12.94	6.12	
7.00	8.00	1.00	HAEMATITIC ORE	DARK BROWN	60.83	4.28	4.33	
8.00	9.00	1.00	HAEMATITIC ORE	DARK BROWN	65.03	2.62	2.04	
9.00	10.00	1.00	HAEMATITIC ORE	DARK BROWN	65.45	1.50	1.53	
10.00	11.00	1.00	HAEMATITIC ORE	DARK BROWN	65.45	1.96	2.04	
11.00	12.00	1.00	HAEMATITIC ORE	DARK BROWN	65.87	2.86	1.53	
12.00	13.00	1.00	HAEMATITIC ORE	DARK BROWN	64.47	2.26	2.04	
13.00	14.00	1.00	HAEMATITIC ORE	DARK BROWN	63.78	1.36	2.04	
14.00	15.00	1.00	HAEMATITIC ORE	DARK BROWN	62.38	2.44	3.57	
15.00	16.00	1.00	HAEMATITIC ORE	DARK BROWN	62.66	1.46	3.06	
16.00	17.00	1.00	HAEMATITIC ORE	DARK BROWN	64.62	1.04	2.04	
17.00	18.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	64.05	1.12	1.88	
18.00	19.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	64.76	0.64	1.78	
19.00	20.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	63.78	1.34	1.78	
20.00	21.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	64.33	1.60	1.78	
21.00	22.00	1.00	HAEMATITIC ORE	DARK BROWN	64.34	1.64	1.78	
22.00	23.00	1.00	HAEMATITIC ORE	DARK BROWN	65.03	1.64	1.53	
23.00	24.00	1.00	HAEMATITIC ORE	DARK BROWN	67.13	0.80	0.76	

BOREHOLE NO:MHGR-9

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	HAEMATITIC ORE	DARK BROWN	66.43	1.34	1.53
25.00	26.00	1.00	HAEMATITIC ORE	DARK BROWN	66.85	1.84	1.02
26.00	27.00	1.00	POWDERY ORE	DARK GREY	66.71	0.68	1.02
27.00	28.00	1.00	POWDERY ORE	DARK GREY	66.43	1.72	0.51
28.00	29.00	1.00	POWDERY ORE	DARK GREY	66.71	0.84	0.76
29.00	30.00	1.00	POWDERY ORE	DARK GREY	67.27	0.60	1.02
30.00	31.00	1.00	HAEMATITIC ORE	DARK GREY	68.25	0.52	0.51
31.00	32.00	1.00	HAEMATITIC ORE	DARK GREY	67.41	0.62	1.02
32.00	33.00	1.00	HAEMATITIC ORE	DARK GREY	36.92	43.98	0.76
33.00	34.00	1.00	HAEMATITIC ORE	DARK GREY	66.01	0.54	1.27
34.00	35.00	1.00	HAEMATITIC ORE	DARK GREY	67.41	0.64	1.27
35.00	36.00	1.00	HAEMATITIC ORE	DARK GREY	66.43	0.62	1.27
36.00	37.00	1.00	HAEMATITIC ORE	DARK GREY	66.43	1.18	1.53
37.00	38.00	1.00	POWDERY ORE	STEEL GREY	68.09	0.95	0.51
38.00	39.00	1.00	POWDERY ORE	STEEL GREY	68.60	1.17	0.44
39.00	40.00	1.00	POWDERY ORE	STEEL GREY	68.52	0.97	0.47
40.00	41.00	1.00	POWDERY ORE	DARK GREY	68.49	0.91	0.57
41.00	42.00	1.00	POWDERY ORE	DARK GREY	67.16	1.36	0.90
42.00	43.00	1.00	POWDERY ORE	DARK GREY	68.12	0.88	0.68
43.00	44.00	1.00	POWDERY ORE	DARK GREY	66.71	2.45	1.19
44.00	45.00	1.00	POWDERY ORE	DARK GREY	67.38	2.06	0.95
45.00	46.00	1.00	POWDERY ORE	DARK GREY	66.51	2.66	1.26
46.00	47.00	1.00	POWDERY ORE	DARK GREY	67.11	2.42	1.04
47.00	48.00	1.00	POWDERY ORE	DARK GREY	67.23	2.24	0.78
48.00	49.00	1.00	POWDERY ORE	DARK GREY	66.43	1.66	0.94
49.00	50.00	1.00	POWDERY ORE	DARK GREY	64.23	4.74	1.32
50.00	51.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	52.05	24.09	1.32
51.00	52.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.89	34.99	0.93
52.00	53.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.97	37.01	1.19
53.00	54.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.67	34.79	1.17
54.00	55.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	46.05	29.63	0.93

BOREHOLE NO:MHGR-9

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
55.00	56.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	41.76	33.89	0.79
56.00	57.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.54	35.86	1.80
57.00	58.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.96	34.83	1.22
58.00	59.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	40.29	35.38	1.17
59.00	60.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	37.72	38.20	1.01
60.00	61.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	35.81	46.63	0.75
61.00	62.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	33.01	48.33	1.00
62.00	63.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	32.43	49.54	0.77
63.00	64.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	37.74	37.51	1.18
64.00	65.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	37.96	37.51	1.16
65.00	66.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	43.03	33.10	0.78
66.00	67.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	41.47	35.01	0.83
67.00	68.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	41.31	34.38	0.79
68.00	69.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	40.71	34.61	1.00
69.00	70.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	37.95	37.77	0.64
70.00	71.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	37.96	36.34	0.69
71.00	72.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	38.77	35.43	0.59
72.00	73.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	34.36	40.74	0.54
73.00	74.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	33.62	48.01	0.50
74.00	75.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	32.40	42.55	0.53
75.00	76.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	34.94	40.29	0.60
76.00	77.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	34.35	40.00	0.70
77.00	78.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	35.58	39.81	0.60
78.00	79.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	33.30	48.18	0.57
79.00	80.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT BROWN	36.42	39.56	0.66
80.00	81.00	1.00	BLUE DUST	LIGHT BROWN	68.01	1.15	0.42
81.00	82.00	1.00	BLUE DUST	GREY	34.78	47.44	0.61
82.00	83.00	1.00	BANDED MAGNETITE QUARTZITE	GREY	33.83	48.10	0.48
83.00	84.00	1.00	BANDED MAGNETITE QUARTZITE	GREY	34.33	47.61	0.47
84.00	85.00	1.00	BANDED MAGNETITE QUARTZITE	GREY	34.68	47.22	0.50
85.00	86.00	1.00	BANDED MAGNETITE QUARTZITE	GREY	31.74	49.94	0.58

BOREHOLE NO:MHGR-9

! DEPTH (M)	! THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
86.00	87.00	1.00	BANDED MAGNETITE QUARTZITE	GREY	32.21	49.87	0.58	
87.00	88.00	1.00	BANDED MAGNETITE QUARTZITE	GREY	36.22	39.10	0.86	
88.00	89.00	1.00	BANDED MAGNETITE QUARTZITE	GREY	35.77	39.29	0.94	
89.00	90.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	36.84	38.54	0.89	
90.00	91.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	39.75	36.53	0.82	
91.00	92.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	35.21	47.31	0.57	
92.00	93.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	36.63	46.23	0.51	
93.00	94.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	39.34	37.11	0.50	
94.00	95.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	38.95	37.36	0.60	
95.00	96.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	39.37	36.88	0.62	
96.00	97.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	34.82	47.14	0.72	
97.00	98.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	34.25	47.57	0.77	
98.00	99.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	40.23	34.97	0.66	
99.00	100.00	1.00	BANDED MAGNETITE QUARTZITE	LIGHT GREY	40.08	35.00	0.66	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-10

LATITUDE : 1664191.625
LONGITUDE : 664458.967
REDUCED LEVEL (M): 922.902

DATE OF COMMENCEMENT : 19/02/16
DATE OF CLOSURE : 20/02/16
DEPTH DRILLED (M) : 75.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	HARD MASSIVE ORE	DARK BROWN	59.26	8.30	3.78	
1.00	2.00	1.00	HARD MASSIVE ORE	DARK BROWN	58.52	8.70	3.69	
2.00	3.00	1.00	HARD MASSIVE ORE	DARK BROWN	61.16	6.29	2.95	
3.00	4.00	1.00	HARD MASSIVE ORE	DARK BROWN	62.42	5.08	1.91	
4.00	5.00	1.00	HARD MASSIVE ORE	DARK BROWN	62.53	4.51	1.90	
5.00	6.00	1.00	HARD MASSIVE ORE	DARK BROWN	61.58	4.82	2.20	
6.00	7.00	1.00	HARD MASSIVE ORE	DARK BROWN	62.90	3.95	2.11	
7.00	8.00	1.00	HARD MASSIVE ORE	DARK BROWN	63.66	3.52	1.88	
8.00	9.00	1.00	HARD MASSIVE ORE	DARK BROWN	60.32	6.91	4.45	
9.00	10.00	1.00	POWDERY ORE	GREY	59.63	8.18	5.13	OCC.HAEMATITE PIECES
10.00	11.00	1.00	POWDERY ORE	GREY	61.71	6.45	4.01	OCC.HAEMATITE PIECES
11.00	12.00	1.00	HAEMATITIC ORE	GREY	55.27	10.64	8.99	
12.00	13.00	1.00	HAEMATITIC ORE	GREY	55.98	10.53	7.45	
13.00	14.00	1.00	POWDERY ORE	GREY	63.40	5.07	2.92	
14.00	15.00	1.00	POWDERY ORE	GREY	63.20	5.56	2.47	
15.00	16.00	1.00	POWDERY ORE	GREY	62.50	6.02	2.05	
16.00	17.00	1.00	POWDERY ORE	GREY	62.49	5.22	2.48	
17.00	18.00	1.00	POWDERY ORE	GREY	62.08	5.25	2.51	
18.00	19.00	1.00	POWDERY ORE	GREY	64.53	3.42	1.67	
19.00	20.00	1.00	HARD MASSIVE ORE	STEEL GREY	64.00	4.36	1.93	
20.00	21.00	1.00	HARD MASSIVE ORE	STEEL GREY	64.76	3.92	2.02	
21.00	22.00	1.00	HARD MASSIVE ORE	STEEL GREY	65.37	2.81	1.19	
22.00	23.00	1.00	HARD MASSIVE ORE	STEEL GREY	65.57	2.49	1.16	
23.00	24.00	1.00	HARD MASSIVE ORE	STEEL GREY	64.30	3.74	1.64	

ANNEXURE - IIIB/31

BOREHOLE NO:MHGR-10

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)					
24.00	25.00	1.00	HARD MASSIVE ORE	STEEL GREY	65.58	2.31	0.97
25.00	26.00	1.00	HARD MASSIVE ORE	STEEL GREY	64.40	3.10	1.52
26.00	27.00	1.00	HARD MASSIVE ORE	STEEL GREY	64.43	3.22	1.59
27.00	28.00	1.00	HAEMATITIC ORE	DARK GREY	62.14	4.97	2.56
28.00	29.00	1.00	HAEMATITIC ORE	DARK GREY	65.04	3.44	1.63
29.00	30.00	1.00	HAEMATITIC ORE	DARK GREY	64.11	3.84	1.99
30.00	31.00	1.00	POWDERY ORE	GREY	64.69	3.32	1.64
31.00	32.00	1.00	POWDERY ORE	GREY	66.59	2.17	0.83
32.00	33.00	1.00	HAEMATITIC ORE	GREY	66.10	2.02	0.69
33.00	34.00	1.00	HAEMATITIC ORE	GREY	66.34	1.58	0.69
34.00	35.00	1.00	HAEMATITIC ORE	GREY	66.78	1.94	0.54
35.00	36.00	1.00	HAEMATITIC ORE	GREY	63.30	3.26	1.50
36.00	37.00	1.00	HAEMATITIC ORE	GREY	64.71	2.80	1.15
37.00	38.00	1.00	HAEMATITIC ORE	GREY	66.58	1.58	0.62
38.00	39.00	1.00	HAEMATITIC ORE	GREY	67.06	1.65	0.54
39.00	40.00	1.00	HAEMATITIC ORE	GREY	58.76	5.75	2.91
40.00	41.00	1.00	HAEMATITIC ORE	GREY			SAMPLE DEPTH : 39.00-41.00m
41.00	42.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	32.98	20.03	18.56
42.00	43.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN			SAMPLE DEPTH : 41.00-43.00m
43.00	44.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	32.08	20.49	18.37
44.00	45.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN			SAMPLE DEPTH : 43.00-45.00m
45.00	46.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	30.57	21.03	18.34
46.00	47.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 45.00-47.00m
47.00	48.00	1.00	FERRUGINOUS SHALE	DARK BROWN	21.73	21.23	22.32
48.00	49.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 47.00-49.00m
49.00	50.00	1.00	FERRUGINOUS SHALE	DARK BROWN	18.62	21.12	23.95
50.00	51.00	1.00	FERRUGINOUS SHALE	DARK BROWN	31.73	17.96	21.37
51.00	52.00	1.00	POWDERY ORE	STEEL GREY	65.07	3.45	1.70
52.00	53.00	1.00	POWDERY ORE	STEEL GREY	64.55	4.39	1.35
53.00	54.00	1.00	POWDERY ORE	STEEL GREY	57.68	8.88	4.43
54.00	55.00	1.00	POWDERY ORE	STEEL GREY	55.26	14.99	1.86
							FEEBLY MAGNETIC
							FEEBLY MAGNETIC
							FEEBLY MAGNETIC
							FEEBLY MAGNETIC

BOREHOLE NO:MHGR-10

! DEPTH (M)	! THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	MAGNETIC ORE	STEEL GREY	44.16	29.48	2.90	MAGNETIC
56.00	57.00	1.00	MAGNETIC ORE	GREY	39.55	34.13	2.96	MAGNETIC
57.00	58.00	1.00	MAGNETIC ORE	GREY	47.67	24.89	4.82	MAGNETIC
58.00	59.00	1.00	MAGNETIC ORE	GREY	38.58	43.22	1.33	MAGNETIC
59.00	60.00	1.00	MAGNETIC ORE	GREY	47.76	28.78	2.07	MAGNETIC
60.00	61.00	1.00	MAGNETIC ORE	GREY	43.96	31.89	1.85	MAGNETIC
61.00	62.00	1.00	MAGNETIC ORE	GREY	43.06	33.42	1.55	MAGNETIC
62.00	63.00	1.00	MAGNETIC ORE	GREY	40.72	40.33	1.28	MAGNETIC
63.00	64.00	1.00	MAGNETIC ORE	GREY	39.69	41.98	1.00	MAGNETIC
64.00	65.00	1.00	MAGNETIC ORE	DARK GREY	37.12	45.50	0.74	MAGNETIC
65.00	66.00	1.00	MAGNETIC ORE	DARK GREY	35.58	47.75	0.95	MAGNETIC
66.00	67.00	1.00	MAGNETIC ORE	DARK GREY	35.73	46.88	1.22	MAGNETIC
67.00	68.00	1.00	MAGNETIC ORE	DARK GREY	44.06	32.80	1.01	MAGNETIC
68.00	69.00	1.00	MAGNETIC ORE	DARK GREY	41.22	39.75	0.91	MAGNETIC
69.00	70.00	1.00	MAGNETIC ORE	DARK GREY	42.73	34.24	1.30	MAGNETIC
70.00	71.00	1.00	MAGNETIC ORE	DARK GREY	39.93	41.64	1.20	MAGNETIC
71.00	72.00	1.00	MAGNETIC ORE	DARK GREY	35.19	48.60	0.80	MAGNETIC
72.00	73.00	1.00	MAGNETIC ORE	DARK GREY	41.01	40.35	0.91	MAGNETIC
73.00	74.00	1.00	MAGNETIC ORE	DARK GREY	40.14	41.46	0.94	MAGNETIC
74.00	75.00	1.00	MAGNETIC ORE	DARK GREY	39.18	40.46	2.62	MAGNETIC

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-11

LATITUDE : 1663947.814
LONGITUDE : 664484.929
REDUCED LEVEL (M): 952.724

DATE OF COMMENCEMENT : 19/02/16
DATE OF CLOSURE : 22/02/16
DEPTH DRILLED (M) : 82.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	HAEMATITIC ORE	DARK BROWN	58.42	3.25	1.84	
1.00	2.00	1.00	HAEMATITIC ORE	DARK BROWN	58.62	2.19	1.68	
2.00	3.00	1.00	HAEMATITIC ORE	DARK BROWN	59.48	2.07	1.53	
3.00	4.00	1.00	HAEMATITIC ORE	DARK BROWN	57.70	1.49	1.56	
4.00	5.00	1.00	HAEMATITIC ORE	DARK BROWN	58.57	1.39	1.58	
5.00	6.00	1.00	HAEMATITIC ORE	DARK BROWN	59.22	1.51	1.53	
6.00	7.00	1.00	HAEMATITIC ORE	DARK BROWN	59.56	1.86	1.49	
7.00	8.00	1.00	HAEMATITIC ORE	DARK BROWN	61.64	1.35	1.11	
8.00	9.00	1.00	HAEMATITIC ORE	GREY	62.51	1.84	1.36	
9.00	10.00	1.00	HAEMATITIC ORE	CHERRY RED	62.46	3.76	1.94	
10.00	11.00	1.00	POWDERY ORE	DARK GREY	66.18	1.43	0.81	
11.00	12.00	1.00	POWDERY ORE	DARK GREY	64.44	2.22	1.31	
12.00	13.00	1.00	POWDERY ORE	DARK GREY	64.11	1.89	1.38	
13.00	14.00	1.00	POWDERY ORE	DARK GREY	66.29	1.13	0.82	
14.00	15.00	1.00	POWDERY ORE	DARK GREY	66.55	1.05	0.77	
15.00	16.00	1.00	POWDERY ORE	DARK GREY	66.12	1.06	0.75	
16.00	17.00	1.00	POWDERY ORE	DARK GREY	66.28	0.82	0.70	
17.00	18.00	1.00	HARD MASSIVE ORE	DARK BROWN	66.61	0.77	0.67	
18.00	19.00	1.00	HARD MASSIVE ORE	DARK BROWN	66.60	1.15	0.73	
19.00	20.00	1.00	POWDERY ORE	DARK GREY	66.51	0.62	0.83	
20.00	21.00	1.00	POWDERY ORE	DARK GREY	67.01	0.59	0.66	
21.00	22.00	1.00	POWDERY ORE	DARK GREY	67.44	0.62	0.60	
22.00	23.00	1.00	POWDERY ORE	DARK GREY	67.21	0.61	0.61	
23.00	24.00	1.00	POWDERY ORE	DARK GREY	67.25	1.03	0.52	

BOREHOLE NO:MHGR-11

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	POWDERY ORE	STEEL GREY	66.18	0.97	0.80	
25.00	26.00	1.00	POWDERY ORE	STEEL GREY	67.69	0.58	0.54	
26.00	27.00	1.00	POWDERY ORE	STEEL GREY	67.72	0.57	0.58	
27.00	28.00	1.00	POWDERY ORE	STEEL GREY	67.22	0.63	0.63	
28.00	29.00	1.00	POWDERY ORE	STEEL GREY	67.64	0.57	0.50	
29.00	30.00	1.00	POWDERY ORE	DARK GREY	67.43	0.52	0.46	
30.00	31.00	1.00	POWDERY ORE	DARK GREY	67.96	0.73	0.54	
31.00	32.00	1.00	POWDERY ORE	DARK GREY	66.87	0.72	0.81	
32.00	33.00	1.00	POWDERY ORE	DARK GREY	66.39	0.51	0.82	
33.00	34.00	1.00	HAEMATITIC ORE	DARK BROWN	58.57	0.86	2.42	
34.00	35.00	1.00	POWDERY ORE	DARK GREY	64.93	0.85	1.48	
35.00	36.00	1.00	POWDERY ORE	DARK GREY	62.46	0.89	1.95	
36.00	37.00	1.00	POWDERY ORE	DARK GREY	66.82	0.67	0.83	
37.00	38.00	1.00	POWDERY ORE	DARK GREY	67.77	0.66	0.53	
38.00	39.00	1.00	POWDERY ORE	DARK GREY	67.21	0.74	0.69	
39.00	40.00	1.00	HAEMATITIC ORE	DARK BROWN	66.99	0.71	0.66	
40.00	41.00	1.00	HAEMATITIC ORE	DARK BROWN	66.84	0.84	0.67	
41.00	42.00	1.00	POWDERY ORE	GREY	67.30	0.61	0.56	
42.00	43.00	1.00	POWDERY ORE	GREY	67.43	0.93	0.55	
43.00	44.00	1.00	POWDERY ORE	GREY	67.28	0.68	0.51	
44.00	45.00	1.00	POWDERY ORE	GREY	67.85	0.68	0.57	
45.00	46.00	1.00	POWDERY ORE	GREY	67.39	0.73	0.60	
46.00	47.00	1.00	POWDERY ORE	GREY	67.68	0.64	0.60	
47.00	48.00	1.00	POWDERY ORE	GREY	67.73	0.68	0.56	
48.00	49.00	1.00	POWDERY ORE	DARK GREY	67.39	0.99	0.64	
49.00	50.00	1.00	POWDERY ORE	DARK GREY	67.86	0.63	0.51	
50.00	51.00	1.00	POWDERY ORE	DARK GREY	66.00	2.22	0.94	
51.00	52.00	1.00	POWDERY ORE	DARK GREY	66.69	1.25	0.88	
52.00	53.00	1.00	POWDERY ORE	DARK GREY	67.17	1.64	1.00	
53.00	54.00	1.00	POWDERY ORE	DARK GREY	65.94	2.96	1.55	
54.00	55.00	1.00	POWDERY ORE	DARK GREY	66.10	3.05	1.62	

BOREHOLE NO:MHGR-11

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	POWDERY ORE	GREENISH GREY	66.24	2.69	1.24	
56.00	57.00	1.00	POWDERY ORE	GREENISH GREY	65.14	3.20	1.33	
57.00	58.00	1.00	POWDERY ORE	GREENISH GREY	64.51	4.76	1.11	
58.00	59.00	1.00	POWDERY ORE	GREENISH GREY	65.47	3.10	1.33	
59.00	60.00	1.00	POWDERY ORE	DARK GREY	60.99	7.35	2.14	
60.00	61.00	1.00	POWDERY ORE	DARK GREY	58.02	10.45	2.15	
61.00	62.00	1.00	POWDERY ORE	DARK GREY	61.09	7.10	1.40	
62.00	63.00	1.00	POWDERY ORE	DARK GREY	61.77	7.00	1.56	
63.00	64.00	1.00	POWDERY ORE	DARK GREY	61.76	6.91	1.53	
64.00	65.00	1.00	POWDERY ORE	DARK GREY	64.22	4.29	1.24	
65.00	66.00	1.00	POWDERY ORE	DARK GREY	60.60	8.59	1.61	
66.00	67.00	1.00	POWDERY ORE	DARK GREY	56.52	13.02	2.22	
67.00	68.00	1.00	POWDERY ORE	DARK GREY	58.64	10.57	1.05	
68.00	69.00	1.00	POWDERY ORE	DARK GREY	55.78	12.72	1.50	
69.00	70.00	1.00	POWDERY ORE	DARK GREY	54.24	19.70	2.14	
70.00	71.00	1.00	POWDERY ORE	DARK GREY	54.21	15.94	2.01	
71.00	72.00	1.00	POWDERY ORE	DARK GREY	62.87	5.09	0.91	
72.00	73.00	1.00	POWDERY ORE	DARK GREY	61.72	7.14	1.01	
73.00	74.00	1.00	POWDERY ORE	DARK GREY	60.91	7.14	0.92	
74.00	75.00	1.00	POWDERY ORE	DARK GREY	56.68	11.80	1.01	
75.00	76.00	1.00	POWDERY ORE	DARK GREY	53.90	14.98	1.22	
76.00	77.00	1.00	ALTERED BHQ	LIGHT BROWN	43.62	32.46	1.00	
77.00	78.00	1.00	ALTERED BHQ	LIGHT BROWN	44.95	32.48	0.64	
78.00	79.00	1.00	BHQ	LIGHT GREY	45.11	32.34	0.62	
79.00	80.00	1.00	BHQ	LIGHT GREY	28.58	54.28	0.45	
80.00	81.00	1.00	BHQ	LIGHT GREY	37.62	45.16	0.47	
81.00	82.00	1.00	BHQ	LIGHT GREY	42.37	34.49	0.59	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-12

LATITUDE : 1664268.211
 LONGITUDE : 664093.979
 REDUCED LEVEL (M): 932.351

DATE OF COMMENCEMENT : 20/02/16
 DATE OF CLOSURE : 20/02/16
 DEPTH DRILLED (M) : 59.00

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	! NESS !		!	! %	! %	! %		!
! FROM ! TO	! (m) !		!	!	!	!		!
0.00	1.00	1.00	HAEMATITIC ORE	DARK BROWN	56.21	10.53	3.46	
1.00	2.00	1.00	HAEMATITIC ORE	DARK BROWN	59.67	6.60	3.12	
2.00	3.00	1.00	HAEMATITIC ORE	DARK BROWN	59.52	6.80	2.58	
3.00	4.00	1.00	HAEMATITIC ORE	DARK BROWN	59.42	8.70	1.88	
4.00	5.00	1.00	HAEMATITIC ORE	DARK BROWN	62.67	5.24	1.56	
5.00	6.00	1.00	HAEMATITIC ORE	DARK BROWN	64.13	3.46	1.33	
6.00	7.00	1.00	HAEMATITIC ORE	DARK BROWN	64.51	4.08	1.08	
7.00	8.00	1.00	HAEMATITIC ORE	DARK BROWN	60.74	6.18	2.30	
8.00	9.00	1.00	HAEMATITIC ORE	DARK BROWN	59.74	7.18	2.83	
9.00	10.00	1.00	HAEMATITIC ORE	CHERRY RED	60.50	6.73	2.81	
10.00	11.00	1.00	HAEMATITIC ORE	CHERRY RED	60.09	6.69	2.21	
11.00	12.00	1.00	HAEMATITIC ORE	CHERRY RED	58.71	8.48	2.54	
12.00	13.00	1.00	HAEMATITIC ORE	CHERRY RED	64.67	3.46	1.01	
13.00	14.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	65.75	2.50	0.74	
14.00	15.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	66.88	1.40	0.49	
15.00	16.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	66.96	1.55	0.51	
16.00	17.00	1.00	POWDERY ORE	STEEL GREY	63.42	4.70	2.36	
17.00	18.00	1.00	POWDERY ORE	STEEL GREY	62.88	5.30	2.91	
18.00	19.00	1.00	POWDERY ORE	LIGHT GREY	61.75	5.74	3.21	
19.00	20.00	1.00	POWDERY ORE	LIGHT GREY	63.31	4.73	2.44	
20.00	21.00	1.00	POWDERY ORE	LIGHT GREY	63.54	4.76	2.27	
21.00	22.00	1.00	POWDERY ORE	LIGHT GREY	53.67	14.04	2.91	
22.00	23.00	1.00	POWDERY ORE	STEEL GREY	62.52	5.65	2.11	
23.00	24.00	1.00	POWDERY ORE	STEEL GREY	63.46	4.64	2.01	

BOREHOLE NO:MHGR-12

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	POWDERY ORE	STEEL GREY	62.61	5.50	1.81	
25.00	26.00	1.00	POWDERY ORE	STEEL GREY	60.79	7.90	1.26	
26.00	27.00	1.00	POWDERY ORE	LIGHT GREY	44.70	30.98	1.94	
27.00	28.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	46.95	29.17	1.85	
28.00	29.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	38.54	41.94	2.35	
29.00	30.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	38.60	41.21	2.94	
30.00	31.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	39.29	40.70	2.32	
31.00	32.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	45.57	29.90	2.38	
32.00	33.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	39.69	39.79	2.68	
33.00	34.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	49.47	27.32	1.92	
34.00	35.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	51.14	23.74	2.37	
35.00	36.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	52.15	21.53	3.80	
36.00	37.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	50.81	22.89	3.67	
37.00	38.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	48.80	27.15	2.25	
38.00	39.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	45.12	27.03	3.25	
39.00	40.00	1.00	SILICEOUS IRON ORE	DARK BROWN	44.56	30.13	1.22	
40.00	41.00	1.00	SILICEOUS IRON ORE	DARK BROWN	45.20	30.28	0.61	
41.00	42.00	1.00	SILICEOUS IRON ORE	DARK BROWN	48.55	27.58	0.85	
42.00	43.00	1.00	SILICEOUS IRON ORE	DARK BROWN	50.32	26.21	0.97	
43.00	44.00	1.00	SILICEOUS IRON ORE	DARK BROWN	43.43	29.90	1.50	
44.00	45.00	1.00	SILICEOUS IRON ORE	DARK BROWN	38.72	30.18	3.66	
45.00	46.00	1.00	SILICEOUS IRON ORE	DARK BROWN	36.90	31.74	3.30	
46.00	47.00	1.00	SILICEOUS IRON ORE	DARK BROWN	30.05	42.88	1.27	
47.00	48.00	1.00	MAGNETIC ORE	DARK BROWN	35.97	38.80	0.89	MAGNETIC
48.00	49.00	1.00	MAGNETIC ORE	DARK BROWN	33.36	41.47	0.82	MAGNETIC
49.00	50.00	1.00	MAGNETIC ORE	DARK BROWN	30.18	50.09	0.75	MAGNETIC
50.00	51.00	1.00	MAGNETIC ORE	DARK BROWN	28.29	51.94	0.66	MAGNETIC
51.00	52.00	1.00	MAGNETIC ORE	DARK BROWN	36.78	37.72	0.69	MAGNETIC
52.00	53.00	1.00	MAGNETIC ORE	LIGHT GREY	37.43	36.30	0.57	MAGNETIC
53.00	54.00	1.00	MAGNETIC ORE	LIGHT GREY	36.83	36.89	0.57	MAGNETIC
54.00	55.00	1.00	MAGNETIC ORE	LIGHT GREY	32.50	42.23	0.52	MAGNETIC

BOREHOLE NO:MHGR-12

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS	!	!	!	!	!	!	!
! FROM ! TO	! (m) !	!	!	!	!	!	!	!
55.00	56.00	1.00	MAGNETIC ORE	LIGHT GREY	32.48	41.72	0.68	MAGNETIC
56.00	57.00	1.00	MAGNETIC ORE	LIGHT GREY	26.65	53.71	0.52	MAGNETIC
57.00	58.00	1.00	MAGNETIC ORE	LIGHT GREY	28.77	51.45	0.55	MAGNETIC
58.00	59.00	1.00	MAGNETIC ORE	LIGHT GREY	33.94	47.28	0.90	MAGNETIC

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-13

LATITUDE : 1663555.117
 LONGITUDE : 664487.898
 REDUCED LEVEL (M): 975.954

DATE OF COMMENCEMENT : 20/02/16
 DATE OF CLOSURE : 20/02/16
 DEPTH DRILLED (M) : 65.00

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	! NESS !		!	! %	! %	! %		!
! FROM ! TO	! (m) !		!	!	!	!		!
0.00	1.00	1.00	FERRUGINOUS SHALE	DARK BROWN	42.01	4.89	5.97	
1.00	2.00	1.00	FERRUGINOUS SHALE	DARK BROWN	39.68	8.48	7.88	SAMPLE DEPTH : 1.00-3.00m
2.00	3.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
3.00	4.00	1.00	FERRUGINOUS SHALE	DARK BROWN	44.64	4.78	5.47	SAMPLE DEPTH : 3.00-5.00m
4.00	5.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
5.00	6.00	1.00	FERRUGINOUS SHALE	DARK BROWN	42.31	10.18	8.21	SAMPLE DEPTH : 5.00-8.00m
6.00	7.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
7.00	8.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
8.00	9.00	1.00	FERRUGINOUS SHALE	DARK BROWN	30.64	17.53	16.59	SAMPLE DEPTH : 8.00-11.00m
9.00	10.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
10.00	11.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
11.00	12.00	1.00	FERRUGINOUS SHALE	DARK BROWN	32.51	16.95	15.97	SAMPLE DEPTH : 11.00-13.00m
12.00	13.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
13.00	14.00	1.00	FERRUGINOUS SHALE	DARK BROWN	37.33	12.48	11.80	SAMPLE DEPTH : 13.00-15.00m
14.00	15.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
15.00	16.00	1.00	FERRUGINOUS SHALE	DARK BROWN	36.71	14.15	12.18	SAMPLE DEPTH : 15.00-18.00m
16.00	17.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
17.00	18.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
18.00	19.00	1.00	FERRUGINOUS SHALE	DARK BROWN	41.72	11.91	9.82	SAMPLE DEPTH : 18.00-20.00m
19.00	20.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
20.00	21.00	1.00	FERRUGINOUS SHALE	DARK BROWN	38.26	13.94	11.70	SAMPLE DEPTH : 20.00-22.00m
21.00	22.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
22.00	23.00	1.00	FERRUGINOUS SHALE	DARK BROWN	34.57	14.93	13.13	SAMPLE DEPTH : 22.00-24.00m
23.00	24.00	1.00	FERRUGINOUS SHALE	DARK BROWN				

ANNEXURE - IIIB/40

BOREHOLE NO:MHGR-13

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	FERRUGINOUS SHALE	DARK BROWN	34.47	15.73	13.84	SAMPLE DEPTH : 24.00-26.00m
25.00	26.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
26.00	27.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN	30.68	17.39	16.59	SAMPLE DEPTH : 26.00-28.00m
27.00	28.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN				
28.00	29.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN	25.38	21.22	20.73	SAMPLE DEPTH : 28.00-30.00m
29.00	30.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN				
30.00	31.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN	30.85	17.45	16.90	SAMPLE DEPTH : 30.00-33.00m
31.00	32.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN				
32.00	33.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN				
33.00	34.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN	30.19	17.72	16.31	SAMPLE DEPTH : 33.00-36.00m
34.00	35.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN				
35.00	36.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN				
36.00	37.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN	31.02	17.48	16.46	SAMPLE DEPTH : 36.00-39.00m
37.00	38.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN				
38.00	39.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN				
39.00	40.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN	25.78	21.66	19.92	SAMPLE DEPTH : 39.00-41.00m
40.00	41.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN				
41.00	42.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	29.41	17.37	16.61	SAMPLE DEPTH : 41.00-44.00m
42.00	43.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
43.00	44.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
44.00	45.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	31.17	17.66	16.77	SAMPLE DEPTH : 44.00-47.00m
45.00	46.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
46.00	47.00	1.00	FERRUGINOUS CLAY	YELLOWISH BROWN				
47.00	48.00	1.00	FERRUGINOUS CLAY	YELLOWISH BROWN	35.80	14.38	12.39	SAMPLE DEPTH : 47.00-50.00m
48.00	49.00	1.00	FERRUGINOUS CLAY	YELLOWISH BROWN				
49.00	50.00	1.00	FERRUGINOUS CLAY	YELLOWISH BROWN				
50.00	51.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	17.81	20.68	25.00	SAMPLE DEPTH : 50.00-52.00m
51.00	52.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
52.00	53.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	33.10	16.99	15.77	SAMPLE DEPTH : 52.00-55.00m
53.00	54.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
54.00	55.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				

ANNEXURE - IIIB/41

BOREHOLE NO:MHGR-13

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS	!	!	!	!	!	!	!
! FROM ! TO	! (m) !		!	!	!	!	!	!
55.00	56.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	28.33	21.20	19.40	SAMPLE DEPTH : 55.00-57.00m
56.00	57.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				
57.00	58.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	28.17	21.12	19.58	SAMPLE DEPTH : 57.00-59.00m
58.00	59.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				
59.00	60.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	26.11	20.83	20.82	SAMPLE DEPTH : 59.00-61.00m
60.00	61.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				
61.00	62.00	1.00	CLAY	WHITE	13.36	18.60	29.14	SAMPLE DEPTH : 61.00-63.00m
62.00	63.00	1.00	CLAY	WHITE				
63.00	64.00	1.00	CLAY	WHITE	14.70	18.36	28.76	SAMPLE DEPTH : 63.00-65.00m
64.00	65.00	1.00	CLAY	WHITE				

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-14

LATITUDE : 1663896.746
 LONGITUDE : 664406.451
 REDUCED LEVEL (M): 961.594

DATE OF COMMENCEMENT : 20/02/16
 DATE OF CLOSURE : 20/02/16
 DEPTH DRILLED (M) : 78.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	HARD MASSIVE ORE	DARK BROWN	65.10	3.86	0.71	
1.00	2.00	1.00	HARD MASSIVE ORE	DARK BROWN	65.29	2.37	0.97	
2.00	3.00	1.00	POWDERY ORE	DARK BROWN	65.77	1.76	1.01	
3.00	4.00	1.00	POWDERY ORE	DARK BROWN	65.47	2.49	1.00	
4.00	5.00	1.00	POWDERY ORE	YELLOWISH BROWN	63.21	2.36	1.55	
5.00	6.00	1.00	POWDERY ORE	YELLOWISH BROWN	62.66	2.84	1.59	
6.00	7.00	1.00	POWDERY ORE	YELLOWISH BROWN	62.66	1.95	1.43	
7.00	8.00	1.00	POWDERY ORE	YELLOWISH BROWN	63.01	1.77	1.33	
8.00	9.00	1.00	POWDERY ORE	YELLOWISH BROWN	61.95	1.94	2.25	
9.00	10.00	1.00	POWDERY ORE	DARK BROWN	64.73	0.81	1.87	
10.00	11.00	1.00	POWDERY ORE	DARK BROWN	54.81	4.29	5.39	
11.00	12.00	1.00	POWDERY ORE	DARK BROWN	55.81	4.54	5.10	
12.00	13.00	1.00	POWDERY ORE	DARK BROWN	57.20	4.09	4.64	
13.00	14.00	1.00	POWDERY ORE	DARK BROWN	61.20	2.71	3.26	
14.00	15.00	1.00	POWDERY ORE	DARK BROWN	59.69	3.10	3.66	
15.00	16.00	1.00	POWDERY ORE	DARK BROWN	64.26	2.55	2.05	
16.00	17.00	1.00	POWDERY ORE	DARK BROWN	66.30	1.74	1.08	
17.00	18.00	1.00	POWDERY ORE	DARK BROWN	67.12	1.48	1.03	
18.00	19.00	1.00	POWDERY ORE	DARK BROWN	66.84	1.24	1.13	
19.00	20.00	1.00	POWDERY ORE	DARK BROWN	65.83	1.67	1.44	
20.00	21.00	1.00	POWDERY ORE	DARK GREY	66.08	1.36	1.22	
21.00	22.00	1.00	POWDERY ORE	DARK GREY	65.16	1.61	1.33	
22.00	23.00	1.00	POWDERY ORE	DARK GREY	67.79	0.89	0.54	
23.00	24.00	1.00	POWDERY ORE	DARK GREY	67.81	0.90	0.54	

BOREHOLE NO:MHGR-14

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	POWDERY ORE	DARK GREY	68.52	0.84	0.49	
25.00	26.00	1.00	POWDERY ORE	DARK GREY	68.07	0.77	0.55	
26.00	27.00	1.00	POWDERY ORE	DARK GREY	67.88	1.08	0.62	
27.00	28.00	1.00	POWDERY ORE	DARK GREY	67.74	0.86	0.53	
28.00	29.00	1.00	POWDERY ORE	DARK GREY	67.93	0.69	0.43	
29.00	30.00	1.00	POWDERY ORE	DARK GREY	67.79	1.17	0.74	
30.00	31.00	1.00	POWDERY ORE	DARK GREY	68.37	0.97	0.49	
31.00	32.00	1.00	POWDERY ORE	DARK GREY	67.59	0.73	0.42	
32.00	33.00	1.00	POWDERY ORE	DARK GREY	67.79	0.91	0.66	
33.00	34.00	1.00	POWDERY ORE	DARK GREY	68.13	0.69	0.40	
34.00	35.00	1.00	POWDERY ORE	DARK GREY	68.42	0.65	0.38	
35.00	36.00	1.00	POWDERY ORE	DARK GREY	68.13	0.77	0.46	
36.00	37.00	1.00	POWDERY ORE	DARK GREY	67.69	0.73	0.42	
37.00	38.00	1.00	POWDERY ORE	DARK GREY	67.87	0.75	0.40	
38.00	39.00	1.00	POWDERY ORE	DARK GREY	67.96	0.96	0.40	
39.00	40.00	1.00	POWDERY ORE	DARK GREY	68.14	0.76	0.40	
40.00	41.00	1.00	POWDERY ORE	DARK GREY	67.74	0.84	0.40	
41.00	42.00	1.00	POWDERY ORE	DARK GREY	67.73	0.79	0.39	
42.00	43.00	1.00	POWDERY ORE	DARK GREY	68.01	0.68	0.34	
43.00	44.00	1.00	POWDERY ORE	DARK GREY	67.86	0.76	0.34	
44.00	45.00	1.00	POWDERY ORE	DARK GREY	67.88	0.80	0.37	
45.00	46.00	1.00	POWDERY ORE	DARK GREY	67.17	0.89	0.36	
46.00	47.00	1.00	POWDERY ORE	DARK GREY	67.23	2.15	0.48	
47.00	48.00	1.00	POWDERY ORE	DARK GREY	66.84	1.75	0.70	
48.00	49.00	1.00	POWDERY ORE	DARK GREY	66.71	1.69	0.68	
49.00	50.00	1.00	POWDERY ORE	DARK GREY	66.25	2.31	0.58	
50.00	51.00	1.00	POWDERY ORE	DARK GREY	61.95	5.23	1.62	
51.00	52.00	1.00	POWDERY ORE	DARK GREY	60.87	7.32	1.12	
52.00	53.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	42.05	33.44	0.94	
53.00	54.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.33	38.80	0.78	
54.00	55.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	34.42	47.07	0.92	

BOREHOLE NO:MHGR-14

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.20	45.57	0.87	
56.00	57.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.12	33.81	2.76	
57.00	58.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.80	43.45	1.02	
58.00	59.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.31	45.65	0.75	
59.00	60.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.07	44.34	0.94	
60.00	61.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	36.17	47.03	0.75	
61.00	62.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.93	38.06	1.78	
62.00	63.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	34.47	47.17	1.63	
63.00	64.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	30.46	51.26	1.37	
64.00	65.00	1.00	BHQ	DARK BROWN	25.41	56.35	1.33	
65.00	66.00	1.00	BHQ	DARK BROWN	33.70	48.64	0.78	
66.00	67.00	1.00	SILICEOUS IRON ORE	YELLOWISH BROWN	37.90	37.20	1.08	
67.00	68.00	1.00	SILICEOUS IRON ORE	YELLOWISH BROWN	43.27	31.70	1.29	
68.00	69.00	1.00	SILICEOUS IRON ORE	YELLOWISH BROWN	29.55	51.51	1.16	
69.00	70.00	1.00	SILICEOUS IRON ORE	YELLOWISH BROWN	34.50	46.92	1.15	
70.00	71.00	1.00	SILICEOUS IRON ORE	YELLOWISH BROWN	35.25	46.66	1.19	
71.00	72.00	1.00	SILICEOUS IRON ORE	YELLOWISH BROWN	28.21	56.33	1.79	
72.00	73.00	1.00	BHQ	LIGHT BROWN	29.55	54.88	1.86	
73.00	74.00	1.00	BHQ	LIGHT BROWN	31.59	52.88	1.17	
74.00	75.00	1.00	BHQ	LIGHT BROWN	31.14	53.74	1.07	
75.00	76.00	1.00	BHQ	LIGHT BROWN	27.77	55.60	1.14	
76.00	77.00	1.00	BHQ	LIGHT BROWN	33.49	48.52	1.45	
77.00	78.00	1.00	BHQ	LIGHT BROWN	38.40	43.47	1.53	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-15

LATITUDE : 1663482.105
LONGITUDE : 664557.120
REDUCED LEVEL (M): 975.835

DATE OF COMMENCEMENT : 20/02/16
DATE OF CLOSURE : 20/02/16
DEPTH DRILLED (M) : 25.00

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	! NESS !		!	! %	! %	! %		!
! FROM ! TO	! (m) !		!	!	!	!		!
0.00	1.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	33.45	14.06	15.64	
1.00	2.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	32.45	10.68	13.44	
2.00	3.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	28.28	15.54	17.40	SAMPLE DEPTH : 2.00-4.00m
3.00	4.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
4.00	5.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	25.96	11.72	18.28	SAMPLE DEPTH : 4.00-6.00m
5.00	6.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
6.00	7.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	20.49	22.54	21.37	SAMPLE DEPTH : 6.00-8.00m
7.00	8.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN				
8.00	9.00	1.00	FERRUGINOUS SHALE	REDDISH BROWN	21.48	23.02	20.18	SAMPLE DEPTH : 8.00-10.00m
9.00	10.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
10.00	11.00	1.00	FERRUGINOUS SHALE	DARK BROWN	23.96	15.45	18.52	SAMPLE DEPTH : 10.00-13.00m
11.00	12.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
12.00	13.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
13.00	14.00	1.00	FERRUGINOUS SHALE	DARK BROWN	21.88	16.17	21.82	
14.00	15.00	1.00	FERRUGINOUS SHALE	DARK BROWN	18.49	22.31	22.77	
15.00	16.00	1.00	FERRUGINOUS SHALE	DARK BROWN	24.76	13.43	18.62	
16.00	17.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	29.19	8.17	13.44	
17.00	18.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	36.00	6.58	9.92	
18.00	19.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	22.30	10.53	19.49	
19.00	20.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	30.41	5.33	12.01	
20.00	21.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	22.11	16.45	22.89	
21.00	22.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	20.66	19.71	24.72	
22.00	23.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	24.25	18.81	24.17	
23.00	24.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	19.28	20.81	24.34	
24.00	25.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	21.99	21.54	21.96	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-16

LATITUDE : 1664413.627
LONGITUDE : 664116.103
REDUCED LEVEL (M): 921.482

DATE OF COMMENCEMENT : 20/02/16
DATE OF CLOSURE : 21/02/16
DEPTH DRILLED (M) : 56.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	LATERITIC ORE	DARK BROWN	54.16	6.39	4.42	
1.00	2.00	1.00	POWDERY ORE	DARK BROWN	61.35	3.51	2.69	
2.00	3.00	1.00	POWDERY ORE	DARK BROWN	60.96	2.87	2.51	
3.00	4.00	1.00	SOFT LAMINATED ORE	YELLOWISH BROWN	60.76	2.32	2.22	
4.00	5.00	1.00	SOFT LAMINATED ORE	YELLOWISH BROWN	64.17	2.02	1.43	
5.00	6.00	1.00	SOFT LAMINATED ORE	YELLOWISH BROWN	65.44	1.49	1.06	
6.00	7.00	1.00	SOFT LAMINATED ORE	YELLOWISH BROWN	65.55	1.60	1.08	
7.00	8.00	1.00	SOFT LAMINATED ORE	YELLOWISH BROWN	65.15	1.74	1.00	
8.00	9.00	1.00	SOFT LAMINATED ORE	YELLOWISH BROWN	65.14	1.28	1.11	
9.00	10.00	1.00	SOFT LAMINATED ORE	YELLOWISH BROWN	65.56	1.25	1.14	
10.00	11.00	1.00	SOFT LAMINATED ORE	YELLOWISH BROWN	65.56	1.29	1.00	
11.00	12.00	1.00	HAEMATITIC ORE	DARK BROWN	65.27	1.27	0.94	
12.00	13.00	1.00	HAEMATITIC ORE	DARK BROWN	64.94	1.03	1.23	
13.00	14.00	1.00	HAEMATITIC ORE	DARK BROWN	64.39	1.15	1.15	
14.00	15.00	1.00	HAEMATITIC ORE	DARK BROWN	66.35	1.32	0.77	
15.00	16.00	1.00	HAEMATITIC ORE	DARK BROWN	65.35	1.77	1.10	
16.00	17.00	1.00	HAEMATITIC ORE	DARK BROWN	65.65	1.85	0.90	
17.00	18.00	1.00	HAEMATITIC ORE	DARK BROWN	66.72	1.07	0.75	
18.00	19.00	1.00	HAEMATITIC ORE	DARK BROWN	65.68	1.53	1.02	
19.00	20.00	1.00	HAEMATITIC ORE	DARK BROWN	66.00	1.34	0.93	
20.00	21.00	1.00	HAEMATITIC ORE	DARK BROWN	66.07	1.18	0.95	
21.00	22.00	1.00	HAEMATITIC ORE	DARK BROWN	64.78	1.78	1.26	WITH SHALE PIECES
22.00	23.00	1.00	HAEMATITIC ORE	DARK BROWN	65.56	1.34	1.06	WITH SHALE PIECES
23.00	24.00	1.00	HAEMATITIC ORE	DARK BROWN	66.90	1.00	0.76	WITH SHALE PIECES

BOREHOLE NO:MHGR-16

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	HAEMATITIC ORE	DARK BROWN	66.20	1.79	0.90	WITH SHALE PIECES
25.00	26.00	1.00	HAEMATITIC ORE	DARK BROWN	66.25	1.12	0.89	WITH SHALE PIECES
26.00	27.00	1.00	POWDERY ORE	DARK GREY	65.32	0.92	1.03	
27.00	28.00	1.00	POWDERY ORE	DARK GREY	66.37	0.91	1.11	
28.00	29.00	1.00	POWDERY ORE	DARK GREY	67.16	0.85	0.71	
29.00	30.00	1.00	POWDERY ORE	DARK GREY	66.72	0.63	0.54	
30.00	31.00	1.00	POWDERY ORE	DARK GREY	67.18	0.72	0.60	
31.00	32.00	1.00	POWDERY ORE	DARK GREY	67.90	0.71	0.52	
32.00	33.00	1.00	POWDERY ORE	DARK GREY	67.98	0.66	0.42	
33.00	34.00	1.00	POWDERY ORE	DARK GREY	67.89	0.79	0.49	
34.00	35.00	1.00	POWDERY ORE	DARK GREY	67.92	0.74	0.56	
35.00	36.00	1.00	POWDERY ORE	DARK GREY	63.88	3.71	1.33	
36.00	37.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	37.89	14.00	15.74	
37.00	38.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	38.55	16.12	21.03	
38.00	39.00	1.00	POWDERY ORE	DARK GREY	67.26	1.12	0.92	
39.00	40.00	1.00	POWDERY ORE	DARK GREY	67.51	0.94	0.59	
40.00	41.00	1.00	POWDERY ORE	DARK GREY	64.50	3.51	2.00	
41.00	42.00	1.00	POWDERY ORE	DARK GREY	65.96	2.74	1.34	
42.00	43.00	1.00	POWDERY ORE	DARK GREY	64.94	3.26	1.62	
43.00	44.00	1.00	POWDERY ORE	DARK GREY	67.97	1.01	0.63	
44.00	45.00	1.00	POWDERY ORE	DARK GREY	60.53	7.80	1.59	
45.00	46.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	42.88	30.42	2.33	
46.00	47.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	47.17	27.13	2.98	
47.00	48.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	54.30	13.73	3.17	
48.00	49.00	1.00	BLUE DUST	DARK BLUE	63.81	4.91	1.56	
49.00	50.00	1.00	BLUE DUST	DARK BLUE	61.67	5.95	1.79	
50.00	51.00	1.00	POWDERY ORE	DARK GREY	65.08	3.90	1.14	
51.00	52.00	1.00	POWDERY ORE	DARK GREY	62.92	5.34	2.05	
52.00	53.00	1.00	POWDERY ORE	DARK GREY	60.89	6.16	3.56	
53.00	54.00	1.00	POWDERY ORE	DARK GREY	62.07	5.87	3.07	
54.00	55.00	1.00	POWDERY ORE	DARK GREY	61.47	6.23	3.93	
55.00	56.00	1.00	POWDERY ORE	DARK GREY	62.40	5.54	3.25	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-17

LATITUDE : 1663609.344
LONGITUDE : 664550.138
REDUCED LEVEL (M): 982.520

DATE OF COMMENCEMENT : 20/02/16
DATE OF CLOSURE : 20/02/16
DEPTH DRILLED (M) : 50.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %		!
! FROM ! TO !	! (m) !		!	!	!	!		!
0.00	1.00	1.00	SHALY ORE	DARK BROWN	50.72	3.31	8.95	
1.00	2.00	1.00	SHALY ORE	DARK BROWN	55.09	1.98	6.77	
2.00	3.00	1.00	SHALY ORE	YELLOWISH BROWN	56.26	3.25	9.05	
3.00	4.00	1.00	SHALY ORE	YELLOWISH BROWN	50.97	3.01	9.12	
4.00	5.00	1.00	SHALY ORE	YELLOWISH BROWN	57.19	1.70	5.79	
5.00	6.00	1.00	SHALY ORE	YELLOWISH BROWN	50.73	2.38	10.71	
6.00	7.00	1.00	SHALY ORE	YELLOWISH BROWN	53.66	1.77	8.91	
7.00	8.00	1.00	SHALY ORE	YELLOWISH BROWN	52.98	1.31	9.04	
8.00	9.00	1.00	SHALY ORE	YELLOWISH BROWN	58.13	1.31	6.31	
9.00	10.00	1.00	HARD MASSIVE ORE	DARK BROWN	57.11	1.57	6.74	
10.00	11.00	1.00	HARD MASSIVE ORE	DARK BROWN	58.79	1.10	5.56	
11.00	12.00	1.00	HARD MASSIVE ORE	DARK BROWN	56.73	1.41	6.46	
12.00	13.00	1.00	HARD MASSIVE ORE	DARK BROWN	53.11	1.59	8.18	
13.00	14.00	1.00	HARD MASSIVE ORE	DARK BROWN	52.46	2.00	8.93	
14.00	15.00	1.00	SHALY ORE	YELLOWISH BROWN	54.32	1.41	7.36	
15.00	16.00	1.00	SHALY ORE	YELLOWISH BROWN	54.35	1.98	8.40	
16.00	17.00	1.00	SHALY ORE	YELLOWISH BROWN	54.40	1.44	8.23	
17.00	18.00	1.00	SHALY ORE	YELLOWISH BROWN	47.55	1.42	11.11	
18.00	19.00	1.00	SHALY ORE	YELLOWISH BROWN	51.44	1.40	8.87	
19.00	20.00	1.00	SHALY ORE	YELLOWISH BROWN	45.50	1.79	12.22	
20.00	21.00	1.00	SHALY ORE	YELLOWISH BROWN	44.76	1.74	12.76	
21.00	22.00	1.00	SHALY ORE	DARK BROWN	45.45	1.57	15.11	
22.00	23.00	1.00	SHALY ORE	DARK BROWN	47.89	1.38	14.03	
23.00	24.00	1.00	SHALY ORE	DARK BROWN	57.03	2.05	5.81	

BOREHOLE NO:MHGR-17

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	SHALY ORE	DARK BROWN	61.93	1.31	2.65	
25.00	26.00	1.00	SHALY ORE	YELLOWISH BROWN	59.70	1.28	4.09	
26.00	27.00	1.00	SHALY ORE	YELLOWISH BROWN	60.34	1.36	3.44	
27.00	28.00	1.00	SHALY ORE	YELLOWISH BROWN	53.35	1.28	7.68	
28.00	29.00	1.00	SHALY ORE	YELLOWISH BROWN	49.08	1.54	11.31	
29.00	30.00	1.00	SHALY ORE	YELLOWISH BROWN	47.31	1.40	11.69	
30.00	31.00	1.00	SHALY ORE	YELLOWISH BROWN	50.35	1.34	9.61	
31.00	32.00	1.00	SHALY ORE	YELLOWISH BROWN	48.24	1.33	12.61	
32.00	33.00	1.00	SHALY ORE	YELLOWISH BROWN	37.95	1.63	21.17	
33.00	34.00	1.00	SHALY ORE	YELLOWISH BROWN	54.01	1.51	8.61	
34.00	35.00	1.00	SHALY ORE	YELLOWISH BROWN	44.78	1.47	15.19	
35.00	36.00	1.00	SHALY ORE	YELLOWISH BROWN	49.38	1.48	11.57	
36.00	37.00	1.00	SHALY ORE	YELLOWISH BROWN	52.10	1.41	8.86	
37.00	38.00	1.00	SHALY ORE	YELLOWISH BROWN	51.38	1.43	8.82	
38.00	39.00	1.00	SHALY ORE	YELLOWISH BROWN	54.73	1.39	7.01	
39.00	40.00	1.00	SHALY ORE	YELLOWISH BROWN	55.22	1.35	6.68	
40.00	41.00	1.00	SHALY ORE	YELLOWISH BROWN	55.54	1.35	7.42	
41.00	42.00	1.00	SHALY ORE	YELLOWISH BROWN	55.88	1.34	8.30	
42.00	43.00	1.00	SHALY ORE	YELLOWISH BROWN	56.97	1.35	5.89	
43.00	44.00	1.00	SHALY ORE	YELLOWISH BROWN	56.70	1.55	6.72	
44.00	45.00	1.00	SHALY ORE	YELLOWISH BROWN	56.39	1.43	6.41	
45.00	46.00	1.00	SHALY ORE	LIGHT BROWN	49.73	2.03	11.48	
46.00	47.00	1.00	SHALY ORE	LIGHT BROWN	52.69	1.39	8.65	
47.00	48.00	1.00	SHALY ORE	LIGHT BROWN	44.24	1.45	15.57	
48.00	49.00	1.00	SHALY ORE	LIGHT BROWN	49.74	1.42	10.18	
49.00	50.00	1.00	SHALY ORE	LIGHT BROWN	53.36	1.82	8.80	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-18

LATITUDE : 1663820.987
 LONGITUDE : 664489.704
 REDUCED LEVEL (M): 941.077

DATE OF COMMENCEMENT : 21/02/16
 DATE OF CLOSURE : 22/02/16
 DEPTH DRILLED (M) : 64.00

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	! NESS !		!	! %	! %	! %		!
! FROM ! TO	! (m) !		!	!	!	!		!
0.00	1.00	1.00	BLUEDUST+SLO	BLUISH GREY	68.05	0.82	1.27	
1.00	2.00	1.00	BLUEDUST+SLO	BLUISH GREY	68.06	0.75	1.23	
2.00	3.00	1.00	BLUEDUST+SLO	BLUISH GREY	68.06	0.93	1.13	
3.00	4.00	1.00	BLUEDUST+SLO	BLUISH GREY	68.60	0.74	0.87	
4.00	5.00	1.00	BLUEDUST+SLO	BLUISH GREY	68.61	0.69	1.03	
5.00	6.00	1.00	BLUEDUST+SLO	BLUISH GREY	68.05	0.75	1.29	
6.00	7.00	1.00	POWDERY ORE	DARK GREY	61.22	4.35	2.37	
7.00	8.00	1.00	POWDERY ORE	DARK GREY	65.55	1.38	2.73	
8.00	9.00	1.00	POWDERY ORE	DARK GREY	67.62	0.92	1.22	
9.00	10.00	1.00	POWDERY ORE	DARK GREY	67.39	0.99	1.35	
10.00	11.00	1.00	POWDERY ORE	DARK GREY	66.42	1.24	1.59	
11.00	12.00	1.00	POWDERY ORE	DARK GREY	65.98	1.88	1.38	
12.00	13.00	1.00	POWDERY ORE	DARK GREY	67.64	0.87	1.12	
13.00	14.00	1.00	POWDERY ORE	BLUISH GREY	67.87	0.88	1.07	
14.00	15.00	1.00	POWDERY ORE	BLUISH GREY	68.55	0.78	0.83	
15.00	16.00	1.00	POWDERY ORE	BLUISH GREY	68.16	0.80	0.95	
16.00	17.00	1.00	POWDERY ORE	BLUISH GREY	68.06	0.77	0.94	
17.00	18.00	1.00	POWDERY ORE	BLUISH GREY	67.48	1.18	1.36	
18.00	19.00	1.00	POWDERY ORE	BLUISH GREY	68.20	0.76	0.98	
19.00	20.00	1.00	POWDERY ORE	BLUISH GREY	68.07	0.92	1.06	
20.00	21.00	1.00	POWDERY ORE	BLUISH GREY	68.24	0.97	1.04	
21.00	22.00	1.00	POWDERY ORE	BLUISH GREY	68.31	0.76	0.87	
22.00	23.00	1.00	POWDERY ORE	BLUISH GREY	68.30	0.82	0.88	
23.00	24.00	1.00	POWDERY ORE	BLUISH GREY	67.57	0.90	0.72	

BOREHOLE NO:MHGR-18

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	POWDERY ORE	BLUISH GREY	68.08	0.80	0.77	
25.00	26.00	1.00	POWDERY ORE	BLUISH GREY	68.31	0.81	0.77	
26.00	27.00	1.00	POWDERY ORE	BLUISH GREY	68.31	0.74	0.74	
27.00	28.00	1.00	POWDERY ORE	DARK GREY	67.88	0.79	0.88	
28.00	29.00	1.00	POWDERY ORE	DARK GREY	67.98	0.81	0.79	
29.00	30.00	1.00	POWDERY ORE	DARK GREY	67.87	0.77	0.74	
30.00	31.00	1.00	POWDERY ORE	DARK GREY	68.13	0.78	0.77	
31.00	32.00	1.00	POWDERY ORE	DARK GREY	67.89	0.96	0.74	
32.00	33.00	1.00	POWDERY ORE	DARK GREY	68.00	0.83	0.78	
33.00	34.00	1.00	POWDERY ORE	DARK GREY	68.27	0.77	0.76	
34.00	35.00	1.00	POWDERY ORE	DARK GREY	68.23	0.84	0.88	
35.00	36.00	1.00	POWDERY ORE	DARK GREY	68.08	0.99	0.85	
36.00	37.00	1.00	POWDERY ORE	DARK GREY	67.98	0.76	1.09	
37.00	38.00	1.00	POWDERY ORE	DARK GREY	67.76	0.73	1.59	
38.00	39.00	1.00	POWDERY ORE	DARK GREY	67.97	0.78	1.23	
39.00	40.00	1.00	POWDERY ORE	DARK GREY	68.32	0.71	1.19	
40.00	41.00	1.00	POWDERY ORE	DARK GREY	67.86	0.73	1.49	
41.00	42.00	1.00	POWDERY ORE	DARK GREY	68.40	0.69	1.08	
42.00	43.00	1.00	POWDERY ORE	DARK GREY	68.02	0.77	1.10	
43.00	44.00	1.00	POWDERY ORE	DARK GREY	68.30	0.76	1.12	
44.00	45.00	1.00	POWDERY ORE	DARK GREY	62.88	3.71	3.61	
45.00	46.00	1.00	POWDERY ORE	DARK GREY	67.52	0.80	2.10	
46.00	47.00	1.00	POWDERY ORE	DARK GREY	66.79	0.59	2.95	
47.00	48.00	1.00	POWDERY ORE	DARK GREY	65.41	2.51	3.35	
48.00	49.00	1.00	POWDERY ORE	DARK GREY	64.16	2.13	5.86	
49.00	50.00	1.00	POWDERY ORE	DARK GREY	64.30	2.06	5.81	
50.00	51.00	1.00	HAEMATITIC ORE	DARK BROWN	61.73	5.20	4.45	
51.00	52.00	1.00	HAEMATITIC ORE	DARK BROWN	67.52	1.04	1.67	
52.00	53.00	1.00	HAEMATITIC ORE	DARK BROWN	62.00	4.18	4.07	
53.00	54.00	1.00	HAEMATITIC ORE	DARK BROWN	61.35	3.84	4.50	
54.00	55.00	1.00	HAEMATITIC ORE	DARK BROWN	61.08	4.30	4.62	

BOREHOLE NO:MHGR-18

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS	!	!	!	!	!	!	!
! FROM ! TO	! (m) !		!	!	!	!	!	!
55.00	56.00	1.00	HAEMATITIC ORE	DARK BROWN	61.77	3.82	3.65	
56.00	57.00	1.00	HAEMATITIC ORE	DARK BROWN	59.73	5.95	6.45	
57.00	58.00	1.00	HAEMATITIC ORE	DARK BROWN	54.69	11.32	8.76	
58.00	59.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	49.84	22.98	4.72	OCC.LIMONITIC CLAY
59.00	60.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	30.96	51.33	2.92	OCC.FE SHALE PIECES
60.00	61.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	29.48	51.62	2.81	WITH BHQ PIECES
61.00	62.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	40.89	36.23	4.41	WITH BHQ PIECES
62.00	63.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	38.43	39.03	2.93	WITH BHQ PIECES
63.00	64.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	30.94	47.16	4.51	WITH BHQ PIECES

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-19

LATITUDE : 1663554.644
LONGITUDE : 664652.054
REDUCED LEVEL (M): 975.932

DATE OF COMMENCEMENT : 21/02/16
DATE OF CLOSURE : 22/02/16
DEPTH DRILLED (M) : 70.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	HAEMATITIC ORE	REDDISH BROWN	48.02	4.37	12.31	
1.00	2.00	1.00	HAEMATITIC ORE	REDDISH BROWN	46.62	5.29	12.88	
2.00	3.00	1.00	HAEMATITIC ORE	REDDISH BROWN	46.78	5.83	12.28	
3.00	4.00	1.00	HAEMATITIC ORE	REDDISH BROWN	45.55	7.35	12.84	
4.00	5.00	1.00	HAEMATITIC ORE	REDDISH BROWN	50.00	4.74	10.65	
5.00	6.00	1.00	HAEMATITIC ORE	REDDISH BROWN	49.66	3.87	10.94	
6.00	7.00	1.00	HAEMATITIC ORE	REDDISH BROWN	47.92	2.88	12.91	
7.00	8.00	1.00	HAEMATITIC ORE	REDDISH BROWN	46.60	3.73	14.04	
8.00	9.00	1.00	HAEMATITIC ORE	REDDISH BROWN	49.87	4.34	10.90	
9.00	10.00	1.00	HAEMATITIC ORE	REDDISH BROWN	45.66	3.20	16.28	
10.00	11.00	1.00	HAEMATITIC ORE	REDDISH BROWN	44.58	2.14	17.67	
11.00	12.00	1.00	HAEMATITIC ORE	REDDISH BROWN	43.74	2.78	18.20	
12.00	13.00	1.00	HAEMATITIC ORE	REDDISH BROWN	45.84	3.90	14.24	
13.00	14.00	1.00	HAEMATITIC ORE	DARK BROWN	52.54	3.23	9.06	WITH LIMONITIC PIECES
14.00	15.00	1.00	HAEMATITIC ORE	DARK BROWN	40.28	4.70	18.84	
15.00	16.00	1.00	HAEMATITIC ORE	DARK BROWN	40.38	1.73	20.82	
16.00	17.00	1.00	HAEMATITIC ORE	DARK BROWN	38.78	2.54	20.10	
17.00	18.00	1.00	HAEMATITIC ORE	DARK BROWN	58.40	1.46	5.83	
18.00	19.00	1.00	HAEMATITIC ORE	CHERRY RED	60.60	1.48	4.95	
19.00	20.00	1.00	HAEMATITIC ORE	CHERRY RED	54.79	2.89	9.12	
20.00	21.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	33.48	10.92	19.82	
21.00	22.00	1.00	HAEMATITIC ORE	DARK BROWN	52.24	3.38	8.82	WITH FE CLAY
22.00	23.00	1.00	HAEMATITIC ORE	DARK BROWN	44.12	6.10	14.32	WITH FE CLAY
23.00	24.00	1.00	HAEMATITIC ORE	DARK BROWN	48.40	3.24	11.45	WITH FE CLAY

BOREHOLE NO:MHGR-19

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	HAEMATITIC ORE	DARK BROWN	52.16	2.65	9.36	WITH FE CLAY
25.00	26.00	1.00	HAEMATITIC ORE	CHERRY RED	56.76	1.49	6.77	
26.00	27.00	1.00	HAEMATITIC ORE	CHERRY RED	55.20	1.38	7.69	
27.00	28.00	1.00	HAEMATITIC ORE	CHERRY RED	52.45	1.31	9.27	
28.00	29.00	1.00	HAEMATITIC ORE	DARK BROWN	48.69	1.98	9.04	
29.00	30.00	1.00	HAEMATITIC ORE	DARK BROWN	50.92	1.79	8.67	
30.00	31.00	1.00	HAEMATITIC ORE	DARK BROWN	56.52	1.50	4.83	
31.00	32.00	1.00	HAEMATITIC ORE	DARK BROWN	57.88	1.33	4.15	
32.00	33.00	1.00	HAEMATITIC ORE	DARK BROWN	58.71	1.67	4.58	
33.00	34.00	1.00	HAEMATITIC ORE	DARK BROWN	61.11	1.57	3.01	
34.00	35.00	1.00	HAEMATITIC ORE	DARK BROWN	58.00	1.33	5.77	
35.00	36.00	1.00	HAEMATITIC ORE	DARK BROWN	57.86	1.52	4.99	
36.00	37.00	1.00	HAEMATITIC ORE	DARK BROWN	50.94	1.99	9.27	
37.00	38.00	1.00	HAEMATITIC ORE	DARK BROWN	56.60	1.77	5.70	
38.00	39.00	1.00	HAEMATITIC ORE	DARK BROWN	54.14	1.48	7.58	
39.00	40.00	1.00	HAEMATITIC ORE	DARK BROWN	55.90	1.54	7.14	
40.00	41.00	1.00	HAEMATITIC ORE	CHERRY RED	55.19	1.29	7.75	
41.00	42.00	1.00	HAEMATITIC ORE	CHERRY RED	55.75	1.23	6.92	
42.00	43.00	1.00	HAEMATITIC ORE	CHERRY RED	58.97	1.34	5.00	
43.00	44.00	1.00	HAEMATITIC ORE	CHERRY RED	54.28	1.56	7.16	
44.00	45.00	1.00	HAEMATITIC ORE	CHERRY RED	50.29	1.38	9.50	
45.00	46.00	1.00	HAEMATITIC ORE	CHERRY RED	47.83	1.37	10.27	
46.00	47.00	1.00	HAEMATITIC ORE	CHERRY RED	46.18	1.47	11.01	
47.00	48.00	1.00	HAEMATITIC ORE	CHERRY RED	53.16	1.58	7.50	
48.00	49.00	1.00	HAEMATITIC ORE	CHERRY RED	49.29	1.47	9.00	
49.00	50.00	1.00	HAEMATITIC ORE	CHERRY RED	49.16	1.60	8.97	
50.00	51.00	1.00	SOFT LAMINATED ORE	DARK BROWN	48.80	1.42	9.00	
51.00	52.00	1.00	SOFT LAMINATED ORE	DARK BROWN	45.31	2.29	13.29	
52.00	53.00	1.00	SOFT LAMINATED ORE	DARK BROWN	42.96	1.74	10.60	
53.00	54.00	1.00	SOFT LAMINATED ORE	DARK BROWN	50.13	1.57	8.22	
54.00	55.00	1.00	SOFT LAMINATED ORE	DARK BROWN	46.59	1.57	9.11	

ANNEXURE - IIIB/55

BOREHOLE NO:MHGR-19

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	SOFT LAMINATED ORE	DARK BROWN	42.69	1.72	11.28	
56.00	57.00	1.00	SOFT LAMINATED ORE	REDDISH BROWN	36.49	2.16	18.15	
57.00	58.00	1.00	SOFT LAMINATED ORE	REDDISH BROWN	37.07	1.93	16.07	
58.00	59.00	1.00	SOFT LAMINATED ORE	REDDISH BROWN	32.14	20.38	20.81	
59.00	60.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	23.12	28.44	29.35	SAMPLE DEPTH : 59.00-61.00m
60.00	61.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				
61.00	62.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	21.03	28.43	27.46	SAMPLE DEPTH : 61.00-63.00m
62.00	63.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				
63.00	64.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	14.99	32.96	29.47	SAMPLE DEPTH : 63.00-65.00m
64.00	65.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				
65.00	66.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	16.06	32.27	29.00	SAMPLE DEPTH : 65.00-67.00m
66.00	67.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				
67.00	68.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	50.72	7.94	10.80	SAMPLE DEPTH : 67.00-70.00m
68.00	69.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				
69.00	70.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-20

LATITUDE : 1663627.423
LONGITUDE : 664879.972
REDUCED LEVEL (M): 926.581

DATE OF COMMENCEMENT : 22/02/16
DATE OF CLOSURE : 22/02/16
DEPTH DRILLED (M) : 72.00

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	! NESS !		!	! %	! %	! %		!
! FROM ! TO	! (m) !		!	!	!	!		!
0.00	1.00	1.00	HARD MASSIVE ORE	DARK BROWN	65.62	1.45	2.12	
1.00	2.00	1.00	HARD MASSIVE ORE	DARK BROWN	67.16	0.77	1.41	
2.00	3.00	1.00	HARD MASSIVE ORE	DARK BROWN	67.09	0.64	1.37	
3.00	4.00	1.00	HARD MASSIVE ORE	DARK BROWN	65.82	1.52	1.95	
4.00	5.00	1.00	HARD MASSIVE ORE	DARK BROWN	66.17	0.53	1.90	
5.00	6.00	1.00	HARD MASSIVE ORE	DARK BROWN	66.15	2.02	2.54	
6.00	7.00	1.00	HARD MASSIVE ORE	DARK BROWN	65.92	0.55	2.27	
7.00	8.00	1.00	HARD MASSIVE ORE	DARK BROWN	66.06	0.84	2.24	
8.00	9.00	1.00	HARD MASSIVE ORE	DARK BROWN	67.16	0.54	1.58	
9.00	10.00	1.00	HARD MASSIVE ORE	DARK BROWN	66.16	0.51	2.51	
10.00	11.00	1.00	HAEMATITIC ORE	DARK BROWN	67.13	0.51	1.99	
11.00	12.00	1.00	HAEMATITIC ORE	DARK BROWN	67.66	0.56	1.03	
12.00	13.00	1.00	HAEMATITIC ORE	DARK BROWN	67.24	0.55	1.29	
13.00	14.00	1.00	HAEMATITIC ORE	DARK BROWN	67.81	0.49	1.20	
14.00	15.00	1.00	HAEMATITIC ORE	DARK BROWN	66.57	0.77	1.89	
15.00	16.00	1.00	HAEMATITIC ORE	DARK BROWN	66.81	0.45	2.33	
16.00	17.00	1.00	HAEMATITIC ORE	DARK BROWN	65.69	0.86	3.29	
17.00	18.00	1.00	HAEMATITIC ORE	DARK BROWN	68.09	0.51	0.98	
18.00	19.00	1.00	HAEMATITIC ORE	DARK BROWN	68.39	0.55	0.88	
19.00	20.00	1.00	HAEMATITIC ORE	DARK BROWN	67.92	0.54	0.99	
20.00	21.00	1.00	HAEMATITIC ORE	DARK BROWN	67.42	0.55	1.09	
21.00	22.00	1.00	HAEMATITIC ORE	DARK BROWN	67.23	0.57	1.07	
22.00	23.00	1.00	HAEMATITIC ORE	DARK BROWN	65.68	0.93	1.92	
23.00	24.00	1.00	HAEMATITIC ORE	DARK BROWN	66.80	0.47	1.49	

BOREHOLE NO:MHGR-20

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	HAEMATITIC ORE	DARK BROWN	65.33	1.02	1.65	
25.00	26.00	1.00	POWDERY ORE	STEEL GREY	65.41	0.78	3.07	
26.00	27.00	1.00	POWDERY ORE	STEEL GREY	66.61	0.59	1.42	
27.00	28.00	1.00	POWDERY ORE	STEEL GREY	67.60	0.78	0.87	
28.00	29.00	1.00	POWDERY ORE	STEEL GREY	66.81	0.61	1.33	
29.00	30.00	1.00	POWDERY ORE	STEEL GREY	66.93	0.70	1.15	
30.00	31.00	1.00	POWDERY ORE	STEEL GREY	65.38	0.65	3.16	
31.00	32.00	1.00	POWDERY ORE	STEEL GREY	66.84	0.63	1.72	
32.00	33.00	1.00	POWDERY ORE	STEEL GREY	66.53	0.79	2.29	
33.00	34.00	1.00	POWDERY ORE	STEEL GREY	67.14	0.86	1.88	
34.00	35.00	1.00	POWDERY ORE	STEEL GREY	67.88	0.71	1.58	
35.00	36.00	1.00	POWDERY ORE	STEEL GREY	64.99	0.78	3.90	
36.00	37.00	1.00	POWDERY ORE	STEEL GREY	66.64	0.66	3.02	
37.00	38.00	1.00	POWDERY ORE	STEEL GREY	66.91	0.85	2.06	
38.00	39.00	1.00	POWDERY ORE	STEEL GREY	67.83	0.68	1.52	
39.00	40.00	1.00	POWDERY ORE	STEEL GREY	67.51	0.71	2.30	
40.00	41.00	1.00	POWDERY ORE	STEEL GREY	66.73	0.68	3.01	
41.00	42.00	1.00	POWDERY ORE	STEEL GREY	66.41	0.88	2.05	
42.00	43.00	1.00	POWDERY ORE	STEEL GREY	66.15	0.92	2.45	
43.00	44.00	1.00	POWDERY ORE	STEEL GREY	65.77	1.06	1.79	
44.00	45.00	1.00	POWDERY ORE	STEEL GREY	67.60	0.89	1.43	
45.00	46.00	1.00	POWDERY ORE	STEEL GREY	66.96	0.73	2.12	
46.00	47.00	1.00	POWDERY ORE	STEEL GREY	66.80	0.69	2.65	
47.00	48.00	1.00	POWDERY ORE	STEEL GREY	62.65	0.70	6.97	
48.00	49.00	1.00	POWDERY ORE	STEEL GREY	65.29	0.77	3.34	
49.00	50.00	1.00	POWDERY ORE	STEEL GREY	65.68	0.79	2.96	
50.00	51.00	1.00	POWDERY ORE	STEEL GREY	65.95	0.85	3.02	
51.00	52.00	1.00	POWDERY ORE	STEEL GREY	66.62	0.64	2.71	
52.00	53.00	1.00	POWDERY ORE	STEEL GREY	64.06	0.99	5.45	
53.00	54.00	1.00	POWDERY ORE	STEEL GREY	66.11	0.79	2.56	
54.00	55.00	1.00	POWDERY ORE	STEEL GREY	66.77	0.85	2.48	

BOREHOLE NO:MHGR-20

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
55.00	56.00	1.00	POWDERY ORE	STEEL GREY	67.06	1.38	1.96
56.00	57.00	1.00	POWDERY ORE	STEEL GREY	66.52	0.76	3.89
57.00	58.00	1.00	POWDERY ORE	STEEL GREY	64.38	1.87	5.24
58.00	59.00	1.00	POWDERY ORE	STEEL GREY	65.22	2.37	2.36
59.00	60.00	1.00	POWDERY ORE	STEEL GREY	65.42	2.59	3.51
60.00	61.00	1.00	POWDERY ORE	STEEL GREY	59.38	9.87	1.71
61.00	62.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	50.73	23.75	2.01
62.00	63.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	63.93	3.73	3.70
63.00	64.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	66.45	1.93	1.64
64.00	65.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	64.42	4.23	1.81
65.00	66.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	57.53	13.34	1.49
66.00	67.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	46.21	28.94	1.01
67.00	68.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.75	41.15	0.91
68.00	69.00	1.00	ALTERED BHQ	LIGHT BROWN	36.34	46.60	1.13 OCC.CLAY PIECES
69.00	70.00	1.00	ALTERED BHQ	LIGHT BROWN	33.52	49.58	1.01 OCC.CLAY PIECES
70.00	71.00	1.00	ALTERED BHQ	LIGHT BROWN	32.66	51.71	1.14 OCC.CLAY PIECES
71.00	72.00	1.00	ALTERED BHQ	LIGHT BROWN	37.20	45.08	0.93 OCC.CLAY PIECES

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-21

LATITUDE : 1664092.520
LONGITUDE : 664495.073
REDUCED LEVEL (M): 942.203

DATE OF COMMENCEMENT : 21/02/16
DATE OF CLOSURE : 22/02/16
DEPTH DRILLED (M) : 90.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!

0.00	1.00	1.00	HARD MASSIVE ORE	DARK BROWN	55.24	9.05	9.54	
1.00	2.00	1.00	HARD MASSIVE ORE	DARK BROWN	56.59	8.09	6.10	
2.00	3.00	1.00	HARD MASSIVE ORE	DARK BROWN	58.19	7.21	6.40	
3.00	4.00	1.00	HARD MASSIVE ORE	DARK BROWN	59.92	3.79	4.80	
4.00	5.00	1.00	HARD MASSIVE ORE	DARK BROWN	60.28	3.54	4.41	
5.00	6.00	1.00	HARD MASSIVE ORE	DARK BROWN	62.25	2.01	4.51	
6.00	7.00	1.00	HARD MASSIVE ORE	DARK BROWN	62.76	1.93	3.72	
7.00	8.00	1.00	HARD MASSIVE ORE	DARK BROWN	63.73	1.40	3.38	
8.00	9.00	1.00	HARD MASSIVE ORE	DARK BROWN	64.20	1.28	2.92	
9.00	10.00	1.00	SOFT LAMINATED ORE	CHERRY RED	65.08	1.32	2.37	
10.00	11.00	1.00	SOFT LAMINATED ORE	CHERRY RED	64.56	1.40	2.34	
11.00	12.00	1.00	HARD LAMINATED ORE	DARK BROWN	62.96	1.85	3.44	
12.00	13.00	1.00	HARD LAMINATED ORE	DARK BROWN	65.35	1.17	1.99	
13.00	14.00	1.00	HARD LAMINATED ORE	DARK BROWN	66.23	1.30	2.17	
14.00	15.00	1.00	HARD LAMINATED ORE	DARK BROWN	62.12	2.90	4.62	
15.00	16.00	1.00	HARD LAMINATED ORE	DARK BROWN	61.91	3.23	5.00	
16.00	17.00	1.00	HARD LAMINATED ORE	DARK BROWN	59.53	3.90	7.77	
17.00	18.00	1.00	SOFT LAMINATED ORE	CHERRY RED	61.92	3.08	5.04	
18.00	19.00	1.00	SOFT LAMINATED ORE	CHERRY RED	61.95	3.23	5.27	
19.00	20.00	1.00	POWDERY ORE	DARK BROWN	62.83	2.71	4.51	
20.00	21.00	1.00	POWDERY ORE	DARK BROWN	63.12	2.08	3.75	
21.00	22.00	1.00	POWDERY ORE	DARK BROWN	65.08	1.27	2.11	
22.00	23.00	1.00	POWDERY ORE	DARK BROWN	65.02	1.36	2.25	
23.00	24.00	1.00	POWDERY ORE	DARK BROWN	62.73	2.44	3.90	

BOREHOLE NO:MHGR-21

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	POWDERY ORE	DARK BROWN	62.62	2.83	3.88	
25.00	26.00	1.00	POWDERY ORE	DARK BROWN	61.02	4.71	6.31	
26.00	27.00	1.00	POWDERY ORE	DARK BROWN	63.26	3.34	4.50	
27.00	28.00	1.00	POWDERY ORE	DARK BROWN	62.35	3.52	5.79	
28.00	29.00	1.00	POWDERY ORE	DARK BROWN	64.29	2.28	3.82	
29.00	30.00	1.00	POWDERY ORE	DARK BROWN	65.08	1.63	2.92	
30.00	31.00	1.00	POWDERY ORE	DARK BROWN	63.96	1.78	2.37	
31.00	32.00	1.00	POWDERY ORE	DARK BROWN	65.34	1.18	1.35	
32.00	33.00	1.00	POWDERY ORE	DARK BROWN	62.58	2.86	3.56	
33.00	34.00	1.00	POWDERY ORE	DARK BROWN	62.05	3.76	3.99	
34.00	35.00	1.00	POWDERY ORE	DARK BROWN	64.70	1.74	2.69	
35.00	36.00	1.00	POWDERY ORE	DARK BROWN	63.90	1.48	2.29	
36.00	37.00	1.00	POWDERY ORE	DARK BROWN	66.80	1.30	1.50	
37.00	38.00	1.00	POWDERY ORE	DARK BROWN	63.68	1.15	3.20	
38.00	39.00	1.00	POWDERY ORE	DARK BROWN	64.16	1.47	2.33	
39.00	40.00	1.00	HAEMATITIC ORE	DARK BROWN	64.42	2.49	3.10	
40.00	41.00	1.00	HAEMATITIC ORE	DARK BROWN	65.00	1.13	1.91	
41.00	42.00	1.00	HAEMATITIC ORE	DARK BROWN	64.95	1.48	2.07	
42.00	43.00	1.00	HAEMATITIC ORE	DARK BROWN	65.97	1.30	2.14	
43.00	44.00	1.00	HAEMATITIC ORE	DARK BROWN	66.00	1.63	1.31	
44.00	45.00	1.00	POWDERY ORE	DARK BROWN	66.62	1.06	1.47	
45.00	46.00	1.00	POWDERY ORE	DARK BROWN	66.86	0.94	1.28	
46.00	47.00	1.00	POWDERY ORE	DARK BROWN	66.85	0.94	1.52	
47.00	48.00	1.00	POWDERY ORE	DARK BROWN	67.08	0.93	1.20	
48.00	49.00	1.00	POWDERY ORE	DARK BROWN	67.00	0.85	0.95	
49.00	50.00	1.00	POWDERY ORE	DARK BROWN	67.14	0.72	0.70	
50.00	51.00	1.00	POWDERY ORE	DARK BROWN	67.32	0.90	1.00	
51.00	52.00	1.00	POWDERY ORE	DARK BROWN	66.74	1.44	1.69	
52.00	53.00	1.00	POWDERY ORE	DARK BROWN	67.13	1.15	1.39	
53.00	54.00	1.00	POWDERY ORE	DARK BROWN	67.32	1.02	1.26	
54.00	55.00	1.00	POWDERY ORE	DARK BROWN	67.04	1.04	1.30	

ANNEXURE - IIIB/61

BOREHOLE NO:MHGR-21

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)					
55.00	56.00	1.00	POWDERY ORE	DARK BROWN	67.34	0.72	0.87
56.00	57.00	1.00	POWDERY ORE	DARK BROWN	67.58	0.78	0.75
57.00	58.00	1.00	POWDERY ORE	DARK BROWN	67.30	0.72	0.65
58.00	59.00	1.00	POWDERY ORE	GREYISH GREEN	66.92	0.67	0.58
59.00	60.00	1.00	POWDERY ORE	GREYISH GREEN	66.62	0.88	0.64
60.00	61.00	1.00	POWDERY ORE	GREYISH GREEN	67.18	0.73	0.70
61.00	62.00	1.00	POWDERY ORE	GREYISH GREEN	67.16	0.76	0.88
62.00	63.00	1.00	POWDERY ORE	GREYISH GREEN	67.11	0.86	0.90
63.00	64.00	1.00	POWDERY ORE	GREYISH GREEN	67.49	0.79	0.69
64.00	65.00	1.00	POWDERY ORE	GREYISH GREEN	67.97	0.81	0.68
65.00	66.00	1.00	POWDERY ORE	GREYISH GREEN	67.40	1.06	1.09
66.00	67.00	1.00	POWDERY ORE	GREYISH GREEN	65.57	2.64	3.31
67.00	68.00	1.00	POWDERY ORE	GREYISH GREEN	65.97	2.09	2.56
68.00	69.00	1.00	POWDERY ORE	GREYISH GREEN	67.21	1.18	1.30
69.00	70.00	1.00	POWDERY ORE	GREYISH GREEN	67.16	1.21	1.28
70.00	71.00	1.00	POWDERY ORE	GREYISH GREEN	66.93	1.46	1.50
71.00	72.00	1.00	POWDERY ORE	GREYISH GREEN	65.61	2.31	2.48
72.00	73.00	1.00	POWDERY ORE	GREYISH GREEN	67.14	1.05	0.87
73.00	74.00	1.00	POWDERY ORE	GREYISH GREEN	66.21	2.02	2.25
74.00	75.00	1.00	POWDERY ORE	GREYISH GREEN	59.36	5.65	6.74
75.00	76.00	1.00	POWDERY ORE	GREYISH GREEN	66.93	1.49	1.74
76.00	77.00	1.00	FERRUGINOUS CLAY	YELLOW	16.23	32.88	29.06
77.00	78.00	1.00	FERRUGINOUS CLAY	YELLOW			
78.00	79.00	1.00	FERRUGINOUS CLAY	YELLOW	14.34	34.22	29.71
79.00	80.00	1.00	FERRUGINOUS CLAY	YELLOW			
80.00	81.00	1.00	FERRUGINOUS CLAY	YELLOW	12.46	35.79	30.97
81.00	82.00	1.00	FERRUGINOUS CLAY	YELLOW			
82.00	83.00	1.00	FERRUGINOUS CLAY	YELLOW	22.86	28.18	25.80
83.00	84.00	1.00	FERRUGINOUS CLAY	YELLOW			
84.00	85.00	1.00	FERRUGINOUS CLAY	YELLOW	19.18	30.47	26.85
85.00	86.00	1.00	FERRUGINOUS CLAY	YELLOW			

BOREHOLE NO:MHGR-21

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
86.00	87.00	1.00	FERRUGINOUS CLAY	YELLOW	24.32	26.00	23.06	SAMPLE DEPTH : 86.00-88.00m
87.00	88.00	1.00	FERRUGINOUS CLAY	YELLOW				
88.00	89.00	1.00	FERRUGINOUS CLAY	YELLOW	23.72	26.25	23.15	SAMPLE DEPTH : 88.00-90.00m
89.00	90.00	1.00	FERRUGINOUS CLAY	YELLOW				

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-23

LATITUDE : 1663794.774
 LONGITUDE : 664770.278
 REDUCED LEVEL (M): 921.112

DATE OF COMMENCEMENT : 22/02/16
 DATE OF CLOSURE : 23/02/16
 DEPTH DRILLED (M) : 77.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	POWDERY ORE	GREYISH BLACK	61.05	0.98	11.13	
1.00	2.00	1.00	POWDERY ORE	GREYISH BLACK	60.09	0.86	12.68	
2.00	3.00	1.00	POWDERY ORE	GREYISH BLACK	60.07	0.07	13.36	
3.00	4.00	1.00	POWDERY ORE	GREYISH BLACK	59.54	1.33	13.11	
4.00	5.00	1.00	POWDERY ORE	GREYISH BLACK	60.09	1.71	11.73	
5.00	6.00	1.00	POWDERY ORE	GREYISH BLACK	63.43	3.07	5.99	
6.00	7.00	1.00	POWDERY ORE	GREYISH BLACK	64.87	3.52	2.89	
7.00	8.00	1.00	SILICEOUS IRON ORE	DARK GREY	56.88	14.73	2.64	
8.00	9.00	1.00	SILICEOUS IRON ORE	DARK GREY	29.02	48.59	2.30	
9.00	10.00	1.00	SILICEOUS IRON ORE	DARK GREY	32.53	45.94	2.37	
10.00	11.00	1.00	HAEMATITIC ORE	DARK GREY	33.19	45.01	2.09	
11.00	12.00	1.00	HAEMATITIC ORE	DARK GREY	37.42	41.52	2.09	
12.00	13.00	1.00	HAEMATITIC ORE	DARK GREY	38.44	40.81	1.92	
13.00	14.00	1.00	HAEMATITIC ORE	DARK GREY	48.21	23.93	3.40	
14.00	15.00	1.00	HAEMATITIC ORE	DARK GREY	40.80	39.23	1.98	
15.00	16.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	33.78	47.29	1.68	WITH BHQ CHIPS
16.00	17.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	27.65	54.29	1.62	WITH BHQ CHIPS
17.00	18.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	33.57	46.32	1.84	WITH BHQ CHIPS
18.00	19.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	33.69	46.03	2.20	WITH BHQ CHIPS
19.00	20.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	39.45	37.85	1.89	WITH BHQ CHIPS
20.00	21.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	35.31	43.46	1.89	WITH BHQ CHIPS
21.00	22.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	34.68	45.02	1.39	WITH BHQ CHIPS
22.00	23.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	39.16	34.20	4.14	WITH BHQ CHIPS
23.00	24.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	36.99	39.41	3.08	WITH BHQ CHIPS

BOREHOLE NO:MHGR-23

DEPTH (M)		THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)						
24.00	25.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	33.96	44.23	2.84	WITH BHQ CHIPS
25.00	26.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	35.25	43.39	2.20	WITH BHQ CHIPS
26.00	27.00	1.00	SILICEOUS IRON ORE	LIGHT GREY	36.17	41.93	2.63	WITH BHQ CHIPS
27.00	28.00	1.00	SILICEOUS IRON ORE	DARK BROWN	36.64	40.31	2.23	
28.00	29.00	1.00	SILICEOUS IRON ORE	DARK BROWN	35.37	43.31	2.19	
29.00	30.00	1.00	SILICEOUS IRON ORE	DARK BROWN	42.11	34.75	4.33	
30.00	31.00	1.00	HAEMATITIC ORE	LIGHT BROWN	34.31	44.42	2.93	
31.00	32.00	1.00	HAEMATITIC ORE	LIGHT BROWN	38.27	39.06	2.49	
32.00	33.00	1.00	HAEMATITIC ORE	LIGHT BROWN	39.55	37.77	2.62	
33.00	34.00	1.00	HAEMATITIC ORE	LIGHT BROWN	42.61	33.56	1.64	
34.00	35.00	1.00	HAEMATITIC ORE	LIGHT BROWN	43.59	34.85	1.37	
35.00	36.00	1.00	SOFT LAMINATED ORE	LIGHT BROWN	40.68	37.07	2.32	
36.00	37.00	1.00	SOFT LAMINATED ORE	LIGHT BROWN	41.43	35.12	1.88	
37.00	38.00	1.00	HAEMATITIC ORE	DARK BROWN	34.43	45.12	0.97	
38.00	39.00	1.00	HAEMATITIC ORE	DARK BROWN	31.37	49.53	0.78	
39.00	40.00	1.00	HAEMATITIC ORE	DARK BROWN	32.82	47.57	0.67	
40.00	41.00	1.00	HAEMATITIC ORE	DARK BROWN	37.48	41.28	0.77	
41.00	42.00	1.00	HAEMATITIC ORE	DARK BROWN	37.89	42.43	0.66	
42.00	43.00	1.00	HAEMATITIC ORE	DARK BROWN	38.63	40.29	0.81	
43.00	44.00	1.00	HAEMATITIC ORE	DARK BROWN	36.00	43.25	0.93	
44.00	45.00	1.00	POWDERY ORE	GREY	37.88	37.30	2.60	
45.00	46.00	1.00	POWDERY ORE	GREY	32.60	45.56	2.65	
46.00	47.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	34.07	45.85	1.60	
47.00	48.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	34.57	45.12	0.92	
48.00	49.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	36.15	44.99	1.10	
49.00	50.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	33.51	47.21	0.81	
50.00	51.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.71	43.68	1.12	
51.00	52.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.42	40.07	1.14	
52.00	53.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	32.22	49.36	0.89	
53.00	54.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	34.36	47.17	0.83	
54.00	55.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.06	45.67	1.53	

BOREHOLE NO:MHGR-23

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	32.11	48.90	0.86	
56.00	57.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	28.01	53.11	0.94	
57.00	58.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.61	45.63	1.42	
58.00	59.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.84	45.09	1.38	
59.00	60.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.38	44.45	1.44	
60.00	61.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	32.04	50.79	0.95	
61.00	62.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	32.52	48.20	1.28	
62.00	63.00	1.00	FERRUGINOUS CLAY	DARK BROWN	35.62	42.49	3.10	
63.00	64.00	1.00	FERRUGINOUS CLAY	DARK BROWN	41.25	30.19	7.13	
64.00	65.00	1.00	FERRUGINOUS CLAY	DARK BROWN	45.02	21.18	9.11	
65.00	66.00	1.00	FERRUGINOUS CLAY	DARK BROWN	25.09	27.08	22.40	
66.00	67.00	1.00	FERRUGINOUS CLAY	DARK BROWN	25.18	27.13	22.33	
67.00	68.00	1.00	SILICEOUS IRON ORE	DARK GREY	52.99	15.36	7.43	
68.00	69.00	1.00	SILICEOUS IRON ORE	DARK GREY	47.27	26.93	3.75	
69.00	70.00	1.00	SILICEOUS IRON ORE	DARK GREY	46.22	29.88	2.84	
70.00	71.00	1.00	SILICEOUS IRON ORE	DARK GREY	37.38	42.21	2.45	
71.00	72.00	1.00	ALTERED BHQ	LIGHT GREY	37.04	42.40	3.32	
72.00	73.00	1.00	ALTERED BHQ	LIGHT GREY	39.86	39.88	2.00	
73.00	74.00	1.00	ALTERED BHQ	LIGHT GREY	38.18	41.96	2.13	
74.00	75.00	1.00	ALTERED BHQ	LIGHT GREY	34.66	46.14	1.58	
75.00	76.00	1.00	BHQ	LIGHT GREY	32.86	48.52	1.78	
76.00	77.00	1.00	BHQ	LIGHT GREY	37.06	42.36	1.11	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-24

LATITUDE : 1663667.740
 LONGITUDE : 664775.208
 REDUCED LEVEL (M): 922.059

DATE OF COMMENCEMENT : 22/02/16
 DATE OF CLOSURE : 25/02/16
 DEPTH DRILLED (M) : 105.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	HAEMATITIC ORE	CHERRY RED	63.66	1.18	4.50	
1.00	2.00	1.00	HAEMATITIC ORE	CHERRY RED	66.87	0.87	2.06	
2.00	3.00	1.00	HAEMATITIC ORE	CHERRY RED	67.06	0.78	1.24	
3.00	4.00	1.00	POWDERY ORE	GREY	68.66	0.66	0.82	
4.00	5.00	1.00	POWDERY ORE	GREY	68.82	0.71	0.69	
5.00	6.00	1.00	POWDERY ORE	GREY	68.53	0.67	0.69	
6.00	7.00	1.00	POWDERY ORE	GREY	68.57	0.72	0.93	
7.00	8.00	1.00	POWDERY ORE	GREY	68.58	0.76	0.91	
8.00	9.00	1.00	POWDERY ORE	GREY	68.49	0.70	0.95	
9.00	10.00	1.00	POWDERY ORE	GREY	68.44	0.76	1.07	
10.00	11.00	1.00	POWDERY ORE	GREY	67.46	0.72	1.81	
11.00	12.00	1.00	POWDERY ORE	GREY	67.80	0.69	1.88	
12.00	13.00	1.00	POWDERY ORE	GREY	67.80	0.72	1.62	
13.00	14.00	1.00	POWDERY ORE	GREY	67.18	0.76	2.28	
14.00	15.00	1.00	POWDERY ORE	GREY	66.91	0.81	2.22	
15.00	16.00	1.00	POWDERY ORE	GREY	67.88	0.73	1.62	
16.00	17.00	1.00	POWDERY ORE	GREY	67.84	0.73	1.47	
17.00	18.00	1.00	POWDERY ORE	GREY	68.01	0.72	1.39	
18.00	19.00	1.00	POWDERY ORE	GREY	67.91	0.72	1.47	
19.00	20.00	1.00	POWDERY ORE	GREY	67.67	0.75	1.85	
20.00	21.00	1.00	POWDERY ORE	GREY	67.46	0.81	1.85	
21.00	22.00	1.00	POWDERY ORE	GREY	65.82	1.91	2.65	
22.00	23.00	1.00	POWDERY ORE	GREY	67.07	0.83	2.00	
23.00	24.00	1.00	POWDERY ORE	GREY	67.41	0.76	1.84	

BOREHOLE NO:MHGR-24

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	POWDERY ORE	GREY	66.31	1.07	2.25	
25.00	26.00	1.00	POWDERY ORE	GREY	67.56	0.80	1.87	
26.00	27.00	1.00	POWDERY ORE	GREY	67.77	0.81	1.73	
27.00	28.00	1.00	POWDERY ORE	GREY	66.63	1.25	2.38	
28.00	29.00	1.00	POWDERY ORE	GREY	67.69	0.81	1.81	
29.00	30.00	1.00	POWDERY ORE	GREY	66.59	0.88	2.90	
30.00	31.00	1.00	POWDERY ORE	GREY	67.37	0.77	2.47	
31.00	32.00	1.00	POWDERY ORE	GREY	67.22	0.82	2.39	
32.00	33.00	1.00	POWDERY ORE	GREY	67.11	0.85	2.34	
33.00	34.00	1.00	POWDERY ORE	GREY	67.33	1.05	1.88	
34.00	35.00	1.00	POWDERY ORE	GREY	67.11	0.75	2.58	
35.00	36.00	1.00	POWDERY ORE	GREY	66.97	0.75	2.64	
36.00	37.00	1.00	POWDERY ORE	GREY	66.93	0.76	2.61	
37.00	38.00	1.00	POWDERY ORE	GREY	67.86	0.74	1.61	
38.00	39.00	1.00	POWDERY ORE	GREY	67.70	0.76	1.76	
39.00	40.00	1.00	POWDERY ORE	GREY	67.78	0.72	1.69	
40.00	41.00	1.00	POWDERY ORE	GREY	67.55	0.79	1.91	
41.00	42.00	1.00	POWDERY ORE	GREY	67.76	0.77	1.48	
42.00	43.00	1.00	POWDERY ORE	GREY	68.05	0.75	1.24	
43.00	44.00	1.00	POWDERY ORE	GREY	67.77	0.75	1.46	
44.00	45.00	1.00	POWDERY ORE	GREY	68.16	0.76	1.28	
45.00	46.00	1.00	POWDERY ORE	GREY	68.51	0.37	1.31	
46.00	47.00	1.00	POWDERY ORE	GREY	68.25	0.67	1.46	
47.00	48.00	1.00	POWDERY ORE	GREY	68.41	0.27	1.53	
48.00	49.00	1.00	POWDERY ORE	GREY	66.85	0.69	1.40	
49.00	50.00	1.00	POWDERY ORE	GREY	66.71	0.77	1.26	
50.00	51.00	1.00	POWDERY ORE	GREY	66.59	0.81	1.34	
51.00	52.00	1.00	POWDERY ORE	GREY	66.54	0.93	1.32	
52.00	53.00	1.00	POWDERY ORE	GREY	65.80	0.79	2.32	
53.00	54.00	1.00	POWDERY ORE	GREY	66.29	0.83	1.59	
54.00	55.00	1.00	POWDERY ORE	GREY	65.97	1.05	1.98	

BOREHOLE NO:MHGR-24

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	POWDERY ORE	GREY	66.20	0.83	1.66	
56.00	57.00	1.00	POWDERY ORE	GREY	66.13	0.98	1.72	
57.00	58.00	1.00	POWDERY ORE	GREY	65.99	0.86	2.08	
58.00	59.00	1.00	POWDERY ORE	GREY	66.49	0.85	1.44	
59.00	60.00	1.00	POWDERY ORE	GREY	67.16	0.87	1.73	
60.00	61.00	1.00	POWDERY ORE	GREY	67.17	0.85	1.51	
61.00	62.00	1.00	POWDERY ORE	GREY	68.05	0.75	1.16	
62.00	63.00	1.00	POWDERY ORE	GREY	68.03	0.71	1.11	
63.00	64.00	1.00	POWDERY ORE	GREY	68.26	0.69	0.98	
64.00	65.00	1.00	POWDERY ORE	GREY	67.81	0.77	1.18	
65.00	66.00	1.00	POWDERY ORE	GREY	67.84	0.75	1.06	
66.00	67.00	1.00	POWDERY ORE	GREY	67.64	0.79	1.19	
67.00	68.00	1.00	POWDERY ORE	GREY	68.29	0.73	1.01	
68.00	69.00	1.00	POWDERY ORE	GREY	68.10	0.72	1.05	
69.00	70.00	1.00	POWDERY ORE	GREY	67.99	0.77	1.11	
70.00	71.00	1.00	POWDERY ORE	GREY	67.84	0.73	1.21	
71.00	72.00	1.00	POWDERY ORE	GREY	67.72	0.73	1.18	
72.00	73.00	1.00	POWDERY ORE	GREY	67.96	0.72	1.16	
73.00	74.00	1.00	POWDERY ORE	GREY	67.79	0.73	1.29	
74.00	75.00	1.00	POWDERY ORE	GREY	66.96	1.91	1.58	
75.00	76.00	1.00	POWDERY ORE	GREY	67.74	0.93	1.30	
76.00	77.00	1.00	POWDERY ORE	GREY	66.79	0.83	2.62	
77.00	78.00	1.00	POWDERY ORE	GREY	67.74	0.76	1.26	
78.00	79.00	1.00	POWDERY ORE	GREY	67.53	0.84	1.39	
79.00	80.00	1.00	POWDERY ORE	GREY	68.01	0.73	1.16	
80.00	81.00	1.00	POWDERY ORE	GREY	67.63	0.76	1.37	
81.00	82.00	1.00	POWDERY ORE	GREY	67.82	0.81	1.37	
82.00	83.00	1.00	POWDERY ORE	GREY	67.62	0.79	1.95	
83.00	84.00	1.00	POWDERY ORE	GREY	67.72	0.76	1.50	
84.00	85.00	1.00	POWDERY ORE	GREY	68.07	0.70	1.88	
85.00	86.00	1.00	POWDERY ORE	GREY	67.58	0.78	2.08	

BOREHOLE NO:MHGR-24

DEPTH (M)	THICK-NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)					
86.00	87.00	1.00	POWDERY ORE	GREY	67.75	0.81	2.16
87.00	88.00	1.00	POWDERY ORE	GREY	67.66	0.72	2.45
88.00	89.00	1.00	POWDERY ORE	GREY	64.36	0.78	5.19
89.00	90.00	1.00	POWDERY ORE	GREY	67.84	0.80	1.38
90.00	91.00	1.00	HAEMATITIC ORE	DARK BROWN	59.93	0.88	11.43
91.00	92.00	1.00	HAEMATITIC ORE	DARK BROWN	54.38	8.33	13.78
92.00	93.00	1.00	HAEMATITIC ORE	DARK BROWN	50.20	11.14	16.25
93.00	94.00	1.00	HAEMATITIC ORE	DARK BROWN	55.65	7.34	12.46
94.00	95.00	1.00	HAEMATITIC ORE	DARK BROWN	61.22	5.31	6.38
95.00	96.00	1.00	HAEMATITIC ORE	DARK BROWN	63.54	2.40	5.13
96.00	97.00	1.00	HAEMATITIC ORE	DARK BROWN	62.82	5.31	1.81
97.00	98.00	1.00	HAEMATITIC ORE	DARK BROWN	38.07	43.30	1.28
98.00	99.00	1.00	BHQ	LIGHT BROWN	27.87	39.30	15.71
99.00	100.00	1.00	BHQ	LIGHT BROWN	27.94	37.07	17.04
100.00	101.00	1.00	BHQ	LIGHT BROWN	36.93	38.25	8.02
101.00	102.00	1.00	BHQ	LIGHT BROWN	42.28	38.26	0.96
102.00	103.00	1.00	BHQ	LIGHT BROWN	39.28	42.06	0.85
103.00	104.00	1.00	BHQ	LIGHT BROWN	38.08	43.97	0.79
104.00	105.00	1.00	BHQ	LIGHT BROWN	45.05	34.57	0.80

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-25

LATITUDE : 1664014.228
 LONGITUDE : 664559.338
 REDUCED LEVEL (M): 941.628

DATE OF COMMENCEMENT : 22/02/16
 DATE OF CLOSURE : 22/02/16
 DEPTH DRILLED (M) : 97.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	HAEMATITIC ORE	CHERRY RED	53.68	4.00	10.65	
1.00	2.00	1.00	HAEMATITIC ORE	CHERRY RED	50.00	3.46	12.20	
2.00	3.00	1.00	HAEMATITIC ORE	CHERRY RED	57.99	1.99	8.54	
3.00	4.00	1.00	HAEMATITIC ORE	DARK BROWN	50.72	4.19	11.91	
4.00	5.00	1.00	HAEMATITIC ORE	DARK BROWN	56.61	1.89	6.39	
5.00	6.00	1.00	HAEMATITIC ORE	DARK BROWN	54.24	2.70	9.02	
6.00	7.00	1.00	HAEMATITIC ORE	DARK BROWN	55.60	3.06	8.65	
7.00	8.00	1.00	HAEMATITIC ORE	DARK BROWN	62.12	1.05	4.65	
8.00	9.00	1.00	HAEMATITIC ORE	DARK BROWN	59.41	1.27	3.97	
9.00	10.00	1.00	HAEMATITIC ORE	DARK BROWN	60.80	2.12	4.68	
10.00	11.00	1.00	HAEMATITIC ORE	DARK BROWN	63.59	1.58	3.40	
11.00	12.00	1.00	HAEMATITIC ORE	DARK BROWN	60.31	1.30	6.41	
12.00	13.00	1.00	HAEMATITIC ORE	DARK BROWN	61.35	1.68	5.91	
13.00	14.00	1.00	POWDERY ORE	DARK GREY	60.57	1.04	7.49	
14.00	15.00	1.00	POWDERY ORE	DARK GREY	62.06	0.88	5.51	
15.00	16.00	1.00	POWDERY ORE	DARK GREY	64.67	0.89	2.88	
16.00	17.00	1.00	POWDERY ORE	DARK GREY	62.00	1.30	5.64	
17.00	18.00	1.00	POWDERY ORE	DARK GREY	63.45	0.76	4.81	
18.00	19.00	1.00	POWDERY ORE	DARK GREY	66.14	0.82	2.06	
19.00	20.00	1.00	POWDERY ORE	DARK GREY	60.75	8.20	2.64	
20.00	21.00	1.00	POWDERY ORE	DARK GREY	65.83	0.64	2.08	
21.00	22.00	1.00	POWDERY ORE	DARK GREY	66.11	0.63	1.77	
22.00	23.00	1.00	POWDERY ORE	DARK GREY	65.46	0.85	2.66	
23.00	24.00	1.00	POWDERY ORE	DARK GREY	64.03	0.79	3.24	

BOREHOLE NO:MHGR-25

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	POWDERY ORE	DARK GREY	66.36	1.62	2.13
25.00	26.00	1.00	POWDERY ORE	DARK GREY	65.79	0.67	1.86
26.00	27.00	1.00	POWDERY ORE	DARK GREY	66.29	0.71	1.54
27.00	28.00	1.00	POWDERY ORE	DARK GREY	66.89	0.92	1.51
28.00	29.00	1.00	POWDERY ORE	DARK GREY	65.72	1.13	2.22
29.00	30.00	1.00	POWDERY ORE	DARK GREY	67.59	0.69	0.93
30.00	31.00	1.00	POWDERY ORE	DARK GREY	67.53	0.78	1.13
31.00	32.00	1.00	POWDERY ORE	DARK GREY	67.88	0.67	0.92
32.00	33.00	1.00	POWDERY ORE	DARK GREY	67.73	0.60	0.82
33.00	34.00	1.00	POWDERY ORE	DARK GREY	67.06	0.72	1.30
34.00	35.00	1.00	POWDERY ORE	DARK GREY	67.05	0.74	1.22
35.00	36.00	1.00	POWDERY ORE	DARK GREY	67.02	0.67	1.10
36.00	37.00	1.00	POWDERY ORE	DARK GREY	67.12	0.68	0.99
37.00	38.00	1.00	POWDERY ORE	DARK GREY	67.14	0.74	1.13
38.00	39.00	1.00	POWDERY ORE	DARK GREY	67.08	0.72	1.22
39.00	40.00	1.00	POWDERY ORE	DARK GREY	66.54	0.74	1.35
40.00	41.00	1.00	POWDERY ORE	DARK GREY	67.21	0.65	1.14
41.00	42.00	1.00	POWDERY ORE	DARK GREY	67.16	0.69	1.17
42.00	43.00	1.00	POWDERY ORE	DARK GREY	67.35	0.75	1.09
43.00	44.00	1.00	POWDERY ORE	DARK GREY	67.36	0.67	1.16
44.00	45.00	1.00	POWDERY ORE	DARK GREY	67.38	0.76	1.13
45.00	46.00	1.00	POWDERY ORE	DARK GREY	67.24	0.74	1.52
46.00	47.00	1.00	POWDERY ORE	DARK GREY	67.79	0.70	0.83
47.00	48.00	1.00	POWDERY ORE	DARK GREY	66.63	0.74	1.10
48.00	49.00	1.00	POWDERY ORE	DARK GREY	66.58	0.73	1.34
49.00	50.00	1.00	POWDERY ORE	DARK GREY	64.85	0.86	2.25
50.00	51.00	1.00	POWDERY ORE	DARK GREY	66.51	0.77	1.41
51.00	52.00	1.00	POWDERY ORE	DARK GREY	67.09	0.79	1.08
52.00	53.00	1.00	POWDERY ORE	DARK GREY	66.84	0.77	0.97
53.00	54.00	1.00	POWDERY ORE	DARK GREY	66.64	0.79	0.89
54.00	55.00	1.00	POWDERY ORE	DARK GREY	65.25	1.55	2.46

ANNEXURE - IIIB/72

BOREHOLE NO:MHGR-25

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR	10.78	36.43	31.64	
56.00	57.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR	10.19	36.93	32.23	SAMPLE DEPTH : 56.00-59.00m
57.00	58.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR				
58.00	59.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR				
59.00	60.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR	10.15	36.92	31.81	SAMPLE DEPTH : 59.00-62.00m
60.00	61.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR				
61.00	62.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR				
62.00	63.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR	10.02	37.61	33.24	SAMPLE DEPTH : 62.00-64.00m
63.00	64.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR				
64.00	65.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR	6.92	39.71	33.83	SAMPLE DEPTH : 64.00-66.00m
65.00	66.00	1.00	FERRUGINOUS CLAY	GREYISH WHITE-BR				
66.00	67.00	1.00	POWDERY ORE	YELLOWISH BROWN	52.53	7.03	17.53	
67.00	68.00	1.00	POWDERY ORE	DARK GREY	67.57	1.11	1.39	
68.00	69.00	1.00	POWDERY ORE	DARK GREY	67.91	0.71	0.88	
69.00	70.00	1.00	POWDERY ORE	DARK GREY	68.16	0.76	0.92	
70.00	71.00	1.00	POWDERY ORE	DARK GREY	68.11	0.67	0.88	
71.00	72.00	1.00	POWDERY ORE	DARK GREY	67.43	0.70	1.14	
72.00	73.00	1.00	POWDERY ORE	DARK GREY	67.80	0.76	0.95	
73.00	74.00	1.00	POWDERY ORE	GREY	66.51	0.93	1.89	
74.00	75.00	1.00	POWDERY ORE	GREY	67.62	0.86	1.26	
75.00	76.00	1.00	POWDERY ORE	GREY	64.66	2.04	5.03	
76.00	77.00	1.00	POWDERY ORE	GREY	66.46	1.22	2.87	
77.00	78.00	1.00	POWDERY ORE	GREY	65.20	1.50	4.57	
78.00	79.00	1.00	POWDERY ORE	GREY	66.56	0.68	3.53	
79.00	80.00	1.00	POWDERY ORE	GREY	66.20	0.69	4.55	
80.00	81.00	1.00	POWDERY ORE	GREY	65.70	0.56	4.74	
81.00	82.00	1.00	POWDERY ORE	GREY	50.48	8.97	17.33	
82.00	83.00	1.00	POWDERY ORE	GREY	64.19	1.40	6.01	
83.00	84.00	1.00	POWDERY ORE	GREY	64.45	1.93	5.12	
84.00	85.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	64.29	2.95	5.02	
85.00	86.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	63.07	3.40	5.51	

BOREHOLE NO:MHGR-25

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS	!	!	!	!	!	!	!
! FROM ! TO	! (m) !	!	!	!	!	!	!	!
86.00	87.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	65.37	1.97	1.78	
87.00	88.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	65.80	2.16	1.38	
88.00	89.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	63.83	4.10	1.50	
89.00	90.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	56.38	13.52	1.53	
90.00	91.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.81	41.82	1.31	
91.00	92.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.72	41.50	1.14	
92.00	93.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.08	44.84	1.15	
93.00	94.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	42.19	37.06	1.38	
94.00	95.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.09	40.62	1.16	
95.00	96.00	1.00	ALTERED BHQ	LIGHT BROWN	38.22	41.57	1.47	
96.00	97.00	1.00	ALTERED BHQ	LIGHT BROWN	40.62	38.98	1.40	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-26

LATITUDE : 1663651.200
LONGITUDE : 664449.427
REDUCED LEVEL (M): 968.337

DATE OF COMMENCEMENT : 23/02/16
DATE OF CLOSURE : 23/02/16
DEPTH DRILLED (M) : 55.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	LATERITE	DARK BROWN	39.14	11.74	10.24	
1.00	2.00	1.00	LATERITE	DARK BROWN	40.77	8.15	8.79	
2.00	3.00	1.00	SHALY ORE	REDDISH BROWN	48.12	4.39	6.00	
3.00	4.00	1.00	SHALY ORE	REDDISH BROWN	46.01	6.35	6.90	
4.00	5.00	1.00	SHALY ORE	REDDISH BROWN	45.44	3.98	6.38	
5.00	6.00	1.00	SHALY ORE	REDDISH BROWN	44.44	4.19	6.81	
6.00	7.00	1.00	SHALY ORE	REDDISH BROWN	49.03	2.60	5.03	
7.00	8.00	1.00	SHALY ORE	REDDISH BROWN	48.40	2.34	5.15	
8.00	9.00	1.00	SHALY ORE	REDDISH BROWN	45.47	2.87	5.96	
9.00	10.00	1.00	SHALY ORE	REDDISH BROWN	50.59	3.16	4.66	
10.00	11.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	36.15	3.12	9.53	
11.00	12.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	36.44	3.05	9.32	
12.00	13.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	34.48	3.12	10.29	
13.00	14.00	1.00	SHALY ORE	REDDISH BROWN	50.25	2.16	4.81	OCC.ORE PIECES
14.00	15.00	1.00	SHALY ORE	REDDISH BROWN	50.42	5.03	5.09	OCC.ORE PIECES
15.00	16.00	1.00	SHALY ORE	REDDISH BROWN	44.66	2.52	5.94	OCC.ORE PIECES
16.00	17.00	1.00	FERRUGINOUS SHALE	DARK BROWN	35.58	13.28	13.05	
17.00	18.00	1.00	FERRUGINOUS CLAY	DARK BROWN	41.22	12.15	9.83	
18.00	19.00	1.00	FERRUGINOUS CLAY	DARK BROWN	40.21	11.72	10.48	
19.00	20.00	1.00	FERRUGINOUS CLAY	DARK BROWN	40.34	12.16	10.77	WITH ORE PIECES
20.00	21.00	1.00	FERRUGINOUS CLAY	DARK BROWN	39.32	11.95	11.37	WITH ORE PIECES
21.00	22.00	1.00	FERRUGINOUS CLAY	DARK BROWN	43.27	9.01	8.89	WITH ORE PIECES
22.00	23.00	1.00	FERRUGINOUS CLAY	DARK BROWN	28.71	21.49	18.73	
23.00	24.00	1.00	FERRUGINOUS CLAY	DARK BROWN	32.45	17.35	16.17	

BOREHOLE NO:MHGR-26

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	FERRUGINOUS CLAY	DARK BROWN	25.49	21.53	20.21
25.00	26.00	1.00	SILICEOUS IRON ORE	DARK BROWN	45.69	8.89	7.83
26.00	27.00	1.00	SILICEOUS IRON ORE	DARK BROWN	40.89	9.71	9.52
27.00	28.00	1.00	SILICEOUS IRON ORE	DARK BROWN	40.35	11.07	10.39
28.00	29.00	1.00	SILICEOUS IRON ORE	DARK BROWN	34.17	15.06	13.80
29.00	30.00	1.00	FERRUGINOUS CLAY	DARK BROWN	33.28	16.18	14.54
30.00	31.00	1.00	FERRUGINOUS CLAY	DARK BROWN	33.73	11.99	12.87
							WITH FE CLAY
							WITH FE CLAY
							WITH FE CLAY
							WITH FE CLAY
							WITH SILICA PIECES
							WITH SILICA PIECES
							SAMPLE DEPTH :30.00-32.00m
31.00	32.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
32.00	33.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	38.21	12.81	11.28
33.00	34.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
34.00	35.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	34.68	18.89	19.41
35.00	36.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
36.00	37.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	40.74	14.59	12.12
37.00	38.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
38.00	39.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	35.56	16.07	14.85
39.00	40.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
40.00	41.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	33.91	16.17	14.67
41.00	42.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
42.00	43.00	1.00	FERRUGINOUS CLAY	YELLOWISH BROWN	27.09	21.68	19.26
43.00	44.00	1.00	FERRUGINOUS CLAY	YELLOWISH BROWN			
44.00	45.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	17.14	22.70	22.89
45.00	46.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
46.00	47.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	17.85	22.52	22.74
47.00	48.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
48.00	49.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	39.32	10.44	11.03
49.00	50.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
50.00	51.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	20.56	22.46	21.42
51.00	52.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
52.00	53.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	19.88	22.58	21.62
53.00	54.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
54.00	55.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN			
							SAMPLE DEPTH : 42.00-44.00m
							SAMPLE DEPTH : 44.00-46.00m
							SAMPLE DEPTH : 46.00-48.00m
							SAMPLE DEPTH : 48.00-50.00m
							SAMPLE DEPTH : 50.00-52.00m
							SAMPLE DEPTH : 52.00-55.00m

ANNEXURE - IIIB/76

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-28

LATITUDE : 1663754.176
 LONGITUDE : 664412.986
 REDUCED LEVEL (M): 962.158

DATE OF COMMENCEMENT : 23/02/16
 DATE OF CLOSURE : 23/02/16
 DEPTH DRILLED (M) : 80.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	POWDERY ORE	GREY	53.31	3.24	4.47	
1.00	2.00	1.00	POWDERY ORE	DARK GREY	49.95	3.33	5.00	
2.00	3.00	1.00	POWDERY ORE	DARK GREY	53.41	2.22	4.06	
3.00	4.00	1.00	POWDERY ORE	DARK GREY	36.29	13.77	14.84	WITH SHALE PIECES
4.00	5.00	1.00	POWDERY ORE	DARK GREY	37.63	12.60	13.89	WITH SHALE PIECES
5.00	6.00	1.00	POWDERY ORE	DARK GREY	52.90	2.05	4.16	
6.00	7.00	1.00	POWDERY ORE	DARK GREY	54.46	4.72	4.72	
7.00	8.00	1.00	POWDERY ORE	GREY	41.14	11.24	12.68	
8.00	9.00	1.00	POWDERY ORE	GREY	47.16	10.59	8.02	
9.00	10.00	1.00	POWDERY ORE	GREY	50.43	8.36	6.42	
10.00	11.00	1.00	POWDERY ORE	GREY	43.33	11.39	10.08	
11.00	12.00	1.00	POWDERY ORE	GREY	46.24	9.93	8.66	
12.00	13.00	1.00	POWDERY ORE	GREY	51.70	5.63	4.91	
13.00	14.00	1.00	POWDERY ORE	GREY	54.28	4.47	3.90	
14.00	15.00	1.00	POWDERY ORE	DARK BROWN	54.57	3.78	3.75	WITH HAEMATITIC ORE PIECES
15.00	16.00	1.00	POWDERY ORE	DARK BROWN	50.84	4.28	4.75	
16.00	17.00	1.00	POWDERY ORE	DARK BROWN	40.93	3.03	6.48	
17.00	18.00	1.00	POWDERY ORE	DARK BROWN	41.19	2.53	12.08	
18.00	19.00	1.00	POWDERY ORE	DARK BROWN	56.47	2.14	6.00	
19.00	20.00	1.00	POWDERY ORE	DARK BROWN	54.86	2.22	7.17	
20.00	21.00	1.00	SHALY ORE	YELLOWISH BROWN	29.49	3.45	20.41	
21.00	22.00	1.00	SHALY ORE	YELLOWISH BROWN	56.01	1.73	6.32	
22.00	23.00	1.00	POWDERY ORE	DARK GREY	62.33	1.09	3.57	
23.00	24.00	1.00	POWDERY ORE	DARK GREY	60.76	1.23	3.72	

ANNEXURE - IIIB/77

BOREHOLE NO:MHGR-28

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	POWDERY ORE	DARK GREY	51.13	1.44	7.92
25.00	26.00	1.00	POWDERY ORE	DARK GREY	54.18	1.71	6.05
26.00	27.00	1.00	POWDERY ORE	DARK GREY	55.12	1.49	5.35
27.00	28.00	1.00	POWDERY ORE	DARK GREY	53.83	1.64	6.54
28.00	29.00	1.00	POWDERY ORE	DARK GREY	57.79	1.46	4.68
29.00	30.00	1.00	POWDERY ORE	DARK GREY	57.10	1.51	4.45
30.00	31.00	1.00	POWDERY ORE	DARK GREY	46.29	2.07	9.64
31.00	32.00	1.00	POWDERY ORE	DARK GREY	45.49	7.40	10.71
32.00	33.00	1.00	POWDERY ORE	DARK GREY	47.05	2.34	10.00
33.00	34.00	1.00	POWDERY ORE	DARK GREY	56.23	1.72	5.60
34.00	35.00	1.00	POWDERY ORE	DARK GREY	56.23	1.61	5.68
35.00	36.00	1.00	POWDERY ORE	DARK GREY	52.16	1.73	7.55
36.00	37.00	1.00	HAEMATITIC ORE	DARK BROWN	52.31	1.71	7.91
37.00	38.00	1.00	HAEMATITIC ORE	DARK BROWN	52.15	1.80	7.70
38.00	39.00	1.00	HAEMATITIC ORE	DARK BROWN	55.25	1.57	6.32
39.00	40.00	1.00	HAEMATITIC ORE	DARK BROWN	57.45	1.55	4.72
40.00	41.00	1.00	HAEMATITIC ORE	DARK BROWN	56.40	1.47	5.50
41.00	42.00	1.00	HAEMATITIC ORE	DARK BROWN	56.59	3.94	5.52
42.00	43.00	1.00	HAEMATITIC ORE	DARK BROWN	59.11	1.58	4.06
43.00	44.00	1.00	POWDERY ORE	DARK GREY	51.43	1.59	8.03
44.00	45.00	1.00	POWDERY ORE	DARK GREY	56.41	1.61	4.64
45.00	46.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	49.68	4.05	8.59
46.00	47.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	51.74	1.70	7.34
47.00	48.00	1.00	POWDERY ORE	YELLOWISH BROWN	45.39	1.38	12.29
48.00	49.00	1.00	POWDERY ORE	YELLOWISH BROWN	46.44	1.43	11.17
49.00	50.00	1.00	POWDERY ORE	YELLOWISH BROWN	31.28	1.57	22.27
50.00	51.00	1.00	POWDERY ORE	DARK BROWN	36.61	1.54	19.02
51.00	52.00	1.00	POWDERY ORE	DARK BROWN	50.43	1.47	11.08
52.00	53.00	1.00	POWDERY ORE	DARK BROWN	51.31	1.23	11.09
53.00	54.00	1.00	POWDERY ORE	DARK BROWN	51.11	1.42	10.17
54.00	55.00	1.00	POWDERY ORE	DARK BROWN	39.56	2.37	15.19

WITH SHALE PIECES
WITH SHALE PIECES

ANNEXURE - IIIB/78

BOREHOLE NO:MHGR-28

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	POWDERY ORE	DARK BROWN	51.51	2.07	8.42	
56.00	57.00	1.00	POWDERY ORE	DARK BROWN	48.69	5.65	10.09	WITH SHALE PIECES
57.00	58.00	1.00	FERRUGINOUS SHALE	DARK BROWN	25.90	20.21	21.66	WITH SHALE PIECES
							SAMPLE DEPTH : 57.00-59.00m	
58.00	59.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
59.00	60.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	23.01	20.35	22.84	SAMPLE DEPTH : 59.00-61.00m
60.00	61.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
61.00	62.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	20.30	20.38	24.03	SAMPLE DEPTH : 61.00-63.00m
62.00	63.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
63.00	64.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	17.04	21.40	24.41	SAMPLE DEPTH : 63.00-65.00m
64.00	65.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
65.00	66.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	18.07	20.73	24.64	SAMPLE DEPTH : 65.00-67.00m
66.00	67.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
67.00	68.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	19.45	20.65	24.20	SAMPLE DEPTH : 67.00-69.00m
68.00	69.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
69.00	70.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	28.81	20.36	20.09	SAMPLE DEPTH : 69.00-71.00m
70.00	71.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
71.00	72.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	16.80	20.64	25.45	SAMPLE DEPTH : 71.00-73.00m
72.00	73.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
73.00	74.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	11.88	20.40	27.89	SAMPLE DEPTH : 73.00-75.00m
74.00	75.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
75.00	76.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	17.83	19.97	25.68	SAMPLE DEPTH : 75.00-78.00m
76.00	77.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
77.00	78.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				
78.00	79.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	16.05	19.32	27.17	SAMPLE DEPTH : 78.00-80.00m
79.00	80.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN				

ANNEXURE - IIIB/79

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-29

LATITUDE : 1663610.379
 LONGITUDE : 664697.339
 REDUCED LEVEL (M): 950.016

DATE OF COMMENCEMENT : 23/02/16
 DATE OF CLOSURE : 23/02/16
 DEPTH DRILLED (M) : 80.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	POWDERY ORE	DARK GREY	67.52	1.02	1.21	
1.00	2.00	1.00	POWDERY ORE	DARK GREY	67.42	0.66	1.42	
2.00	3.00	1.00	POWDERY ORE	DARK GREY	67.89	0.68	1.00	
3.00	4.00	1.00	POWDERY ORE	DARK GREY	68.61	0.59	0.71	
4.00	5.00	1.00	POWDERY ORE	DARK GREY	68.71	0.59	0.68	
5.00	6.00	1.00	POWDERY ORE	DARK GREY	68.66	0.55	0.54	
6.00	7.00	1.00	POWDERY ORE	DARK GREY	69.00	0.58	0.20	
7.00	8.00	1.00	POWDERY ORE	DARK GREY	67.29	0.99	0.90	
8.00	9.00	1.00	POWDERY ORE	DARK GREY	67.98	0.64	0.99	
9.00	10.00	1.00	POWDERY ORE	DARK GREY	69.09	0.53	0.20	
10.00	11.00	1.00	POWDERY ORE	DARK GREY	68.99	0.62	0.36	
11.00	12.00	1.00	POWDERY ORE	DARK GREY	67.95	0.79	0.92	
12.00	13.00	1.00	POWDERY ORE	DARK GREY	68.95	0.60	0.51	
13.00	14.00	1.00	POWDERY ORE	DARK GREY	68.01	0.59	0.99	
14.00	15.00	1.00	POWDERY ORE	DARK GREY	68.13	0.52	1.06	
15.00	16.00	1.00	HAEMATITIC ORE	DARK GREY	65.77	1.32	2.34	WITH ORE PIECES
16.00	17.00	1.00	HAEMATITIC ORE	DARK GREY	67.95	0.63	0.94	WITH ORE PIECES
17.00	18.00	1.00	HAEMATITIC ORE	DARK GREY	68.33	0.62	0.71	WITH ORE PIECES
18.00	19.00	1.00	HAEMATITIC ORE	DARK GREY	68.56	0.53	0.56	WITH ORE PIECES
19.00	20.00	1.00	HAEMATITIC ORE	DARK GREY	68.29	0.56	0.80	WITH ORE PIECES
20.00	21.00	1.00	HAEMATITIC ORE	DARK GREY	68.34	0.53	0.81	WITH ORE PIECES
21.00	22.00	1.00	HAEMATITIC ORE	DARK BROWN	67.93	0.65	0.88	
22.00	23.00	1.00	HAEMATITIC ORE	DARK BROWN	67.74	0.58	1.14	
23.00	24.00	1.00	HAEMATITIC ORE	DARK BROWN	68.55	0.59	0.57	

BOREHOLE NO:MHGR-29

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	HAEMATITIC ORE	DARK BROWN	67.46	0.62	1.12
25.00	26.00	1.00	HAEMATITIC ORE	DARK BROWN	67.52	0.67	1.05
26.00	27.00	1.00	HAEMATITIC ORE	DARK BROWN	66.67	0.63	1.74
27.00	28.00	1.00	HAEMATITIC ORE	DARK BROWN	67.11	0.58	1.58
28.00	29.00	1.00	HAEMATITIC ORE	DARK BROWN	66.57	0.82	1.71
29.00	30.00	1.00	HAEMATITIC ORE	DARK BROWN	66.11	0.69	2.14
30.00	31.00	1.00	HAEMATITIC ORE	DARK BROWN	61.76	0.84	3.55
31.00	32.00	1.00	HAEMATITIC ORE	DARK BROWN	62.94	0.88	2.85
32.00	33.00	1.00	HAEMATITIC ORE	DARK BROWN	62.83	0.85	2.80
33.00	34.00	1.00	HAEMATITIC ORE	DARK BROWN	61.90	0.81	2.82
34.00	35.00	1.00	HAEMATITIC ORE	DARK BROWN	62.08	0.83	2.98
35.00	36.00	1.00	HAEMATITIC ORE	DARK BROWN	53.11	0.87	7.71
36.00	37.00	1.00	HAEMATITIC ORE	DARK BROWN	42.70	1.89	13.91
37.00	38.00	1.00	HAEMATITIC ORE	DARK BROWN	51.07	0.91	8.73
38.00	39.00	1.00	HAEMATITIC ORE	DARK BROWN	46.63	1.72	10.61
39.00	40.00	1.00	HAEMATITIC ORE	DARK BROWN	56.28	0.94	5.76
40.00	41.00	1.00	HAEMATITIC ORE	DARK BROWN	53.54	0.81	7.11
41.00	42.00	1.00	HAEMATITIC ORE	DARK BROWN	61.85	0.98	3.47
42.00	43.00	1.00	HAEMATITIC ORE	DARK BROWN	62.05	1.07	3.59
43.00	44.00	1.00	HAEMATITIC ORE	DARK BROWN	64.73	0.87	2.25
44.00	45.00	1.00	HAEMATITIC ORE	DARK BROWN	62.07	0.97	3.34
45.00	46.00	1.00	HAEMATITIC ORE	DARK BROWN	55.27	0.95	5.79
46.00	47.00	1.00	HAEMATITIC ORE	DARK BROWN	55.71	0.91	5.29
47.00	48.00	1.00	HAEMATITIC ORE	DARK BROWN	48.82	1.00	9.74
48.00	49.00	1.00	HAEMATITIC ORE	DARK BROWN	47.02	1.35	9.63
49.00	50.00	1.00	LIMONITIC CLAY	YELLOWISH BROWN	19.29	22.31	22.33
50.00	51.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	41.28	7.56	13.04
51.00	52.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	35.08	11.68	15.90
52.00	53.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	37.50	12.89	14.89
53.00	54.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	27.52	21.89	18.75
54.00	55.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	36.87	13.53	14.77

WITH CLAY
WITH CLAY
WITH CLAY

ANNEXURE - IIIB/81

BOREHOLE NO:MHGR-29

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
55.00	56.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	14.54	21.87	25.19
56.00	57.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	17.58	19.90	25.99
57.00	58.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	16.19	20.79	25.67
58.00	59.00	1.00	FERRUGINOUS CLAY	LIGHT BROWN	20.29	20.53	24.02
59.00	60.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 58.00-60.00m
60.00	61.00	1.00	FERRUGINOUS SHALE	DARK BROWN	19.96	21.15	23.41
61.00	62.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 60.00-62.00m
62.00	63.00	1.00	FERRUGINOUS SHALE	DARK BROWN	21.76	19.04	24.94
63.00	64.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 62.00-64.00m
64.00	65.00	1.00	FERRUGINOUS SHALE	DARK BROWN	32.92	17.06	19.09
65.00	66.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 64.00-66.00m
66.00	67.00	1.00	FERRUGINOUS SHALE	DARK BROWN	21.12	21.04	23.01
67.00	68.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 66.00-68.00m
68.00	69.00	1.00	FERRUGINOUS SHALE	DARK BROWN	16.23	20.81	25.57
69.00	70.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 68.00-70.00m
70.00	71.00	1.00	LIMONITIC CLAY	YELLOWISH BROWN	33.12	15.64	16.39
71.00	72.00	1.00	LIMONITIC CLAY	YELLOWISH BROWN			SAMPLE DEPTH : 70.00-72.00m
72.00	73.00	1.00	FERRUGINOUS SHALE	DARK BROWN	22.61	23.12	19.45
73.00	74.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 72.00-74.00m
74.00	75.00	1.00	FERRUGINOUS SHALE	DARK BROWN	27.04	21.92	18.93
75.00	76.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 74.00-76.00m
76.00	77.00	1.00	FERRUGINOUS SHALE	DARK BROWN	20.11	18.94	25.65
77.00	78.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 76.00-78.00m
78.00	79.00	1.00	FERRUGINOUS SHALE	DARK BROWN	20.08	21.66	22.69
79.00	80.00	1.00	FERRUGINOUS SHALE	DARK BROWN			SAMPLE DEPTH : 78.00-80.00m

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-30

LATITUDE : 1663838.056
 LONGITUDE : 664358.619
 REDUCED LEVEL (M): 965.726

DATE OF COMMENCEMENT : 24/02/16
 DATE OF CLOSURE : 24/02/16
 DEPTH DRILLED (M) : 61.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	LATERITE	DARK BROWN	57.26	5.18	7.27	
1.00	2.00	1.00	LATERITE	DARK BROWN	56.76	4.88	6.12	
2.00	3.00	1.00	POWDERY ORE	DARK GREY	63.22	2.29	2.87	
3.00	4.00	1.00	POWDERY ORE	DARK GREY	62.55	2.03	3.20	
4.00	5.00	1.00	POWDERY ORE	DARK GREY	63.05	1.81	3.02	
5.00	6.00	1.00	POWDERY ORE	DARK GREY	65.00	1.28	2.01	
6.00	7.00	1.00	POWDERY ORE	DARK GREY	65.25	1.18	1.82	
7.00	8.00	1.00	POWDERY ORE	DARK GREY	66.28	0.91	1.33	
8.00	9.00	1.00	POWDERY ORE	DARK GREY	65.70	0.98	1.39	
9.00	10.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	63.25	0.80	1.88	
10.00	11.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	63.21	0.74	1.87	
11.00	12.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	62.30	0.73	2.13	
12.00	13.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	62.22	0.74	2.20	
13.00	14.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	60.45	1.56	3.08	
14.00	15.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	62.94	1.08	2.38	
15.00	16.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	63.55	1.14	2.30	
16.00	17.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	64.35	1.15	2.32	
17.00	18.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	63.97	1.48	2.55	
18.00	19.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	65.07	0.87	1.91	
19.00	20.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	66.02	0.68	1.44	
20.00	21.00	1.00	POWDERY ORE	DARK GREY	66.05	1.20	1.50	
21.00	22.00	1.00	POWDERY ORE	DARK GREY	65.77	1.38	1.64	
22.00	23.00	1.00	POWDERY ORE	DARK GREY	66.79	1.10	0.99	
23.00	24.00	1.00	POWDERY ORE	DARK GREY	65.92	1.21	1.19	

ANNEXURE - IIIB/83

BOREHOLE NO:MHGR-30

DEPTH (M)		THICK-NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)						
24.00	25.00	1.00	POWDERY ORE	DARK GREY	66.04	0.96	1.11	
25.00	26.00	1.00	POWDERY ORE	DARK GREY	67.39	0.84	0.65	
26.00	27.00	1.00	POWDERY ORE	DARK GREY	67.52	0.67	0.44	
27.00	28.00	1.00	POWDERY ORE	DARK GREY	67.83	0.66	0.44	
28.00	29.00	1.00	POWDERY ORE	DARK GREY	67.01	0.63	0.73	
29.00	30.00	1.00	POWDERY ORE	DARK GREY	66.94	0.73	0.81	
30.00	31.00	1.00	POWDERY ORE	DARK GREY	66.70	0.69	0.86	
31.00	32.00	1.00	POWDERY ORE	DARK GREY	66.77	0.70	0.69	
32.00	33.00	1.00	POWDERY ORE	DARK GREY	65.65	0.89	1.63	
33.00	34.00	1.00	POWDERY ORE	DARK GREY	65.57	1.01	1.70	
34.00	35.00	1.00	POWDERY ORE	DARK GREY	65.95	0.87	1.54	
35.00	36.00	1.00	POWDERY ORE	DARK GREY	64.85	0.91	1.89	
36.00	37.00	1.00	POWDERY ORE	DARK GREY	65.33	1.17	1.55	
37.00	38.00	1.00	POWDERY ORE	DARK GREY	66.25	1.03	1.14	
38.00	39.00	1.00	POWDERY ORE	DARK GREY	66.94	0.90	1.07	
39.00	40.00	1.00	HAEMATITIC ORE	DARK BROWN	65.60	0.95	1.33	
40.00	41.00	1.00	HAEMATITIC ORE	DARK BROWN	59.61	0.96	3.29	
41.00	42.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	60.09	0.96	2.90	
42.00	43.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	54.44	1.19	4.88	
43.00	44.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN	42.43	1.22	10.58	SAMPLE DEPTH : 43.00-45.00m
44.00	45.00	1.00	FERRUGINOUS SHALE	YELLOWISH BROWN				
45.00	46.00	1.00	CLAY	LIGHT BROWN	16.04	20.03	26.98	SAMPLE DEPTH : 45.00-47.00m
46.00	47.00	1.00	CLAY	LIGHT BROWN				
47.00	48.00	1.00	CLAY	LIGHT BROWN	5.52	18.74	32.66	SAMPLE DEPTH : 47.00-49.00m
48.00	49.00	1.00	CLAY	LIGHT BROWN				
49.00	50.00	1.00	CLAY	LIGHT BROWN	5.50	18.46	32.90	SAMPLE DEPTH : 49.00-51.00m
50.00	51.00	1.00	SHALE	YELLOWISH BROWN				
51.00	52.00	1.00	SHALE	YELLOWISH BROWN	6.67	18.40	32.47	SAMPLE DEPTH : 51.00-53.00m
52.00	53.00	1.00	SHALE	YELLOWISH BROWN				
53.00	54.00	1.00	SHALE	YELLOWISH BROWN	5.01	18.12	33.51	SAMPLE DEPTH : 53.00-55.00m
54.00	55.00	1.00	SHALE	YELLOWISH BROWN				

ANNEXURE - IIIB/84

BOREHOLE NO:MHGR-30

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	SHALE	YELLOWISH BROWN	6.75	18.77	32.10	SAMPLE DEPTH : 55.00-57.00m
56.00	57.00	1.00	SHALE	YELLOWISH BROWN				
57.00	58.00	1.00	SHALE	YELLOWISH BROWN	14.24	20.22	27.20	SAMPLE DEPTH : 57.00-59.00m
58.00	59.00	1.00	SHALE	YELLOWISH BROWN				
59.00	60.00	1.00	SHALE	YELLOWISH BROWN	13.07	19.91	28.15	SAMPLE DEPTH : 59.00-61.00m
60.00	61.00	1.00	SHALE	YELLOWISH BROWN				

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-31

LATITUDE : 1664044.294
 LONGITUDE : 664448.413
 REDUCED LEVEL (M): 947.708

DATE OF COMMENCEMENT : 24/02/16
 DATE OF CLOSURE : 24/02/16
 DEPTH DRILLED (M) : 92.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS !	!	!	!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !	!	!	!	!	!	!	!
0.00	1.00	1.00	LATERITIC ORE	DARK BROWN	51.10	5.33	7.71	
1.00	2.00	1.00	POWDERY ORE	DARK GREY	66.00	1.43	2.32	
2.00	3.00	1.00	POWDERY ORE	DARK GREY	53.57	14.15	2.38	
3.00	4.00	1.00	POWDERY ORE	DARK GREY	59.86	4.31	4.13	
4.00	5.00	1.00	POWDERY ORE	DARK GREY	65.15	2.05	2.95	
5.00	6.00	1.00	POWDERY ORE	DARK GREY	63.21	2.38	3.38	
6.00	7.00	1.00	POWDERY ORE	DARK GREY	65.32	1.42	2.16	
7.00	8.00	1.00	POWDERY ORE	DARK GREY	65.86	1.34	1.93	
8.00	9.00	1.00	POWDERY ORE	DARK GREY	66.56	1.26	1.58	
9.00	10.00	1.00	POWDERY ORE	DARK GREY	66.52	1.55	1.16	
10.00	11.00	1.00	POWDERY ORE	DARK GREY	67.19	0.94	1.39	WITH ORE PIECES
11.00	12.00	1.00	POWDERY ORE	DARK GREY	67.40	0.88	1.25	WITH ORE PIECES
12.00	13.00	1.00	POWDERY ORE	DARK GREY	67.46	0.90	1.08	WITH ORE PIECES
13.00	14.00	1.00	POWDERY ORE	DARK GREY	67.81	0.69	1.00	WITH ORE PIECES
14.00	15.00	1.00	POWDERY ORE	DARK GREY	67.33	0.87	1.13	WITH ORE PIECES
15.00	16.00	1.00	POWDERY ORE	DARK GREY	67.40	1.02	1.03	
16.00	17.00	1.00	POWDERY ORE	DARK GREY	69.28	0.52	0.20	
17.00	18.00	1.00	POWDERY ORE	DARK GREY	69.49	0.41	0.07	
18.00	19.00	1.00	POWDERY ORE	DARK GREY	69.38	0.55	0.12	
19.00	20.00	1.00	POWDERY ORE	DARK GREY	68.82	0.84	0.10	
20.00	21.00	1.00	POWDERY ORE	DARK GREY	69.31	0.54	0.12	
21.00	22.00	1.00	POWDERY ORE	DARK GREY	69.46	0.49	0.09	WITH ORE PIECES
22.00	23.00	1.00	POWDERY ORE	DARK GREY	69.17	0.64	0.27	
23.00	24.00	1.00	POWDERY ORE	DARK GREY	68.66	0.71	0.39	

BOREHOLE NO:MHGR-31

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	POWDERY ORE	DARK GREY	68.70	0.74	0.40	
25.00	26.00	1.00	POWDERY ORE	DARK GREY	67.98	0.85	0.47	
26.00	27.00	1.00	POWDERY ORE	DARK GREY	67.73	1.46	0.46	
27.00	28.00	1.00	POWDERY ORE	DARK GREY	67.91	0.74	0.53	
28.00	29.00	1.00	POWDERY ORE	DARK GREY	67.42	0.91	0.47	
29.00	30.00	1.00	POWDERY ORE	DARK GREY	67.46	0.90	0.85	
30.00	31.00	1.00	POWDERY ORE	DARK GREY	67.68	0.75	0.28	
31.00	32.00	1.00	POWDERY ORE	DARK GREY	67.74	0.77	0.66	
32.00	33.00	1.00	POWDERY ORE	DARK GREY	67.23	1.03	1.05	
33.00	34.00	1.00	POWDERY ORE	DARK GREY	66.85	0.97	1.00	
34.00	35.00	1.00	POWDERY ORE	DARK GREY	66.78	1.19	1.00	
35.00	36.00	1.00	POWDERY ORE	DARK GREY	67.11	1.33	0.93	
36.00	37.00	1.00	POWDERY ORE	DARK GREY	64.75	2.88	2.60	
37.00	38.00	1.00	POWDERY ORE	DARK GREY	62.41	4.37	4.46	
38.00	39.00	1.00	POWDERY ORE	DARK GREY	63.25	3.93	3.67	
39.00	40.00	1.00	POWDERY ORE	DARK GREY	64.03	3.75	3.11	
40.00	41.00	1.00	POWDERY ORE	DARK GREY	63.37	3.44	3.42	
41.00	42.00	1.00	POWDERY ORE	DARK GREY	66.01	1.99	1.71	
42.00	43.00	1.00	POWDERY ORE	DARK GREY	66.88	1.62	1.32	
43.00	44.00	1.00	POWDERY ORE	DARK GREY	67.05	1.61	1.41	
44.00	45.00	1.00	POWDERY ORE	DARK GREY	67.90	1.15	0.64	
45.00	46.00	1.00	POWDERY ORE	DARK GREY	67.85	1.06	0.65	
46.00	47.00	1.00	POWDERY ORE	DARK GREY	67.82	1.01	0.88	
47.00	48.00	1.00	POWDERY ORE	DARK GREY	69.01	0.75	0.40	
48.00	49.00	1.00	POWDERY ORE	DARK GREY	67.15	1.58	1.10	
49.00	50.00	1.00	POWDERY ORE	DARK GREY	66.99	1.78	1.19	
50.00	51.00	1.00	POWDERY ORE	DARK GREY	67.15	2.09	1.66	
51.00	52.00	1.00	POWDERY ORE	DARK GREY	66.08	2.29	2.05	
52.00	53.00	1.00	POWDERY ORE	DARK GREY	65.81	2.94	2.57	
53.00	54.00	1.00	POWDERY ORE	DARK GREY	65.58	3.03	2.67	
54.00	55.00	1.00	POWDERY ORE	DARK GREY	64.53	3.51	3.11	

BOREHOLE NO:MHGR-31

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	POWDERY ORE	DARK GREY	53.61	9.07	9.38	
56.00	57.00	1.00	FERRUGINOUS CLAY	GREY BROWN	32.29	20.19	18.69	
57.00	58.00	1.00	CLAYEY IRON ORE	GREY BROWN	50.16	10.45	11.19	
58.00	59.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	59.70	6.47	6.12	
59.00	60.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	53.76	14.61	3.15	
60.00	61.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	54.09	15.31	2.59	
61.00	62.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	46.25	27.10	3.50	
62.00	63.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	33.16	47.83	1.40	
63.00	64.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	33.29	47.59	1.41	
64.00	65.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.49	36.38	1.51	
65.00	66.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.92	36.45	1.75	
66.00	67.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.46	34.73	1.59	
67.00	68.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.42	35.52	1.41	
68.00	69.00	1.00	ALTERED BHQ	GREY	42.32	33.24	1.43	
69.00	70.00	1.00	ALTERED BHQ	GREY	38.50	36.90	1.41	
70.00	71.00	1.00	ALTERED BHQ	GREY	40.59	34.11	1.85	
71.00	72.00	1.00	ALTERED BHQ	GREY	37.43	44.84	1.25	
72.00	73.00	1.00	ALTERED BHQ	GREY	38.30	37.32	1.14	
73.00	74.00	1.00	BHQ	LIGHT BROWN	35.95	46.01	1.09	
74.00	75.00	1.00	BHQ	LIGHT BROWN	37.34	37.97	1.31	
75.00	76.00	1.00	BHQ	LIGHT BROWN	37.23	37.97	1.40	
76.00	77.00	1.00	BHQ	LIGHT BROWN	34.83	46.54	1.47	
77.00	78.00	1.00	BHQ	LIGHT BROWN	33.99	47.26	1.51	
78.00	79.00	1.00	BHQ	LIGHT BROWN	33.01	48.12	1.43	
79.00	80.00	1.00	BHQ	LIGHT BROWN	31.58	49.28	1.39	
80.00	81.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	33.45	47.54	1.34	
81.00	82.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.97	36.50	1.85	
82.00	83.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.98	36.57	1.27	
83.00	84.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.46	45.90	1.39	
84.00	85.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.94	33.99	2.52	
85.00	86.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	31.40	49.61	1.00	

BOREHOLE NO:MHGR-31

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
86.00	87.00	1.00	BHQ	GREY	28.53	52.43	0.97	
87.00	88.00	1.00	BHQ	GREY	33.68	47.72	1.08	
88.00	89.00	1.00	BHQ	GREY	35.02	47.01	1.02	
89.00	90.00	1.00	BHQ	GREY	34.55	47.29	1.03	
90.00	91.00	1.00	BHQ	GREY	38.14	44.02	0.94	
91.00	92.00	1.00	BHQ	GREY	36.67	45.63	1.14	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-32

LATITUDE : 1663942.241
 LONGITUDE : 664322.968
 REDUCED LEVEL (M): 949.318

DATE OF COMMENCEMENT : 24/02/16
 DATE OF CLOSURE : 24/02/16
 DEPTH DRILLED (M) : 70.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	HAEMATITIC ORE	DARK GREY	65.43	2.50	2.34	
1.00	2.00	1.00	HAEMATITIC ORE	DARK GREY	65.44	2.63	2.68	
2.00	3.00	1.00	HAEMATITIC ORE	DARK GREY	65.38	2.58	2.37	
3.00	4.00	1.00	HAEMATITIC ORE	DARK GREY	65.00	2.60	2.61	
4.00	5.00	1.00	HAEMATITIC ORE	LIGHT BROWN	61.00	3.54	4.40	WITH FERRUGINOUS CLAY
5.00	6.00	1.00	HAEMATITIC ORE	LIGHT BROWN	57.67	5.27	6.51	WITH FERRUGINOUS CLAY
6.00	7.00	1.00	POWDERY ORE	DARK GREY	66.35	1.83	1.70	
7.00	8.00	1.00	POWDERY ORE	DARK GREY	68.65	1.05	0.54	
8.00	9.00	1.00	POWDERY ORE	DARK GREY	68.76	0.96	0.50	
9.00	10.00	1.00	POWDERY ORE	DARK GREY	69.25	0.69	0.11	
10.00	11.00	1.00	POWDERY ORE	DARK GREY	69.16	0.78	0.24	
11.00	12.00	1.00	POWDERY ORE	DARK GREY	68.34	1.04	0.48	
12.00	13.00	1.00	POWDERY ORE	DARK GREY	67.35	1.42	0.86	
13.00	14.00	1.00	POWDERY ORE	DARK GREY	67.44	1.62	1.06	
14.00	15.00	1.00	POWDERY ORE	DARK GREY	67.02	1.68	1.14	
15.00	16.00	1.00	HAEMATITIC ORE	DARK BROWN	65.95	2.08	1.73	
16.00	17.00	1.00	HAEMATITIC ORE	DARK BROWN	65.89	2.25	1.79	
17.00	18.00	1.00	HAEMATITIC ORE	DARK BROWN	68.05	1.07	0.59	
18.00	19.00	1.00	HAEMATITIC ORE	DARK BROWN	68.34	0.89	0.38	
19.00	20.00	1.00	HAEMATITIC ORE	DARK BROWN	67.46	1.36	0.82	
20.00	21.00	1.00	HAEMATITIC ORE	DARK BROWN	68.34	0.87	0.49	
21.00	22.00	1.00	HAEMATITIC ORE	DARK BROWN	68.37	0.84	0.39	
22.00	23.00	1.00	HAEMATITIC ORE	DARK BROWN	68.79	0.75	0.24	
23.00	24.00	1.00	HAEMATITIC ORE	DARK BROWN	68.24	0.82	0.30	

ANNEXURE - IIIB/90

BOREHOLE NO:MHGR-32

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	HAEMATITIC ORE	DARK BROWN	68.40	0.84	0.38
25.00	26.00	1.00	HAEMATITIC ORE	DARK BROWN	68.27	0.87	0.43
26.00	27.00	1.00	HAEMATITIC ORE	DARK BROWN	68.06	0.93	0.55
27.00	28.00	1.00	HAEMATITIC ORE	DARK BROWN	41.81	32.38	1.41
28.00	29.00	1.00	HAEMATITIC ORE	DARK BROWN	66.84	2.30	1.01
29.00	30.00	1.00	HAEMATITIC ORE	DARK BROWN	66.79	1.53	1.19
30.00	31.00	1.00	HAEMATITIC ORE	DARK BROWN	67.14	1.53	0.95
31.00	32.00	1.00	HAEMATITIC ORE	DARK BROWN	67.30	1.44	0.88
32.00	33.00	1.00	HAEMATITIC ORE	DARK BROWN	67.15	1.48	0.93
33.00	34.00	1.00	HAEMATITIC ORE	DARK BROWN	67.21	1.23	0.79
34.00	35.00	1.00	HAEMATITIC ORE	DARK BROWN	67.17	1.23	0.86
35.00	36.00	1.00	HAEMATITIC ORE	DARK BROWN	67.63	1.17	0.71
36.00	37.00	1.00	HAEMATITIC ORE	DARK BROWN	67.80	1.10	0.58
37.00	38.00	1.00	HAEMATITIC ORE	DARK BROWN	68.44	0.82	0.30
38.00	39.00	1.00	HAEMATITIC ORE	DARK BROWN	68.64	0.84	0.28
39.00	40.00	1.00	HAEMATITIC ORE	DARK BROWN	68.67	0.80	0.32
40.00	41.00	1.00	HAEMATITIC ORE	DARK BROWN	68.87	0.75	0.25
41.00	42.00	1.00	HAEMATITIC ORE	DARK BROWN	67.83	0.85	0.76
42.00	43.00	1.00	HAEMATITIC ORE	DARK BROWN	68.10	0.85	0.52
43.00	44.00	1.00	HAEMATITIC ORE	DARK BROWN	68.69	0.85	0.42
44.00	45.00	1.00	HAEMATITIC ORE	DARK BROWN	68.47	0.85	0.44
45.00	46.00	1.00	HAEMATITIC ORE	DARK BROWN	68.10	0.81	0.46
46.00	47.00	1.00	HAEMATITIC ORE	DARK BROWN	68.21	0.76	0.48
47.00	48.00	1.00	HAEMATITIC ORE	DARK BROWN	68.21	0.76	0.48
48.00	49.00	1.00	HAEMATITIC ORE	DARK BROWN	65.24	0.93	1.71
49.00	50.00	1.00	HAEMATITIC ORE	DARK BROWN	65.27	0.80	1.87
50.00	51.00	1.00	HAEMATITIC ORE	DARK BROWN	65.36	0.84	1.57
51.00	52.00	1.00	HAEMATITIC ORE	DARK BROWN	64.90	0.92	1.79
52.00	53.00	1.00	HAEMATITIC ORE	DARK BROWN	60.97	1.00	4.76
53.00	54.00	1.00	HAEMATITIC ORE	DARK BROWN	64.46	1.05	2.68
54.00	55.00	1.00	HAEMATITIC ORE	DARK BROWN	65.33	1.30	1.92

WITH SILICEOUS POWDER

ANNEXURE - IIIB/91

BOREHOLE NO:MHGR-32

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	HAEMATITIC ORE	DARK BROWN	64.08	1.11	2.72	WITH FERRUGINOUS CLAY
56.00	57.00	1.00	HAEMATITIC ORE	DARK BROWN	57.65	1.31	5.28	WITH FERRUGINOUS CLAY
57.00	58.00	1.00	HAEMATITIC ORE	DARK BROWN	56.89	1.29	5.85	WITH FERRUGINOUS CLAY
58.00	59.00	1.00	HAEMATITIC ORE	DARK BROWN	59.31	1.08	4.56	WITH FERRUGINOUS CLAY
59.00	60.00	1.00	HAEMATITIC ORE	DARK BROWN	60.03	1.08	3.99	
60.00	61.00	1.00	SHALE	LIGHT BROWN	7.20	21.37	29.39	SAMPLE DEPTH : 60.00-62.00m
61.00	62.00	1.00	SHALE	LIGHT BROWN				
62.00	63.00	1.00	SHALE	LIGHT BROWN	7.14	18.78	31.79	SAMPLE DEPTH : 62.00-64.00m
63.00	64.00	1.00	SHALE	LIGHT BROWN				
64.00	65.00	1.00	SHALE	LIGHT BROWN	9.34	18.73	30.82	SAMPLE DEPTH : 64.00-66.00m
65.00	66.00	1.00	SHALE	LIGHT BROWN				
66.00	67.00	1.00	SHALE	LIGHT BROWN	12.83	20.63	27.37	SAMPLE DEPTH : 66.00-68.00m
67.00	68.00	1.00	SHALE	LIGHT BROWN				
68.00	69.00	1.00	SHALE	LIGHT BROWN	8.92	18.93	30.83	SAMPLE DEPTH : 68.00-70.00m
69.00	70.00	1.00	SHALE	LIGHT BROWN				

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-33

LATITUDE : 1663710.868
LONGITUDE : 664522.570
REDUCED LEVEL (M): 961.658

DATE OF COMMENCEMENT : 24/02/16
DATE OF CLOSURE : 24/02/16
DEPTH DRILLED (M) : 85.00

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	! NESS !		!	! % !	! % !	! % !		!
! FROM ! TO	! (m) !		!	!	!	!		!
0.00	1.00	1.00	POWDERY ORE	DARK GREY	66.64	1.20	2.04	
1.00	2.00	1.00	POWDERY ORE	DARK GREY	66.84	1.26	3.06	
2.00	3.00	1.00	POWDERY ORE	DARK GREY	67.04	0.52	3.32	
3.00	4.00	1.00	POWDERY ORE	DARK GREY	66.92	0.68	2.04	
4.00	5.00	1.00	POWDERY ORE	DARK GREY	67.90	0.60	1.53	
5.00	6.00	1.00	HAEMATITIC ORE	DARK BROWN	65.38	0.66	2.55	
6.00	7.00	1.00	HAEMATITIC ORE	DARK BROWN	63.56	0.76	3.57	
7.00	8.00	1.00	HAEMATITIC ORE	DARK BROWN	62.72	1.02	3.32	
8.00	9.00	1.00	SOFT LAMINATED ORE	DARK GREY	67.90	0.48	2.30	
9.00	10.00	1.00	SOFT LAMINATED ORE	DARK GREY	67.06	0.96	3.06	
10.00	11.00	1.00	HAEMATITIC ORE	DARK BROWN	66.92	0.66	2.04	
11.00	12.00	1.00	HAEMATITIC ORE	DARK BROWN	65.10	0.52	2.81	
12.00	13.00	1.00	HAEMATITIC ORE	DARK BROWN	65.80	1.08	2.30	
13.00	14.00	1.00	HAEMATITIC ORE	DARK BROWN	67.06	1.02	1.79	
14.00	15.00	1.00	HAEMATITIC ORE	DARK BROWN	65.66	2.06	2.04	
15.00	16.00	1.00	HAEMATITIC ORE	DARK BROWN	68.04	0.56	2.04	
16.00	17.00	1.00	HAEMATITIC ORE	DARK BROWN	66.78	0.48	1.53	
17.00	18.00	1.00	HAEMATITIC ORE	DARK BROWN	67.06	0.74	1.79	
18.00	19.00	1.00	HAEMATITIC ORE	DARK BROWN	66.08	1.16	1.79	
19.00	20.00	1.00	POWDERY ORE	GREY BROWN	62.44	2.46	4.08	
20.00	21.00	1.00	POWDERY ORE	GREY BROWN	66.64	0.94	1.53	
21.00	22.00	1.00	POWDERY ORE	GREY BROWN	67.20	0.92	1.53	
22.00	23.00	1.00	POWDERY ORE	GREY BROWN	67.90	0.82	1.53	
23.00	24.00	1.00	POWDERY ORE	GREY BROWN	68.04	1.08	1.53	

ANNEXURE - IIIB/93

BOREHOLE NO:MHGR-33

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	POWDERY ORE	GREY BROWN	68.60	0.20	1.53	
25.00	26.00	1.00	POWDERY ORE	GREY BROWN	67.76	1.18	1.28	
26.00	27.00	1.00	POWDERY ORE	GREY BROWN	67.80	1.14	1.79	
27.00	28.00	1.00	POWDERY ORE	GREY BROWN	68.06	0.98	1.53	
28.00	29.00	1.00	POWDERY ORE	GREY BROWN	66.22	2.06	2.30	
29.00	30.00	1.00	POWDERY ORE	GREY BROWN	68.00	1.10	1.53	
30.00	31.00	1.00	POWDERY ORE	GREY BROWN	68.16	0.96	1.53	
31.00	32.00	1.00	POWDERY ORE	GREY BROWN	68.00	1.20	1.53	
32.00	33.00	1.00	POWDERY ORE	GREY BROWN	68.02	0.92	1.79	
33.00	34.00	1.00	POWDERY ORE	GREY BROWN	68.12	1.02	1.53	
34.00	35.00	1.00	POWDERY ORE	GREY BROWN	68.84	0.32	1.02	
35.00	36.00	1.00	POWDERY ORE	GREY BROWN	68.04	0.68	1.28	
36.00	37.00	1.00	POWDERY ORE	GREY BROWN	68.22	0.88	1.53	
37.00	38.00	1.00	POWDERY ORE	GREY BROWN	68.00	1.12	1.53	
38.00	39.00	1.00	POWDERY ORE	GREY BROWN	66.64	1.34	2.81	
39.00	40.00	1.00	POWDERY ORE	GREY BROWN	67.06	1.24	1.53	
40.00	41.00	1.00	POWDERY ORE	DARK GREY	65.38	1.18	1.53	
41.00	42.00	1.00	POWDERY ORE	DARK GREY	66.50	1.04	1.53	
42.00	43.00	1.00	POWDERY ORE	DARK GREY	66.92	0.86	2.04	
43.00	44.00	1.00	POWDERY ORE	DARK GREY	66.08	0.88	1.53	
44.00	45.00	1.00	POWDERY ORE	DARK GREY	67.74	0.92	2.04	
45.00	46.00	1.00	POWDERY ORE	DARK GREY	67.06	1.04	1.53	
46.00	47.00	1.00	POWDERY ORE	DARK GREY	66.50	0.88	3.58	
47.00	48.00	1.00	POWDERY ORE	DARK GREY	65.38	1.24	2.55	
48.00	49.00	1.00	POWDERY ORE	DARK GREY	64.26	1.42	2.30	
49.00	50.00	1.00	POWDERY ORE	YELLOWISH BROWN	68.02	0.42	2.04	WITH LIMONITE PIECES
50.00	51.00	1.00	POWDERY ORE	DARK BROWN	60.62	2.14	4.08	WITH LIMONITE PIECES
51.00	52.00	1.00	POWDERY ORE	DARK BROWN	63.42	2.26	2.30	WITH LIMONITE PIECES
52.00	53.00	1.00	POWDERY ORE	DARK BROWN	61.04	6.10	1.79	WITH LIMONITE PIECES
53.00	54.00	1.00	HAEMATITIC ORE	DARK BROWN	62.16	4.14	3.06	
54.00	55.00	1.00	HAEMATITIC ORE	DARK BROWN	65.38	1.82	2.30	

ANNEXURE - IIIB/94

BOREHOLE NO:MHGR-33

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	HAEMATITIC ORE	DARK BROWN	59.78	4.26	4.34	
56.00	57.00	1.00	HAEMATITIC ORE	DARK BROWN	55.72	9.14	5.61	
57.00	58.00	1.00	HAEMATITIC ORE	DARK BROWN	59.22	7.12	5.36	
58.00	59.00	1.00	HAEMATITIC ORE	DARK BROWN	55.86	7.34	6.38	
59.00	60.00	1.00	HAEMATITIC ORE	DARK BROWN	58.10	5.32	5.36	
60.00	61.00	1.00	LIMONITIC ORE	YELLOWISH BROWN	40.88	22.50	8.67	
61.00	62.00	1.00	FERRUGINOUS SHALE	DARK BROWN	34.44	20.72	14.03	SAMPLE DEPTH : 61.00-63.00m
62.00	63.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
63.00	64.00	1.00	FERRUGINOUS SHALE	DARK BROWN	32.34	23.50	16.58	SAMPLE DEPTH : 63.00-65.00m
64.00	65.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
65.00	66.00	1.00	FERRUGINOUS CLAY	DARK BROWN	33.60	21.98	17.85	SAMPLE DEPTH : 65.00-67.00m
66.00	67.00	1.00	FERRUGINOUS CLAY	DARK BROWN				
67.00	68.00	1.00	FERRUGINOUS CLAY	DARK BROWN	37.80	18.26	15.30	SAMPLE DEPTH : 67.00-69.00m
68.00	69.00	1.00	FERRUGINOUS CLAY	DARK BROWN				
69.00	70.00	1.00	FERRUGINOUS CLAY	DARK BROWN	26.88	22.30	21.42	SAMPLE DEPTH : 69.00-71.00m
70.00	71.00	1.00	FERRUGINOUS CLAY	DARK BROWN				
71.00	72.00	1.00	FERRUGINOUS CLAY	DARK BROWN	30.66	24.38	17.60	SAMPLE DEPTH : 71.00-73.00m
72.00	73.00	1.00	FERRUGINOUS CLAY	DARK BROWN				
73.00	74.00	1.00	FERRUGINOUS CLAY	DARK BROWN	33.46	22.70	17.34	SAMPLE DEPTH : 73.00-75.00m
74.00	75.00	1.00	FERRUGINOUS CLAY	DARK BROWN				
75.00	76.00	1.00	FERRUGINOUS CLAY	DARK BROWN	36.26	17.04	17.60	SAMPLE DEPTH : 75.00-77.00m
76.00	77.00	1.00	FERRUGINOUS CLAY	DARK BROWN				
77.00	78.00	1.00	FERRUGINOUS CLAY	DARK BROWN	23.66	22.18	21.17	SAMPLE DEPTH : 77.00-79.00m
78.00	79.00	1.00	FERRUGINOUS CLAY	DARK BROWN				
79.00	80.00	1.00	FERRUGINOUS CLAY	DARK BROWN	34.72	22.02	17.60	SAMPLE DEPTH : 79.00-81.00m
80.00	81.00	1.00	FERRUGINOUS CLAY	DARK BROWN				
81.00	82.00	1.00	FERRUGINOUS CLAY	DARK BROWN	24.22	23.26	16.07	SAMPLE DEPTH : 81.00-83.00m
82.00	83.00	1.00	FERRUGINOUS CLAY	DARK BROWN				
83.00	84.00	1.00	FERRUGINOUS CLAY	DARK BROWN	28.84	27.08	17.60	SAMPLE DEPTH : 83.00-85.00m
84.00	85.00	1.00	FERRUGINOUS CLAY	DARK BROWN				

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-34

LATITUDE : 1664085.003
 LONGITUDE : 664338.632
 REDUCED LEVEL (M): 933.054

DATE OF COMMENCEMENT : 24/02/16
 DATE OF CLOSURE : 24/02/16
 DEPTH DRILLED (M) : 70.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	SOFT LAMINATED ORE	DARK GREY	66.45	1.33	1.64	
1.00	2.00	1.00	SOFT LAMINATED ORE	DARK GREY	67.81	0.78	1.13	
2.00	3.00	1.00	SOFT LAMINATED ORE	DARK GREY	62.67	1.63	6.44	
3.00	4.00	1.00	SOFT LAMINATED ORE	DARK GREY	67.46	0.97	1.22	
4.00	5.00	1.00	SOFT LAMINATED ORE	DARK GREY	68.65	0.68	0.77	
5.00	6.00	1.00	BLUEDUST+SLO	STEEL GREY	68.52	0.72	0.85	
6.00	7.00	1.00	BLUEDUST+SLO	STEEL GREY	67.91	0.76	1.25	
7.00	8.00	1.00	SOFT LAMINATED ORE	DARK GREY	66.42	0.95	2.12	
8.00	9.00	1.00	SOFT LAMINATED ORE	DARK GREY	65.50	1.42	2.33	
9.00	10.00	1.00	SOFT LAMINATED ORE	GREY BROWN	60.06	3.02	4.24	
10.00	11.00	1.00	SOFT LAMINATED ORE	GREY BROWN	63.78	1.28	3.07	
11.00	12.00	1.00	SOFT LAMINATED ORE	GREY BROWN	61.60	1.60	3.88	
12.00	13.00	1.00	SOFT LAMINATED ORE	GREY BROWN	62.03	1.86	4.66	
13.00	14.00	1.00	SOFT LAMINATED ORE	GREY BROWN	63.60	0.84	3.63	
14.00	15.00	1.00	HAEMATITIC ORE	GREY BROWN	64.16	0.81	3.96	
15.00	16.00	1.00	HAEMATITIC ORE	GREY BROWN	61.16	1.37	8.92	
16.00	17.00	1.00	HAEMATITIC ORE	DARK GREY	67.26	0.72	1.55	
17.00	18.00	1.00	HAEMATITIC ORE	DARK GREY	67.53	0.67	1.42	
18.00	19.00	1.00	SOFT LAMINATED ORE	DARK GREY	67.76	0.69	0.98	
19.00	20.00	1.00	SOFT LAMINATED ORE	DARK GREY	67.91	0.74	1.40	
20.00	21.00	1.00	SOFT LAMINATED ORE	DARK GREY	67.75	0.79	1.04	
21.00	22.00	1.00	SOFT LAMINATED ORE	DARK GREY	62.15	4.01	5.21	OCC. SHALY
22.00	23.00	1.00	SOFT LAMINATED ORE	DARK GREY	59.84	4.76	8.80	OCC. SHALY
23.00	24.00	1.00	SOFT LAMINATED ORE	DARK GREY	61.62	5.29	6.22	OCC. SHALY

BOREHOLE NO:MHGR-34

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	SOFT LAMINATED ORE	DARK GREY	64.17	3.31	3.43
25.00	26.00	1.00	SOFT LAMINATED ORE	DARK GREY	64.73	4.15	2.65
26.00	27.00	1.00	SOFT LAMINATED ORE	STEEL GREY	65.19	2.38	2.84
27.00	28.00	1.00	SOFT LAMINATED ORE	DARK GREY	66.20	2.05	2.56
28.00	29.00	1.00	SOFT LAMINATED ORE	DARK GREY	65.91	2.15	2.57
29.00	30.00	1.00	SOFT LAMINATED ORE	DARK GREY	64.54	2.59	3.26
30.00	31.00	1.00	SOFT LAMINATED ORE	DARK GREY	65.39	2.18	2.57
31.00	32.00	1.00	SOFT LAMINATED ORE	DARK GREY	67.36	1.18	1.41
32.00	33.00	1.00	SOFT LAMINATED ORE	DARK GREY	67.37	1.28	1.36
33.00	34.00	1.00	SOFT LAMINATED ORE	DARK GREY	64.85	2.71	3.11
34.00	35.00	1.00	SOFT LAMINATED ORE	DARK GREY	65.47	2.64	3.15
35.00	36.00	1.00	SHALY ORE	DARK GREY	60.71	4.97	7.79
36.00	37.00	1.00	SHALY ORE	DARK GREY	62.82	3.97	4.75
37.00	38.00	1.00	BLUEDUST+SLO	STEEL GREY	66.05	2.42	2.86
38.00	39.00	1.00	BLUEDUST+SLO	STEEL GREY	66.64	2.03	2.25
39.00	40.00	1.00	BLUEDUST+SLO	STEEL GREY	66.49	1.85	2.07
40.00	41.00	1.00	SOFT LAMINATED ORE	DARK GREY	63.47	2.93	2.61
41.00	42.00	1.00	SHALY ORE	DARK GREY	60.45	5.47	5.13
42.00	43.00	1.00	SHALY ORE	GREYISH BLACK	45.56	28.60	5.79
43.00	44.00	1.00	HAEMATITIC ORE	GREYISH BLACK	51.38	22.40	1.79
44.00	45.00	1.00	SILICEOUS IRON ORE	GREYISH BLACK	50.29	25.57	2.23
45.00	46.00	1.00	SILICEOUS IRON ORE	GREYISH BLACK	42.64	37.02	1.72
46.00	47.00	1.00	SILICEOUS IRON ORE	GREYISH BLACK	42.09	37.53	1.19
47.00	48.00	1.00	SILICEOUS IRON ORE	GREYISH BLACK	45.22	33.29	1.34
48.00	49.00	1.00	SILICEOUS IRON ORE	GREYISH BLACK	47.98	27.99	1.84
49.00	50.00	1.00	SILICEOUS IRON ORE	GREYISH BLACK	51.37	20.41	2.45
50.00	51.00	1.00	MAGNETIC ORE	GREYISH BLACK	34.31	47.68	1.14
51.00	52.00	1.00	MAGNETIC ORE	GREYISH BLACK	35.86	46.92	1.11
52.00	53.00	1.00	MAGNETIC ORE	GREYISH BLACK	44.00	34.51	1.23
53.00	54.00	1.00	MAGNETIC ORE	GREYISH BLACK	42.12	38.37	1.03
54.00	55.00	1.00	MAGNETIC ORE	GREYISH BLACK	39.23	42.15	1.15

BOREHOLE NO:MHGR-34

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	MAGNETIC ORE	GREYISH BLACK	37.59	43.56	1.01	MAGNETIC
56.00	57.00	1.00	MAGNETIC ORE	GREYISH BLACK	48.96	28.50	1.05	MAGNETIC
57.00	58.00	1.00	MAGNETIC ORE	GREYISH BLACK	42.92	36.65	1.02	MAGNETIC
58.00	59.00	1.00	MAGNETIC ORE	GREYISH BLACK	45.04	33.60	1.12	MAGNETIC
59.00	60.00	1.00	MAGNETIC ORE	GREYISH BLACK	39.11	42.98	0.90	MAGNETIC
60.00	61.00	1.00	MAGNETIC ORE	GREYISH BLACK	38.15	43.69	0.88	MAGNETIC
61.00	62.00	1.00	MAGNETIC ORE	GREYISH BLACK	41.78	38.49	1.34	MAGNETIC
62.00	63.00	1.00	MAGNETIC ORE	GREYISH BLACK	37.19	44.84	1.33	MAGNETIC
63.00	64.00	1.00	MAGNETIC ORE	GREYISH BLACK	35.94	46.69	1.18	MAGNETIC
64.00	65.00	1.00	MAGNETIC ORE	GREYISH BLACK	44.25	34.22	1.70	MAGNETIC
65.00	66.00	1.00	MAGNETIC ORE	GREYISH BLACK	36.35	46.06	1.58	MAGNETIC
66.00	67.00	1.00	MAGNETIC ORE	GREYISH BLACK	34.58	47.30	2.16	MAGNETIC
67.00	68.00	1.00	MAGNETIC ORE	GREYISH BLACK	39.81	40.28	2.16	MAGNETIC
68.00	69.00	1.00	MAGNETIC ORE	GREYISH BLACK	41.41	37.91	2.51	MAGNETIC
69.00	70.00	1.00	MAGNETIC ORE	GREYISH BLACK	42.12	36.24	2.54	MAGNETIC

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-35

LATITUDE : 1663440.505
LONGITUDE : 664656.910
REDUCED LEVEL (M): 974.559

DATE OF COMMENCEMENT : 25/02/16
DATE OF CLOSURE : 25/02/16
DEPTH DRILLED (M) : 60.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	LATERITIC ORE	REDDISH BROWN	28.40	14.65	23.44	
1.00	2.00	1.00	LATERITIC ORE	REDDISH BROWN	25.23	14.82	26.56	
2.00	3.00	1.00	HAEMATITIC ORE	REDDISH BROWN	46.63	6.39	13.81	
3.00	4.00	1.00	HAEMATITIC ORE	REDDISH BROWN	40.88	8.88	17.13	
4.00	5.00	1.00	FERRUGINOUS CLAY	REDDISH BROWN	27.83	12.23	26.66	
5.00	6.00	1.00	HAEMATITIC ORE	REDDISH BROWN	43.62	7.13	15.61	
6.00	7.00	1.00	HAEMATITIC ORE	REDDISH BROWN	49.85	5.47	11.15	
7.00	8.00	1.00	HAEMATITIC ORE	REDDISH BROWN	36.81	15.70	18.59	
8.00	9.00	1.00	HAEMATITIC ORE	REDDISH BROWN	38.00	11.31	18.72	
9.00	10.00	1.00	FERRUGINOUS CLAY	DARK BROWN	24.01	14.15	26.02	OCC. CLAYEY
10.00	11.00	1.00	FERRUGINOUS CLAY	DARK BROWN	24.73	13.43	26.28	
11.00	12.00	1.00	HAEMATITIC ORE	DARK BROWN	40.75	7.70	15.64	
12.00	13.00	1.00	HAEMATITIC ORE	DARK BROWN	41.44	7.14	15.87	
13.00	14.00	1.00	HAEMATITIC ORE	DARK BROWN	42.80	10.29	14.62	
14.00	15.00	1.00	HAEMATITIC ORE	DARK BROWN	47.09	8.36	12.54	
15.00	16.00	1.00	HAEMATITIC ORE	DARK BROWN	49.81	4.30	11.25	
16.00	17.00	1.00	HAEMATITIC ORE	CHERRY RED	51.12	5.07	10.76	
17.00	18.00	1.00	HAEMATITIC ORE	CHERRY RED	51.58	3.29	10.76	
18.00	19.00	1.00	HAEMATITIC ORE	CHERRY RED	49.00	3.20	11.88	
19.00	20.00	1.00	HAEMATITIC ORE	CHERRY RED	48.65	4.01	12.30	
20.00	21.00	1.00	HAEMATITIC ORE	CHERRY RED	53.82	2.71	9.43	
21.00	22.00	1.00	HAEMATITIC ORE	CHERRY RED	45.72	2.50	14.13	
22.00	23.00	1.00	HAEMATITIC ORE	CHERRY RED	44.23	4.02	14.74	
23.00	24.00	1.00	HAEMATITIC ORE	CHERRY RED	36.46	3.93	19.84	

ANNEXURE - IIIB/99

BOREHOLE NO:MHGR-35

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	FERRUGINOUS CLAY	DARK BROWN	29.89	6.68	21.94	
25.00	26.00	1.00	FERRUGINOUS CLAY	DARK BROWN	23.61	7.66	26.74	
26.00	27.00	1.00	FERRUGINOUS SHALE	DARK BROWN	11.43	35.18	31.67	SAMPLE DEPTH : 26.00-28.00m
27.00	28.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
28.00	29.00	1.00	FERRUGINOUS SHALE	DARK BROWN	20.55	28.42	29.00	SAMPLE DEPTH : 28.00-30.00m
29.00	30.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
30.00	31.00	1.00	FERRUGINOUS SHALE	DARK BROWN	16.43	32.37	31.34	SAMPLE DEPTH : 30.00-32.00m
31.00	32.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
32.00	33.00	1.00	FERRUGINOUS SHALE	DARK BROWN	15.13	33.30	31.69	SAMPLE DEPTH : 32.00-34.00m
33.00	34.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
34.00	35.00	1.00	FERRUGINOUS SHALE	DARK BROWN	12.33	35.52	32.69	SAMPLE DEPTH : 34.00-36.00m
35.00	36.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
36.00	37.00	1.00	FERRUGINOUS SHALE	DARK BROWN	17.52	31.58	28.57	SAMPLE DEPTH : 36.00-38.00m
37.00	38.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
38.00	39.00	1.00	FERRUGINOUS SHALE	DARK BROWN	18.16	31.45	30.14	SAMPLE DEPTH : 38.00-40.00m
39.00	40.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
40.00	41.00	1.00	FERRUGINOUS SHALE	DARK BROWN	17.55	31.76	30.76	SAMPLE DEPTH : 40.00-42.00m
41.00	42.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
42.00	43.00	1.00	FERRUGINOUS SHALE	DARK BROWN	21.04	28.65	28.13	SAMPLE DEPTH : 42.00-44.00m
43.00	44.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
44.00	45.00	1.00	FERRUGINOUS SHALE	DARK BROWN	23.95	26.61	26.16	SAMPLE DEPTH : 44.00-46.00m
45.00	46.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
46.00	47.00	1.00	FERRUGINOUS SHALE	DARK BROWN	16.57	29.68	28.62	SAMPLE DEPTH : 46.00-48.00m
47.00	48.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
48.00	49.00	1.00	FERRUGINOUS SHALE	DARK BROWN	17.76	30.41	29.35	SAMPLE DEPTH : 48.00-50.00m
49.00	50.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
50.00	51.00	1.00	FERRUGINOUS SHALE	DARK BROWN	12.21	34.41	31.98	SAMPLE DEPTH : 50.00-52.00m
51.00	52.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
52.00	53.00	1.00	FERRUGINOUS SHALE	DARK BROWN	16.39	31.93	29.49	SAMPLE DEPTH : 52.00-54.00m
53.00	54.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
54.00	55.00	1.00	FERRUGINOUS SHALE	DARK BROWN	22.64	26.09	24.54	SAMPLE DEPTH : 54.00-56.00m

ANNEXURE - IIIB/100

BOREHOLE NO:MHGR-35

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
56.00	57.00	1.00	FERRUGINOUS SHALE	DARK BROWN	32.20	20.72	19.95	SAMPLE DEPTH : 56.00-58.00m
57.00	58.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
58.00	59.00	1.00	FERRUGINOUS SHALE	DARK BROWN	19.26	30.28	28.33	SAMPLE DEPTH : 58.00-60.00m
59.00	60.00	1.00	FERRUGINOUS SHALE	DARK BROWN				

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-36

LATITUDE : 1663860.831
 LONGITUDE : 664675.029
 REDUCED LEVEL (M): 923.105

DATE OF COMMENCEMENT : 25/02/16
 DATE OF CLOSURE : 25/02/16
 DEPTH DRILLED (M) : 60.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	POWDERY ORE	DARK GREY	66.38	2.08	2.13	
1.00	2.00	1.00	POWDERY ORE	DARK GREY	65.99	2.67	2.52	
2.00	3.00	1.00	POWDERY ORE	DARK GREY	64.82	2.00	4.73	
3.00	4.00	1.00	POWDERY ORE	DARK GREY	64.47	3.60	3.65	
4.00	5.00	1.00	POWDERY ORE	DARK GREY	59.44	9.60	2.07	
5.00	6.00	1.00	POWDERY ORE	DARK GREY	47.21	26.66	1.44	
6.00	7.00	1.00	POWDERY ORE	DARK GREY	59.73	8.84	3.03	
7.00	8.00	1.00	POWDERY ORE	DARK GREY	53.57	17.43	2.59	
8.00	9.00	1.00	POWDERY ORE	DARK GREY	48.42	25.06	1.50	
9.00	10.00	1.00	POWDERY ORE	DARK GREY	55.11	15.72	2.43	
10.00	11.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.70	40.80	2.02	
11.00	12.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.00	42.35	2.26	
12.00	13.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	34.79	44.39	1.17	
13.00	14.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	36.15	44.40	1.09	
14.00	15.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	42.21	34.18	1.57	
15.00	16.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	33.55	44.62	1.67	
16.00	17.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	34.04	46.04	1.39	
17.00	18.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.82	42.26	1.94	
18.00	19.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.42	39.19	2.84	
19.00	20.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	32.08	46.82	2.39	
20.00	21.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.67	40.30	1.78	
21.00	22.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.59	41.17	1.81	
22.00	23.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.18	39.51	1.57	
23.00	24.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	31.44	47.27	1.44	

BOREHOLE NO:MHGR-36

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM TO	(m)						
24.00	25.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.50	39.81	1.45
25.00	26.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	32.74	48.08	1.05
26.00	27.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	34.14	43.82	2.35
27.00	28.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.28	40.11	0.92
28.00	29.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.81	41.37	1.83
29.00	30.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.32	45.39	0.98
30.00	31.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	36.39	44.72	0.94
31.00	32.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.66	44.06	1.67
32.00	33.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	28.04	53.62	1.11
33.00	34.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	32.07	46.24	2.20
34.00	35.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.02	43.16	1.57
35.00	36.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	36.07	45.96	1.32
36.00	37.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	36.21	43.83	1.59
37.00	38.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	41.94	35.13	1.70
38.00	39.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	29.76	50.88	1.68
39.00	40.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	34.22	45.72	1.51
40.00	41.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	28.07	53.08	1.47
41.00	42.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	27.09	54.35	1.45
42.00	43.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	34.93	45.42	1.47
43.00	44.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	31.67	48.84	1.61
44.00	45.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	35.87	45.45	1.12
45.00	46.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	31.45	49.69	1.27
46.00	47.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	33.47	47.79	1.43
47.00	48.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	33.73	48.23	1.33
48.00	49.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	30.96	39.56	13.07
49.00	50.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	41.55	31.39	8.52
50.00	51.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	44.09	30.57	6.07
51.00	52.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	42.92	22.64	11.54
52.00	53.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	29.89	24.89	20.21
53.00	54.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	33.81	22.19	18.04
54.00	55.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	35.08	27.60	15.61

BOREHOLE NO:MHGR-36

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS	!	!	!	!	!	!	!
! FROM ! TO	! (m) !	!	!	!	!	!	!	!
55.00	56.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	39.02	22.97	16.39	
56.00	57.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.90	34.78	5.32	
57.00	58.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	37.19	32.37	9.32	
58.00	59.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.84	38.76	2.64	
59.00	60.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	36.23	41.93	4.37	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-37

LATITUDE : 1663496.612
LONGITUDE : 664732.306
REDUCED LEVEL (M): 976.292

DATE OF COMMENCEMENT : 25/02/16
DATE OF CLOSURE : 26/02/16
DEPTH DRILLED (M) : 70.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) !		!	!	!	!	!	!
0.00	1.00	1.00	LATERITIC ORE	REDDISH BROWN	42.56	8.66	14.97	
1.00	2.00	1.00	LATERITIC ORE	REDDISH BROWN	50.43	4.08	10.21	
2.00	3.00	1.00	LATERITIC ORE	REDDISH BROWN	48.11	3.69	11.11	
3.00	4.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	44.80	7.91	12.10	
4.00	5.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	30.21	12.73	17.97	
5.00	6.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	34.85	10.55	18.06	
6.00	7.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	27.92	14.62	20.15	
7.00	8.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	43.95	6.84	10.29	
8.00	9.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	45.13	7.29	9.21	
9.00	10.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	39.60	11.86	13.33	
10.00	11.00	1.00	HAEMATITIC ORE	YELLOWISH BROWN	40.21	8.98	13.85	
11.00	12.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	28.03	23.98	25.59	
12.00	13.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	28.27	23.88	25.49	
13.00	14.00	1.00	HAEMATITIC ORE	DARK BROWN	42.37	7.87	12.60	
14.00	15.00	1.00	HAEMATITIC ORE	DARK BROWN	46.36	7.32	11.47	
15.00	16.00	1.00	HAEMATITIC ORE	DARK BROWN	47.14	6.16	9.74	OCC.FERRU. CLAY
16.00	17.00	1.00	HAEMATITIC ORE	DARK BROWN	52.86	3.68	6.11	OCC.FERRU. CLAY
17.00	18.00	1.00	HAEMATITIC ORE	DARK BROWN	51.55	5.62	8.04	
18.00	19.00	1.00	HAEMATITIC ORE	DARK BROWN	47.91	4.49	10.60	
19.00	20.00	1.00	HAEMATITIC ORE	DARK BROWN	48.24	4.16	9.66	
20.00	21.00	1.00	HAEMATITIC ORE	DARK BROWN	52.59	3.69	6.62	
21.00	22.00	1.00	HAEMATITIC ORE	DARK BROWN	51.57	4.10	7.40	
22.00	23.00	1.00	HAEMATITIC ORE	DARK BROWN	52.65	2.02	6.72	
23.00	24.00	1.00	HAEMATITIC ORE	DARK BROWN	54.28	2.77	5.12	

BOREHOLE NO:MHGR-37

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	HAEMATITIC ORE	DARK BROWN	53.80	1.71	6.74	
25.00	26.00	1.00	HAEMATITIC ORE	DARK BROWN	50.87	1.91	8.68	
26.00	27.00	1.00	HAEMATITIC ORE	DARK BROWN	52.83	1.98	7.01	
27.00	28.00	1.00	HAEMATITIC ORE	CHERRY RED	53.12	2.23	8.60	
28.00	29.00	1.00	HAEMATITIC ORE	CHERRY RED	51.65	1.79	9.70	
29.00	30.00	1.00	HAEMATITIC ORE	CHERRY RED	51.89	1.72	8.55	
30.00	31.00	1.00	HAEMATITIC ORE	CHERRY RED	52.67	1.97	8.57	
31.00	32.00	1.00	HAEMATITIC ORE	CHERRY RED	48.06	1.55	11.03	
32.00	33.00	1.00	HAEMATITIC ORE	CHERRY RED	51.98	1.36	9.20	
33.00	34.00	1.00	HAEMATITIC ORE	CHERRY RED	49.39	1.44	10.69	
34.00	35.00	1.00	HAEMATITIC ORE	CHERRY RED	27.27	3.71	22.76	
35.00	36.00	1.00	HAEMATITIC ORE	CHERRY RED	36.00	2.51	17.42	
36.00	37.00	1.00	HAEMATITIC ORE	CHERRY RED	37.05	2.25	19.35	
37.00	38.00	1.00	HAEMATITIC ORE	CHERRY RED	51.36	1.60	10.05	
38.00	39.00	1.00	HAEMATITIC ORE	CHERRY RED	50.67	2.00	10.55	
39.00	40.00	1.00	HAEMATITIC ORE	CHERRY RED	52.32	1.67	7.17	
40.00	41.00	1.00	HAEMATITIC ORE	CHERRY RED	51.73	1.51	8.40	
41.00	42.00	1.00	HAEMATITIC ORE	CHERRY RED	49.23	1.59	8.68	
42.00	43.00	1.00	HAEMATITIC ORE	CHERRY RED	51.24	1.42	9.33	
43.00	44.00	1.00	HAEMATITIC ORE	CHERRY RED	56.48	1.29	6.62	
44.00	45.00	1.00	HAEMATITIC ORE	CHERRY RED	49.61	1.58	9.95	
45.00	46.00	1.00	HAEMATITIC ORE	CHERRY RED	55.42	1.37	8.14	
46.00	47.00	1.00	HAEMATITIC ORE	CHERRY RED	54.92	1.14	6.87	
47.00	48.00	1.00	HAEMATITIC ORE	CHERRY RED	56.62	1.10	4.99	
48.00	49.00	1.00	HAEMATITIC ORE	CHERRY RED	50.51	1.31	8.86	
49.00	50.00	1.00	HAEMATITIC ORE	CHERRY RED	50.16	1.23	11.38	
50.00	51.00	1.00	HAEMATITIC ORE	CHERRY RED	51.69	1.14	10.10	
51.00	52.00	1.00	HAEMATITIC ORE	CHERRY RED	40.93	1.34	17.72	
52.00	53.00	1.00	HAEMATITIC ORE	CHERRY RED	40.37	1.30	19.11	
53.00	54.00	1.00	HAEMATITIC ORE	CHERRY RED	40.47	1.99	15.07	
54.00	55.00	1.00	HAEMATITIC ORE	CHERRY RED	36.65	2.70	15.99	

ANNEXURE - IIIB/106

BOREHOLE NO:MHGR-37

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
55.00	56.00	1.00	HAEMATITIC ORE	CHERRY RED	37.49	2.43	18.81	
56.00	57.00	1.00	HAEMATITIC ORE	CHERRY RED	49.18	1.38	11.74	
57.00	58.00	1.00	HAEMATITIC ORE	CHERRY RED	47.72	1.67	11.64	
58.00	59.00	1.00	HAEMATITIC ORE	CHERRY RED	38.63	1.64	18.45	
59.00	60.00	1.00	HAEMATITIC ORE	CHERRY RED	39.73	1.70	16.84	
60.00	61.00	1.00	HAEMATITIC ORE	CHERRY RED	46.62	1.56	13.71	
61.00	62.00	1.00	HAEMATITIC ORE	CHERRY RED	27.49	2.01	25.03	
62.00	63.00	1.00	HAEMATITIC ORE	CHERRY RED	24.31	1.92	26.34	
63.00	64.00	1.00	HAEMATITIC ORE	DARK BROWN	21.99	2.14	26.62	
64.00	65.00	1.00	HAEMATITIC ORE	DARK BROWN	28.72	4.89	19.65	
65.00	66.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	18.91	26.93	25.34	SAMPLE DEPTH : 65.00-67.00m
66.00	67.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				
67.00	68.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	21.12	24.24	24.88	SAMPLE DEPTH : 67.00-70.00m
68.00	69.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				
69.00	70.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN				

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-38

LATITUDE : 1663543.299
LONGITUDE : 664795.987
REDUCED LEVEL (M): 940.793

DATE OF COMMENCEMENT : 25/02/16
DATE OF CLOSURE : 26/02/16
DEPTH DRILLED (M) : 45.00

! DEPTH (M) !	THICK- !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! !	NESS !		!	! %	! %	! %		!
! FROM ! TO !	! (m) !		!	!	!	!		!
0.00	1.00	1.00	SHALE	DARK BROWN	11.61	32.63	32.33	SAMPLE DEPTH : 0.00-2.00m
1.00	2.00	1.00	SHALE	DARK BROWN				
2.00	3.00	1.00	SHALE	DARK BROWN	5.37	40.35	35.10	SAMPLE DEPTH : 2.00-4.00m
3.00	4.00	1.00	SHALE	DARK BROWN				
4.00	5.00	1.00	SHALE	DARK BROWN	5.98	39.72	34.55	SAMPLE DEPTH : 4.00-6.00m
5.00	6.00	1.00	SHALE	LIGHT BROWN				
6.00	7.00	1.00	SHALE	LIGHT BROWN	9.68	36.46	31.02	SAMPLE DEPTH : 6.00-8.00m
7.00	8.00	1.00	SHALE	LIGHT BROWN				
8.00	9.00	1.00	SHALE	LIGHT BROWN	5.93	39.79	34.41	SAMPLE DEPTH : 8.00-10.00m
9.00	10.00	1.00	SHALE	LIGHT BROWN				
10.00	11.00	1.00	SHALE	LIGHT BROWN	5.77	40.16	34.40	SAMPLE DEPTH : 10.00-12.00m
11.00	12.00	1.00	SHALE	LIGHT BROWN				
12.00	13.00	1.00	SHALE	LIGHT BROWN	5.64	39.94	33.90	SAMPLE DEPTH : 12.00-14.00m
13.00	14.00	1.00	SHALE	LIGHT BROWN				
14.00	15.00	1.00	SHALE	LIGHT BROWN	6.80	39.18	33.05	SAMPLE DEPTH : 14.00-16.00m
15.00	16.00	1.00	SHALE	LIGHT BROWN				
16.00	17.00	1.00	SHALE	LIGHT BROWN	6.58	39.37	33.84	SAMPLE DEPTH : 16.00-18.00m
17.00	18.00	1.00	SHALE	LIGHT BROWN				
18.00	19.00	1.00	FERRUGINOUS SHALE	LIGHT BROWN	19.48	29.38	25.14	SAMPLE DEPTH : 18.00-20.00m
19.00	20.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
20.00	21.00	1.00	FERRUGINOUS SHALE	DARK BROWN	17.18	31.54	28.01	SAMPLE DEPTH : 20.00-22.00m
21.00	22.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
22.00	23.00	1.00	FERRUGINOUS SHALE	DARK BROWN	41.97	14.61	15.11	SAMPLE DEPTH : 22.00-24.00m
23.00	24.00	1.00	FERRUGINOUS SHALE	DARK BROWN				

ANNEXURE - IIIB/108

BOREHOLE NO:MHGR-38

DEPTH (M)		THICK-NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)						
24.00	25.00	1.00	FERRUGINOUS SHALE	DARK BROWN	39.70	16.57	16.91	SAMPLE DEPTH : 24.00-26.00m
25.00	26.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
26.00	27.00	1.00	FERRUGINOUS SHALE	DARK BROWN	40.14	16.52	17.18	
27.00	28.00	1.00	FERRUGINOUS SHALE	DARK BROWN				SAMPLE DEPTH : 26.00-28.00m
28.00	29.00	1.00	FERRUGINOUS SHALE	DARK BROWN	38.15	17.57	17.57	
29.00	30.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
30.00	31.00	1.00	FERRUGINOUS SHALE	DARK BROWN	15.86	32.47	29.15	SAMPLE DEPTH : 30.00-32.00m
31.00	32.00	1.00	FERRUGINOUS SHALE	DARK BROWN				
32.00	33.00	1.00	SHALE	DARK BROWN	9.47	37.91	33.10	
33.00	34.00	1.00	SHALE	DARK BROWN				SAMPLE DEPTH : 32.00-34.00m
34.00	35.00	1.00	HAEMATITIC ORE	DARK BROWN	31.32	21.77	21.93	
35.00	36.00	1.00	FERRUGINOUS SHALE	DARK BROWN	22.16	28.80	28.02	
36.00	37.00	1.00	FERRUGINOUS SHALE	DARK BROWN				SAMPLE DEPTH : 35.00-37.00m
37.00	38.00	1.00	HAEMATITIC ORE	CHERRY RED	47.89	10.04	10.22	
38.00	39.00	1.00	HAEMATITIC ORE	CHERRY RED	44.89	14.38	16.96	
39.00	40.00	1.00	HAEMATITIC ORE	CHERRY RED	60.36	5.00	5.95	
40.00	41.00	1.00	HAEMATITIC ORE	DARK BROWN	52.01	9.95	11.69	
41.00	42.00	1.00	SHALE	DARK BROWN	6.07	40.10	34.62	
42.00	43.00	1.00	SHALE	DARK BROWN				SAMPLE DEPTH : 41.00-43.00m
43.00	44.00	1.00	FERRUGINOUS SHALE	DARK BROWN	14.95	32.89	29.29	
44.00	45.00	1.00	FERRUGINOUS SHALE	DARK BROWN				

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-39

LATITUDE : 1664321.925
 LONGITUDE : 664327.260
 REDUCED LEVEL (M): 900.008

DATE OF COMMENCEMENT : 25/02/16
 DATE OF CLOSURE : 26/02/16
 DEPTH DRILLED (M) : 50.00

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	! NESS !		!	! %	! %	! %		!
! FROM ! TO	! (m) !		!	!	!	!		!
0.00	1.00	1.00	HAEMATITIC ORE	DARK BROWN	64.56	1.87	2.81	
1.00	2.00	1.00	HAEMATITIC ORE	DARK BROWN	65.53	0.95	3.56	
2.00	3.00	1.00	HAEMATITIC ORE	DARK BROWN	65.21	1.56	2.79	
3.00	4.00	1.00	HAEMATITIC ORE	DARK BROWN	65.14	1.46	2.90	
4.00	5.00	1.00	HAEMATITIC ORE	CHERRY RED	65.49	1.23	3.24	
5.00	6.00	1.00	HAEMATITIC ORE	CHERRY RED	66.34	1.76	2.80	
6.00	7.00	1.00	HAEMATITIC ORE	CHERRY RED	65.58	1.01	3.15	
7.00	8.00	1.00	POWDERY ORE	DARK GREY	63.47	1.71	4.45	
8.00	9.00	1.00	POWDERY ORE	DARK GREY	62.95	1.91	4.61	
9.00	10.00	1.00	POWDERY ORE	DARK GREY	64.98	2.51	3.00	
10.00	11.00	1.00	POWDERY ORE	DARK GREY	66.35	1.94	2.45	
11.00	12.00	1.00	POWDERY ORE	DARK GREY	65.89	1.90	3.01	
12.00	13.00	1.00	POWDERY ORE	DARK GREY	65.95	1.92	2.93	
13.00	14.00	1.00	POWDERY ORE	DARK GREY	65.15	3.38	2.84	
14.00	15.00	1.00	POWDERY ORE	DARK GREY	62.16	5.77	4.69	
15.00	16.00	1.00	POWDERY ORE	DARK GREY	61.35	8.08	2.61	
16.00	17.00	1.00	POWDERY ORE	DARK GREY	62.66	6.49	2.57	
17.00	18.00	1.00	POWDERY ORE	DARK GREY	63.49	5.44	2.96	
18.00	19.00	1.00	POWDERY ORE	DARK GREY	59.29	12.07	2.49	
19.00	20.00	1.00	POWDERY ORE	DARK GREY	63.62	5.54	2.27	
20.00	21.00	1.00	POWDERY ORE	DARK GREY	61.77	8.22	2.10	
21.00	22.00	1.00	POWDERY ORE	DARK GREY	61.56	8.59	2.46	
22.00	23.00	1.00	POWDERY ORE	DARK GREY	64.14	4.41	2.76	
23.00	24.00	1.00	POWDERY ORE	DARK GREY	63.20	5.08	2.21	

BOREHOLE NO:MHGR-39

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	NESS !		!	!	!	!		!
! FROM ! TO	! (m) !		!	!	!	!		!
24.00	25.00	1.00	POWDERY ORE	DARK GREY	65.15	2.95	2.74	
25.00	26.00	1.00	POWDERY ORE	DARK GREY	65.19	3.69	2.66	
26.00	27.00	1.00	POWDERY ORE	DARK GREY	65.38	3.33	2.57	
27.00	28.00	1.00	POWDERY ORE	DARK GREY	65.04	3.32	2.06	
28.00	29.00	1.00	POWDERY ORE	DARK GREY	64.51	5.74	1.79	
29.00	30.00	1.00	POWDERY ORE	DARK GREY	64.78	4.01	2.83	
30.00	31.00	1.00	POWDERY ORE	DARK GREY	63.90	5.39	2.14	
31.00	32.00	1.00	POWDERY ORE	DARK GREY	64.16	4.97	2.43	
32.00	33.00	1.00	POWDERY ORE	DARK GREY	65.15	3.72	2.66	
33.00	34.00	1.00	POWDERY ORE	GREY	62.13	7.28	2.53	
34.00	35.00	1.00	POWDERY ORE	GREY	61.06	8.26	2.63	
35.00	36.00	1.00	POWDERY ORE	GREY	56.85	13.98	2.43	
36.00	37.00	1.00	POWDERY ORE	GREY	61.56	7.39	2.79	
37.00	38.00	1.00	POWDERY ORE	GREY	58.27	12.21	2.26	
38.00	39.00	1.00	POWDERY ORE	GREY	55.37	17.08	1.85	
39.00	40.00	1.00	POWDERY ORE	GREY	63.42	5.47	2.52	
40.00	41.00	1.00	POWDERY ORE	GREY	61.73	7.81	2.25	
41.00	42.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	50.69	25.68	1.38	
42.00	43.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	48.61	25.45	2.73	
43.00	44.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	48.12	28.98	1.43	
44.00	45.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	44.50	31.27	3.14	
45.00	46.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.06	37.49	3.18	
46.00	47.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.56	40.35	1.54	
47.00	48.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.41	38.22	1.98	
48.00	49.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	38.48	42.71	0.56	
49.00	50.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.33	41.82	0.52	

DETAILED LITHOLOG AND ANALYTICAL DETAILS OF BOREHOLES (REVERSE CIRCULATION DRILLING)
M/s. H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148)

BOREHOLE NO:MHGR-40

LATITUDE : 1664056.173
LONGITUDE : 664279.430
REDUCED LEVEL (M): 942.522

DATE OF COMMENCEMENT : 26/02/16
DATE OF CLOSURE : 26/02/16
DEPTH DRILLED (M) : 49.00

! DEPTH (M)	! THICK-!	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----!	! NESS !		!	! %	! %	! %		!
! FROM ! TO	! (m) !		!	!	!	!		!
0.00	1.00	1.00	HAEMATITIC ORE	DARK BROWN	62.11	2.55	5.39	
1.00	2.00	1.00	HAEMATITIC ORE	DARK BROWN	62.65	3.17	4.92	
2.00	3.00	1.00	HAEMATITIC ORE	DARK BROWN	64.48	1.86	3.69	
3.00	4.00	1.00	HAEMATITIC ORE	DARK BROWN	62.12	3.17	5.38	
4.00	5.00	1.00	HAEMATITIC ORE	DARK BROWN	62.23	3.56	5.18	
5.00	6.00	1.00	HAEMATITIC ORE	DARK BROWN	62.17	2.95	5.20	
6.00	7.00	1.00	HAEMATITIC ORE	DARK BROWN	62.08	3.24	5.09	
7.00	8.00	1.00	HAEMATITIC ORE	DARK BROWN	62.47	2.08	3.85	
8.00	9.00	1.00	HAEMATITIC ORE	DARK BROWN	62.29	2.17	4.19	
9.00	10.00	1.00	HAEMATITIC ORE	DARK BROWN	60.60	8.91	3.21	
10.00	11.00	1.00	HAEMATITIC ORE	DARK BROWN	61.84	3.56	3.47	
11.00	12.00	1.00	HAEMATITIC ORE	DARK BROWN	61.86	3.39	3.93	
12.00	13.00	1.00	HAEMATITIC ORE	DARK BROWN	60.38	3.13	5.31	
13.00	14.00	1.00	HAEMATITIC ORE	DARK BROWN	62.81	2.45	3.44	
14.00	15.00	1.00	HAEMATITIC ORE	DARK BROWN	62.19	2.32	3.66	
15.00	16.00	1.00	HAEMATITIC ORE	DARK BROWN	61.62	4.53	5.19	
16.00	17.00	1.00	HAEMATITIC ORE	DARK BROWN	56.37	15.74	2.98	
17.00	18.00	1.00	HAEMATITIC ORE	DARK BROWN	61.66	3.46	4.59	
18.00	19.00	1.00	HAEMATITIC ORE	DARK BROWN	61.19	3.30	4.70	
19.00	20.00	1.00	HAEMATITIC ORE	DARK BROWN	60.05	2.72	5.65	
20.00	21.00	1.00	HAEMATITIC ORE	DARK BROWN	58.67	3.51	6.07	
21.00	22.00	1.00	HAEMATITIC ORE	DARK BROWN	49.80	3.71	13.03	
22.00	23.00	1.00	HAEMATITIC ORE	DARK BROWN	55.84	4.73	8.27	
23.00	24.00	1.00	HAEMATITIC ORE	DARK BROWN	52.48	18.00	4.70	

ANNEXURE - IIIB/112

BOREHOLE NO:MHGR-40

DEPTH (M)	THICK- NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)					
24.00	25.00	1.00	HAEMATITIC ORE	DARK BROWN	56.79	4.43	7.88
25.00	26.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	52.22	23.04	1.88
26.00	27.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	48.09	29.57	1.34
27.00	28.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	45.72	32.25	1.48
28.00	29.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.22	42.07	1.25
29.00	30.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	43.03	36.56	1.22
30.00	31.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	44.70	34.18	1.12
31.00	32.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	42.55	37.66	1.04
32.00	33.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	43.43	35.63	1.45
33.00	34.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	43.02	36.02	1.58
34.00	35.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.89	40.30	1.02
35.00	36.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	44.37	34.37	1.21
36.00	37.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	41.44	38.96	1.30
37.00	38.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	40.60	40.03	1.20
38.00	39.00	1.00	SILICEOUS IRON ORE	LIGHT BROWN	39.46	41.68	1.30
39.00	40.00	1.00	FERRUGINOUS CLAY	DARK BROWN	25.86	25.37	20.45
40.00	41.00	1.00	FERRUGINOUS CLAY	DARK BROWN	42.77	19.90	12.56
41.00	42.00	1.00	RED OCHRE	REDDISH BROWN	28.75	25.01	19.88
42.00	43.00	1.00	RED OCHRE	REDDISH BROWN	22.57	27.38	22.41
43.00	44.00	1.00	FERRUGINOUS CLAY	DARK BROWN	28.00	23.71	19.92
44.00	45.00	1.00	FERRUGINOUS CLAY	DARK BROWN			SAMPLE DEPTH : 43.00-45.00m
45.00	46.00	1.00	FERRUGINOUS CLAY	DARK BROWN	35.97	29.31	13.90
46.00	47.00	1.00	FERRUGINOUS CLAY	DARK BROWN			SAMPLE DEPTH : 45.00-47.00m
47.00	48.00	1.00	FERRUGINOUS CLAY	DARK BROWN	24.36	27.47	22.16
48.00	49.00	1.00	FERRUGINOUS CLAY	DARK BROWN			SAMPLE DEPTH : 47.00-49.00m

ANALYTICAL RESULTS OF PRIMARY SAMPLES (CORE DRILLING)
SHRI H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA

BOREHOLE NO:MHG-22

LATITUDE : 1664145.652
LONGITUDE : 664406.225
REDUCED LEVEL (M): 912.851

DATE OF COMMENCEMENT : 20/02/16
DATE OF CLOSURE : 29/02/16
DEPTH DRILLED (M) : 83.30

! DEPTH (M) !	THICK-! TRUE !	LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	!	!	! % !	! % !	! % !	!	!
! FROM ! TO !	! (m) ! NESS (m) !	!	!	!	!	!	!	!
0.00	1.00	1.00	0.86	SILICEOUS IRON ORE	LIGHT GREEN	50.40	21.29	2.20
1.00	1.70	0.70	0.60	SILICEOUS IRON ORE	DARK BROWN	39.72	37.62	1.67
1.70	3.10	1.40	1.20	SILICEOUS IRON ORE	LIGHT GREY	40.00	38.84	1.55
3.10	5.05	1.95	1.68	SILICEOUS IRON ORE	LIGHT GREY	39.43	38.56	2.29
5.05	5.30	0.25	0.22	MAGNETIC ORE	GREY	45.77	32.74	1.31
5.30	6.70	1.40	1.20	MAGNETIC ORE	GREY	39.69	38.91	1.27
6.70	8.00	1.30	1.12	MAGNETIC ORE	GREY	34.67	45.58	0.75
8.00	8.50	0.50	0.43	MAGNETIC ORE	GREY	44.98	32.02	1.41
8.50	8.65	0.15	0.13	MAGNETIC ORE	GREY	51.52	24.21	1.64
8.65	9.60	0.95	0.82	MAGNETIC ORE	GREY	34.16	46.48	0.95
9.60	12.70	3.10	2.67	MAGNETIC ORE	GREY	43.60	35.69	1.50
12.70	13.60	0.90	0.77	MAGNETIC ORE	GREY	42.14	36.53	1.53
13.60	15.50	1.90	1.63	MAGNETIC ORE	GREY	40.86	38.26	1.57
15.50	16.80	1.30	1.12	MAGNETIC ORE	GREY	46.89	28.16	1.24
16.80	18.00	1.20	1.03	MAGNETIC ORE	GREY	28.69	53.38	1.11
18.00	19.20	1.20	1.03	MAGNETIC ORE	GREY	42.52	33.83	1.26
19.20	20.50	1.30	1.12	MAGNETIC ORE	GREY	31.39	47.26	2.18
20.50	21.80	1.30	1.12	MAGNETIC ORE	GREY	42.57	33.20	1.03
21.80	23.20	1.40	1.20	MAGNETIC ORE	GREY	42.39	34.90	0.69
23.20	24.10	0.90	0.77	MAGNETIC ORE	GREY	26.59	54.03	0.75
24.10	24.50	0.40	0.34	MAGNETIC ORE	GREY	29.78	51.56	0.66
24.50	25.50	1.00	0.86	MAGNETIC ORE	GREY	23.24	57.84	0.87
25.50	26.65	1.15	0.99	MAGNETIC ORE	GREY	35.80	43.95	0.73
26.65	28.70	2.05	1.76	MAGNETIC ORE	GREY	29.27	51.44	0.75

BOREHOLE NO:MHG-22

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! NESS ! THICK- !			! % !	! % !	! % !		!
! FROM ! TO !	! (m) ! NESS (m) !			!	!	!		!
28.70	31.50	2.80	2.41	MAGNETIC ORE	GREY	29.92	49.34	1.96
31.50	33.70	2.20	1.89	MAGNETIC ORE	GREY	32.87	45.65	0.78
33.70	34.00	0.30	0.26	MAGNETIC ORE	GREY	40.17	37.58	0.94
34.00	35.30	1.30	1.12	MAGNETIC ORE	GREY	35.19	43.38	0.90
35.30	37.30	2.00	1.72	MAGNETIC ORE	GREY	35.41	44.18	0.75
37.30	38.85	1.55	1.33	MAGNETIC ORE	GREY	41.01	37.45	0.85
38.85	41.25	2.40	2.06	MAGNETIC ORE	GREY	38.88	39.06	1.18
41.25	43.30	2.05	1.76	MAGNETIC ORE	GREY	35.15	43.22	0.87
43.30	45.50	2.20	1.89	MAGNETIC ORE	GREY	30.16	48.43	1.01
45.50	48.00	2.50	2.15	MAGNETIC ORE	GREY	28.75	50.44	1.04
48.00	50.00	2.00	1.72	MAGNETIC ORE	GREY	36.20	40.74	1.17
50.00	52.00	2.00	1.72	MAGNETIC ORE	GREY	32.01	44.97	0.81
52.00	53.30	1.30	1.12	MAGNETIC ORE	GREY	33.66	43.96	1.07
53.30	55.60	2.30	1.98	MAGNETIC ORE	GREY	29.26	49.45	0.87
55.60	57.00	1.40	1.20	MAGNETIC ORE	GREY	30.01	48.82	0.87
57.00	59.35	2.35	2.02	MAGNETIC ORE	GREY	31.46	46.51	0.99
59.35	62.00	2.65	2.28	MAGNETIC ORE	GREY	29.88	48.44	0.87
62.00	62.80	0.80	0.69	MAGNETIC ORE	GREY	30.48	48.04	1.12
62.80	64.20	1.40	1.20	MAGNETIC ORE	GREY	29.94	48.75	1.01
64.20	65.80	1.60	1.38	MAGNETIC ORE	GREY	29.96	48.23	1.16
65.80	68.00	2.20	1.89	MAGNETIC ORE	GREY	30.78	47.13	1.23
68.00	70.90	2.90	2.49	MAGNETIC ORE	GREY	30.54	47.23	1.22
70.90	72.90	2.00	1.72	MAGNETIC ORE	GREY	29.38	49.11	1.12
72.90	74.40	1.50	1.29	MAGNETIC ORE	GREY	32.07	44.48	0.78
74.40	75.60	1.20	1.03	MAGNETIC ORE	GREY	33.62	43.22	0.96
75.60	76.80	1.20	1.03	MAGNETIC ORE	GREY	29.88	48.19	0.80
76.80	78.90	2.10	1.81	MAGNETIC ORE	GREY	34.66	41.81	0.99
78.90	81.20	2.30	1.98	MAGNETIC ORE	GREY	29.44	48.68	0.81
81.20	83.30	2.10	1.81	MAGNETIC ORE	GREY	30.67	46.96	0.86

ANALYTICAL RESULTS OF PRIMARY SAMPLES (CORE DRILLING)
SHRI H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA

BOREHOLE NO:MHG-27

LATITUDE : 1664165.409
LONGITUDE : 664276.738
REDUCED LEVEL (M): 907.639

DATE OF COMMENCEMENT : 23/02/16
DATE OF CLOSURE : 29/02/16
DEPTH DRILLED (M) : 52.30

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS	! THICK- !		!	! %	! %	! %	!	!
! FROM ! TO !	! (m) ! NESS (m)!		!	!	!	!	!	!
0.00	3.90	3.90	3.35	SHALE	REDDISH BROWN	7.33	39.86	31.49
3.90	7.00	3.10	2.67	SHALE	REDDISH BROWN	5.01	41.69	32.61
7.00	7.50	0.50	0.43	SHALE	YELLOWISH BROWN	10.73	36.23	28.52
7.50	7.70	0.20	0.17	SHALY ORE	YELLOWISH BROWN	43.47	13.61	11.54
7.70	9.90	2.20	1.89	SHALE	YELLOWISH BROWN	7.94	38.49	30.28
9.90	11.50	1.60	1.38	SHALE	DARK BROWN	11.81	34.73	26.88
11.50	13.00	1.50	1.29	FERRUGINOUS SHALE	REDDISH BROWN	21.42	27.45	21.72
13.00	14.35	1.35	1.16	FERRUGINOUS SHALE	REDDISH BROWN	18.19	27.58	19.94
14.35	16.70	2.35	2.02	FERRUGINOUS SHALE	REDDISH BROWN	26.99	24.19	20.94
16.70	17.65	0.95	0.82	BLUEDUST+SLO	REDDISH BROWN	66.01	1.99	2.27
17.65	20.89	3.24	2.79	FERRUGINOUS SHALE	DARK BROWN	12.60	34.01	26.22
20.89	22.35	1.46	1.26	FERRUGINOUS SHALE	LIGHT BROWN	15.58	32.17	25.67
22.35	23.10	0.75	0.65	FERRUGINOUS CLAY	LIGHT BROWN	16.75	29.92	22.77
23.10	23.50	0.40	0.34	FERRUGINOUS CLAY	LIGHT BROWN	17.12	30.18	23.87
23.50	24.20	0.70	0.60	FERRUGINOUS CLAY	LIGHT BROWN	21.95	27.13	22.32
24.20	26.30	2.10	1.81	FERRUGINOUS CLAY	LIGHT BROWN	37.66	17.63	15.63
26.30	27.45	1.15	0.99	FERRUGINOUS CLAY	DARK BROWN	33.39	20.23	17.80
27.45	28.00	0.55	0.47	MAGNETIC ORE	DARK BROWN	60.86	4.45	4.13
28.00	28.60	0.60	0.52	MAGNETIC ORE	DARK BROWN	63.71	3.52	3.09
28.60	29.20	0.60	0.52	MAGNETIC ORE	DARK BROWN	64.01	2.73	2.05
29.20	29.80	0.60	0.52	MAGNETIC ORE	DARK BROWN	59.25	11.96	1.68
29.80	30.90	1.10	0.95	MAGNETIC ORE	DARK BROWN	59.60	10.02	2.08
30.90	31.15	0.25	0.22	MAGNETIC ORE	DARK BROWN	60.15	6.49	2.78
31.15	32.90	1.75	1.51	MAGNETIC ORE	DARK BROWN	41.05	39.23	1.31

BOREHOLE NO:MHG-27

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	! !	! !	! % !	! % !	! % !	! !	!
! FROM ! TO !	! (m) ! NESS (m) !	! !	! !	! !	! !	! !	! !	!
32.90	33.50	0.60	0.52	MAGNETIC ORE	DARK BROWN	54.92	18.89	0.99
33.50	35.30	1.80	1.55	MAGNETIC ORE	DARK BROWN	35.90	46.31	1.15
35.30	35.70	0.40	0.34	MAGNETIC ORE	DARK BROWN	40.31	30.98	2.59
35.70	36.55	0.85	0.73	MAGNETIC ORE	DARK BROWN	35.40	44.18	3.01
36.55	38.00	1.45	1.25	MAGNETIC ORE	DARK BROWN	34.44	47.10	2.47
38.00	39.00	1.00	0.86	MAGNETIC ORE	DARK BROWN	45.61	27.10	7.12
39.00	40.35	1.35	1.16	FERRUGINOUS SHALE	DARK BROWN	10.25	45.42	29.06
40.35	41.35	1.00	0.86	MAGNETIC ORE	DARK BROWN	26.35	51.56	9.33
41.35	42.70	1.35	1.16	MAGNETIC ORE	DARK BROWN	35.89	42.95	3.81
42.70	44.15	1.45	1.25	MAGNETIC ORE	DARK BROWN	31.59	52.16	1.37
44.15	45.80	1.65	1.42	MAGNETIC ORE	DARK BROWN	36.52	43.59	3.65
45.80	47.15	1.35	1.16	MAGNETIC ORE	DARK BROWN	36.30	44.14	3.63
47.15	49.35	2.20	1.89	MAGNETIC ORE	DARK BROWN	30.86	52.20	2.77
49.35	51.00	1.65	1.42	MAGNETIC ORE	DARK BROWN	34.97	27.58	9.10
51.00	52.30	1.30	1.12	MAGNETIC ORE	DARK BROWN	18.58	36.10	16.87

ANALYTICAL RESULTS OF PRIMARY SAMPLES (CORE DRILLING)
SHRI H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA

BOREHOLE NO:MHG-41

LATITUDE : 1664316.597
LONGITUDE : 664156.112
REDUCED LEVEL (M): 901.863

DATE OF COMMENCEMENT : 28/02/16
DATE OF CLOSURE : 29/02/16
DEPTH DRILLED (M) : 38.20

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	! !	! !	! % !	! % !	! % !	!	!
! FROM ! TO !	! (m) ! NESS (m) !	!	!	!	!	!	!	!
0.00	0.75	0.75	0.65	HAEMATITIC ORE	DARK BROWN	63.09	2.84	4.42
0.75	1.00	0.25	0.22	CLAYEY IRON ORE	DARK BROWN	54.49	3.18	12.29
1.00	1.70	0.70	0.60	POWDERY ORE	GREY	67.78	0.81	1.21
1.70	2.35	0.65	0.56	POWDERY ORE	GREY	63.45	2.20	5.24
2.35	2.65	0.30	0.26	FERRUGINOUS CLAY	DARK BROWN	34.61	18.71	19.74
2.65	3.05	0.40	0.34	POWDERY ORE	GREY	66.45	1.26	1.45
3.05	3.40	0.35	0.30	POWDERY ORE	GREY	66.68	0.80	2.22
3.40	3.70	0.30	0.26	POWDERY ORE	GREY	63.24	1.85	6.89
3.70	5.40	1.70	1.46	FERRUGINOUS CLAY	YELLOWISH BROWN	28.23	23.14	21.99
5.40	6.00	0.60	0.52	POWDERY ORE	STEEL GREY	65.82	1.97	3.15
6.00	6.60	0.60	0.52	POWDERY ORE	STEEL GREY	64.27	1.52	5.72
6.60	7.50	0.90	0.77	POWDERY ORE	STEEL GREY	63.54	1.92	5.80
7.50	8.15	0.65	0.56	POWDERY ORE	STEEL GREY	63.85	0.15	8.12
8.15	8.80	0.65	0.56	POWDERY ORE	STEEL GREY	65.42	0.48	5.13
8.80	9.40	0.60	0.52	POWDERY ORE	STEEL GREY	65.36	0.67	5.17
9.40	10.00	0.60	0.52	POWDERY ORE	STEEL GREY	65.71	0.95	3.96
10.00	10.60	0.60	0.52	POWDERY ORE	STEEL GREY	63.70	1.83	6.17
10.60	11.25	0.65	0.56	POWDERY ORE	STEEL GREY	63.42	1.29	7.23
11.25	11.75	0.50	0.43	POWDERY ORE	STEEL GREY	65.04	1.77	4.43
11.75	12.35	0.60	0.52	POWDERY ORE	STEEL GREY	65.96	1.70	3.51
12.35	13.25	0.90	0.77	POWDERY ORE	STEEL GREY	63.60	0.32	7.52
13.25	14.00	0.75	0.65	POWDERY ORE	STEEL GREY	61.99	1.75	8.65
14.00	14.75	0.75	0.65	POWDERY ORE	STEEL GREY	64.70	0.68	5.99
14.75	15.45	0.70	0.60	POWDERY ORE	STEEL GREY	66.20	0.38	4.58

BOREHOLE NO:MHG-41

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! NESS ! THICK- !			! % !	! % !	! % !		!
! FROM ! TO !	! (m) ! NESS (m) !			!	!	!		!
15.45	16.15	0.70	0.60	POWDERY ORE	STEEL GREY	64.19	1.81	6.05
16.15	16.85	0.70	0.60	POWDERY ORE	STEEL GREY	65.59	0.94	4.79
16.85	18.00	1.15	0.99	POWDERY ORE	STEEL GREY	65.11	0.37	5.42
18.00	18.65	0.65	0.56	POWDERY ORE	STEEL GREY	64.90	2.64	3.95
18.65	19.20	0.55	0.47	MAGNETIC ORE	STEEL GREY	58.61	10.86	4.60
19.20	20.75	1.55	1.33	MAGNETIC ORE	GREY	45.12	31.61	2.40
20.75	22.95	2.20	1.89	MAGNETIC ORE	GREY	40.10	37.37	3.13
22.95	25.30	2.35	2.02	MAGNETIC ORE	GREY	39.31	18.45	18.00
25.30	26.20	0.90	0.77	MAGNETIC ORE	GREY	41.69	36.43	2.77
26.20	27.00	0.80	0.69	MAGNETIC ORE	DARK BROWN	40.19	37.99	1.90
27.00	28.50	1.50	1.29	FERRUGINOUS SHALE	DARK BROWN	33.77	21.22	18.86
28.50	30.45	1.95	1.68	FERRUGINOUS SHALE	DARK BROWN	35.61	19.20	16.71
30.45	31.45	1.00	0.86	MAGNETIC ORE	LIGHT GREY	64.98	1.09	5.17
31.45	32.40	0.95	0.82	MAGNETIC ORE	LIGHT GREY	35.83	43.14	2.45
32.40	35.05	2.65	2.28	MAGNETIC ORE	LIGHT GREY	30.36	51.02	1.44
35.05	36.70	1.65	1.42	MAGNETIC ORE	LIGHT GREY	38.87	40.40	2.22
36.70	38.20	1.50	1.29	MAGNETIC ORE	LIGHT GREY	43.54	35.01	1.75

WITH ORE PIECES

ANALYTICAL RESULTS OF PRIMARY SAMPLES (CORE DRILLING)
SHRI H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA

BOREHOLE NO:MHG-42

LATITUDE : 1663737.844
 LONGITUDE : 664698.673
 REDUCED LEVEL (M): 919.882

DATE OF COMMENCEMENT : 01/03/16
 DATE OF CLOSURE : 07/03/16
 DEPTH DRILLED (M) : 63.40

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	! !	! !	! % !	! % !	! % !	!	!
! FROM ! TO !	! (m) ! NESS (m) !	!	!	!	!	!	!	!
0.00	2.00	2.00	1.72	HAEMATITIC ORE	DARK BROWN	62.46	4.12	5.81
2.00	2.60	0.60	0.52	POWDERY ORE	DARK GREY	67.65	0.81	1.33
2.60	3.20	0.60	0.52	POWDERY ORE	DARK GREY	68.00	0.81	1.13
3.20	4.00	0.80	0.69	POWDERY ORE	DARK GREY	67.77	1.04	1.21
4.00	4.50	0.50	0.43	POWDERY ORE	DARK GREY	66.35	0.93	1.50
4.50	5.20	0.70	0.60	POWDERY ORE	DARK GREY	67.78	0.78	1.28
5.20	6.00	0.80	0.69	POWDERY ORE	DARK GREY	64.12	0.80	5.41
6.00	6.50	0.50	0.43	POWDERY ORE	DARK GREY	65.03	0.87	4.22
6.50	7.45	0.95	0.82	POWDERY ORE	DARK GREY	64.26	0.89	3.37
7.45	8.00	0.55	0.47	POWDERY ORE	DARK GREY	64.12	0.94	4.25
8.00	8.40	0.40	0.34	POWDERY ORE	DARK GREY	66.67	0.83	1.93
8.40	8.80	0.40	0.34	POWDERY ORE	DARK GREY	64.69	0.86	3.52
8.80	9.30	0.50	0.43	POWDERY ORE	STEEL GREY	65.14	0.85	3.61
9.30	9.85	0.55	0.47	POWDERY ORE	STEEL GREY	64.06	1.05	4.50
9.85	10.70	0.85	0.73	SHALY ORE	DARK BROWN	59.10	0.82	12.90
10.70	11.40	0.70	0.60	POWDERY ORE	STEEL GREY	66.89	0.69	3.07
11.40	11.95	0.55	0.47	POWDERY ORE	STEEL GREY	67.58	0.83	2.05
11.95	12.50	0.55	0.47	POWDERY ORE	REDDISH BROWN	67.17	0.95	2.02
12.50	13.40	0.90	0.77	POWDERY ORE	DARK GREY	66.63	0.87	1.79
13.40	13.85	0.45	0.39	POWDERY ORE	DARK GREY	67.56	0.90	1.17
13.85	14.30	0.45	0.39	POWDERY ORE	DARK GREY	65.77	1.09	2.12
14.30	15.00	0.70	0.60	POWDERY ORE	DARK GREY	65.97	0.95	3.44
15.00	16.00	1.00	0.86	POWDERY ORE	DARK GREY	65.31	0.83	4.66
16.00	17.00	1.00	0.86	POWDERY ORE	DARK GREY	64.03	0.74	7.15

BOREHOLE NO:MHG-42

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	! !	! !	! % !	! % !	! % !	! !	!
! FROM ! TO !	! (m) ! NESS (m) !	!	!	!	!	!	!	!
17.00	18.00	1.00	0.86	HAEMATITIC ORE	DARK BROWN	63.37	0.89	7.81
18.00	19.00	1.00	0.86	HAEMATITIC ORE	DARK BROWN	61.66	0.87	10.58
19.00	19.70	0.70	0.60	HAEMATITIC ORE	DARK BROWN	62.83	0.85	7.49
19.70	21.00	1.30	1.12	HAEMATITIC ORE	DARK BROWN	61.73	1.60	5.35
21.00	22.00	1.00	0.86	POWDERY ORE	STEEL GREY	67.10	0.94	2.81
22.00	23.00	1.00	0.86	POWDERY ORE	STEEL GREY	66.63	1.60	2.81
23.00	24.00	1.00	0.86	POWDERY ORE	STEEL GREY	67.02	0.52	2.69
24.00	24.35	0.35	0.30	CLAYEY IRON ORE	YELLOWISH BROWN	66.72	0.92	2.19
24.35	25.25	0.90	0.77	POWDERY ORE	DARK GREY	65.40	0.95	4.30
25.25	26.00	0.75	0.65	SOFT LAMINATED ORE	DARK GREY	65.56	0.94	3.46
26.00	27.15	1.15	0.99	POWDERY ORE	STEEL GREY	64.67	0.58	6.35
27.15	27.80	0.65	0.56	POWDERY ORE	STEEL GREY	64.36	1.08	3.28
27.80	29.00	1.20	1.03	POWDERY ORE	STEEL GREY	66.69	0.85	2.55
29.00	30.00	1.00	0.86	POWDERY ORE	STEEL GREY	67.99	0.82	1.42
30.00	31.00	1.00	0.86	SOFT LAMINATED ORE	STEEL GREY	67.99	0.79	1.66
31.00	32.00	1.00	0.86	SOFT LAMINATED ORE	STEEL GREY	67.25	1.08	1.94
32.00	33.00	1.00	0.86	SOFT LAMINATED ORE	STEEL GREY	66.15	1.66	3.30
33.00	34.00	1.00	0.86	SOFT LAMINATED ORE	STEEL GREY	64.88	2.78	3.25
34.00	34.60	0.60	0.52	SOFT LAMINATED ORE	LIGHT GREY	64.62	3.06	3.23
34.60	35.50	0.90	0.77	SOFT LAMINATED ORE	LIGHT GREY	66.36	2.10	1.55
35.50	36.00	0.50	0.43	SILICEOUS IRON ORE	LIGHT GREY	48.27	29.08	1.67
36.00	37.59	1.59	1.37	MAGNETIC ORE	LIGHT GREY	32.69	47.88	2.52
37.59	39.65	2.06	1.77	MAGNETIC ORE	LIGHT GREY	31.55	48.58	3.67
39.65	41.15	1.50	1.29	MAGNETIC ORE	LIGHT GREY	39.42	40.13	2.34
41.15	43.95	2.80	2.41	MAGNETIC ORE	LIGHT GREY	46.36	31.14	1.95
43.95	46.10	2.15	1.85	MAGNETIC ORE	LIGHT GREY	37.67	43.77	2.16
46.10	48.70	2.60	2.24	MAGNETIC ORE	LIGHT GREY	37.18	43.86	1.25
48.70	51.10	2.40	2.06	MAGNETIC ORE	LIGHT GREY	36.55	45.24	1.28
51.10	53.30	2.20	1.89	MAGNETIC ORE	LIGHT GREY	30.43	51.71	0.95
53.30	55.00	1.70	1.46	MAGNETIC ORE	LIGHT GREY	28.67	53.97	0.86
55.00	57.00	2.00	1.72	MAGNETIC ORE	LIGHT GREY	31.51	38.63	9.33
57.00	59.00	2.00	1.72	MAGNETIC ORE	LIGHT GREY	33.22	47.97	1.29
59.00	61.00	2.00	1.72	MAGNETIC ORE	LIGHT GREY	37.12	44.89	1.25
61.00	63.40	2.40	2.06	MAGNETIC ORE	LIGHT GREY	44.83	33.98	1.50

ANALYTICAL RESULTS OF PRIMARY SAMPLES (CORE DRILLING)
SHRI H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA

BOREHOLE NO:MHG-43

LATITUDE : 1663875.459
LONGITUDE : 664559.270
REDUCED LEVEL (M): 927.985

DATE OF COMMENCEMENT : 01/03/16
DATE OF CLOSURE : 02/03/16
DEPTH DRILLED (M) : 60.50

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	! !	! !	! % !	! % !	! % !	!	!
! FROM ! TO !	! (m) ! NESS (m) !	!	!	!	!	!	!	!
0.00	0.50	0.50	0.43	HAEMATITIC ORE	DARK BROWN	64.48	1.95	2.65
0.50	1.40	0.90	0.77	POWDERY ORE	DARK GREY	67.19	0.92	1.02
1.40	2.20	0.80	0.69	POWDERY ORE	DARK GREY	67.61	0.70	0.83
2.20	2.40	0.20	0.17	POWDERY ORE	DARK GREY	21.51	28.80	25.95
2.40	3.20	0.80	0.69	POWDERY ORE	DARK GREY	67.44	0.71	0.87
3.20	3.80	0.60	0.52	POWDERY ORE	DARK GREY	67.46	0.68	1.02
3.80	4.40	0.60	0.52	POWDERY ORE	DARK GREY	67.49	0.73	1.02
4.40	5.20	0.80	0.69	POWDERY ORE	DARK GREY	67.41	0.73	0.79
5.20	6.60	1.40	1.20	POWDERY ORE	DARK GREY	68.40	0.66	0.65
6.60	8.20	1.60	1.38	POWDERY ORE	DARK GREY	67.79	1.19	0.76
8.20	9.10	0.90	0.77	POWDERY ORE	DARK GREY	67.55	1.15	1.47
9.10	10.70	1.60	1.38	POWDERY ORE	DARK GREY	68.35	0.66	0.84
10.70	11.35	0.65	0.56	POWDERY ORE	DARK GREY	67.73	0.96	1.04
11.35	13.00	1.65	1.42	POWDERY ORE	DARK GREY	67.84	0.62	1.11
13.00	15.80	2.80	2.41	POWDERY ORE	DARK GREY	67.51	0.72	1.23
15.80	16.65	0.85	0.73	POWDERY ORE	DARK GREY	67.99	0.66	0.74
16.65	17.10	0.45	0.39	POWDERY ORE	DARK GREY	68.03	0.72	0.74
17.10	17.50	0.40	0.34	POWDERY ORE	DARK GREY	67.79	0.72	0.70
17.50	17.65	0.15	0.13	POWDERY ORE	DARK GREY	67.07	0.65	0.55
17.65	18.40	0.75	0.65	POWDERY ORE	DARK GREY	68.48	0.56	0.69
18.40	19.40	1.00	0.86	POWDERY ORE	DARK GREY	66.44	1.97	2.26
19.40	20.00	0.60	0.52	POWDERY ORE	DARK GREY	66.34	1.87	2.11
20.00	20.30	0.30	0.26	HARD LAMINATED ORE	DARK BROWN	62.61	4.56	5.39
20.30	20.90	0.60	0.52	POWDERY ORE	GREY	62.59	0.80	8.75

BOREHOLE NO:MHG-43

DEPTH (M)	THICK-NESS	TRUE THICK-NESS	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)	(m)					
20.90	21.50	0.60	0.52	POWDERY ORE	GREY	60.02	1.42	11.25
21.50	21.70	0.20	0.17	HARD LAMINATED ORE	LIGHT BROWN	58.43	3.21	12.10
21.70	24.30	2.60	2.24	POWDERY ORE	DARK GREY	64.93	2.12	3.97
24.30	25.00	0.70	0.60	POWDERY ORE	DARK GREY	68.55	0.66	0.68
25.00	26.90	1.90	1.63	POWDERY ORE	DARK GREY	68.27	0.76	0.86
26.90	27.15	0.25	0.22	POWDERY ORE	DARK GREY	68.32	0.93	1.01
27.15	29.40	2.25	1.94	POWDERY ORE	DARK GREY	68.59	0.78	0.76
29.40	32.20	2.80	2.41	POWDERY ORE	DARK GREY	68.03	0.93	0.79
32.20	32.95	0.75	0.65	HAEMATITIC ORE	STEEL GREY	68.29	0.70	0.70
32.95	33.20	0.25	0.22	HAEMATITIC ORE	STEEL GREY	68.72	0.59	0.57
33.20	34.80	1.60	1.38	POWDERY ORE	DARK GREY	67.31	0.66	0.70
34.80	36.15	1.35	1.16	POWDERY ORE	DARK GREY	65.63	0.95	1.16
36.15	38.15	2.00	1.72	POWDERY ORE	DARK GREY	66.68	0.84	0.92
38.15	40.00	1.85	1.59	HAEMATITIC ORE	DARK BROWN	66.21	0.84	1.20
40.00	41.15	1.15	0.99	HAEMATITIC ORE	DARK BROWN	67.41	0.91	0.95
41.15	42.60	1.45	1.25	POWDERY ORE	GREY	66.51	1.92	2.38
42.60	42.80	0.20	0.17	HARD MASSIVE ORE	DARK BROWN	67.30	1.08	0.75
42.80	43.30	0.50	0.43	POWDERY ORE	GREY	67.39	1.21	0.77
43.30	45.20	1.90	1.63	POWDERY ORE	DARK GREY	66.40	2.19	1.84
45.20	46.30	1.10	0.95	POWDERY ORE	DARK GREY	48.31	13.19	12.86
46.30	46.60	0.30	0.26	RED OCHRE	DARK BROWN	42.15	14.12	11.26
46.60	47.20	0.60	0.52	SHALY ORE	DARK BROWN	48.47	13.04	12.59
47.20	47.75	0.55	0.47	HARD LAMINATED ORE	GREY	39.34	22.53	11.05
47.75	48.65	0.90	0.77	HARD LAMINATED ORE	GREY	25.03	20.14	19.91
48.65	50.00	1.35	1.16	FERRUGINOUS CLAY	YELLOWISH BROWN	19.78	19.80	22.95
50.00	51.00	1.00	0.86	SHALE	YELLOWISH BROWN	9.71	17.95	28.48
51.00	51.70	0.70	0.60	FERRUGINOUS CLAY	YELLOWISH BROWN	25.23	22.19	17.81
51.70	53.70	2.00	1.72	FERRUGINOUS CLAY	YELLOWISH BROWN	17.62	25.66	18.05
53.70	54.40	0.70	0.60	FERRUGINOUS CLAY	YELLOWISH BROWN	14.85	26.11	18.81
54.40	55.30	0.90	0.77	FERRUGINOUS SHALE	YELLOWISH BROWN	16.66	27.90	15.62
55.30	57.80	2.50	2.15	FERRUGINOUS CLAY	YELLOWISH BROWN	15.01	25.73	19.17
57.80	59.00	1.20	1.03	FERRUGINOUS CLAY	YELLOWISH BROWN	15.01	25.90	19.06
59.00	59.30	0.30	0.26	FERRUGINOUS CLAY	YELLOWISH BROWN	20.90	25.69	16.40
59.30	60.50	1.20	1.03	BHQ	GREY	20.87	25.41	16.62

ANALYTICAL RESULTS OF PRIMARY SAMPLES (CORE DRILLING)
SHRI H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA

BOREHOLE NO:MHG-44

LATITUDE : 1664459.062
 LONGITUDE : 664005.888
 REDUCED LEVEL (M): 918.020

DATE OF COMMENCEMENT : 02/03/16
 DATE OF CLOSURE : 06/03/16
 DEPTH DRILLED (M) : 44.00

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	! !	! !	! % !	! % !	! % !	!	!
! FROM ! TO	! (m) ! NESS (m) !	!	!	!	!	!	!	!
0.00	1.00	1.00	0.86	HAEMATITIC ORE	YELLOWISH BROWN	49.60	26.83	2.08
1.00	2.50	1.50	1.29	HAEMATITIC ORE	YELLOWISH BROWN	65.67	1.10	0.93
2.50	3.60	1.10	0.95	HAEMATITIC ORE	YELLOWISH BROWN	64.87	1.47	1.59
3.60	4.30	0.70	0.60	LIMONITIC ORE	YELLOWISH BROWN	65.46	0.89	1.45
4.30	5.00	0.70	0.60	POWDERY ORE	STEEL GREY	66.45	0.76	1.07
5.00	6.00	1.00	0.86	HAEMATITIC ORE	YELLOWISH BROWN	66.51	0.66	1.08
6.00	7.00	1.00	0.86	POWDERY ORE	STEEL GREY	66.28	0.95	1.04
7.00	8.00	1.00	0.86	POWDERY ORE	STEEL GREY	64.50	1.66	1.80
8.00	8.60	0.60	0.52	POWDERY ORE	STEEL GREY	65.67	0.84	0.94
8.60	9.20	0.60	0.52	POWDERY ORE	STEEL GREY	65.82	1.29	1.14
9.20	9.80	0.60	0.52	POWDERY ORE	STEEL GREY	64.95	2.89	1.78
9.80	10.40	0.60	0.52	POWDERY ORE	STEEL GREY	64.69	2.99	2.08
10.40	11.00	0.60	0.52	POWDERY ORE	STEEL GREY	65.94	2.04	1.82
11.00	11.50	0.50	0.43	POWDERY ORE	STEEL GREY	65.77	1.72	1.61
11.50	12.00	0.50	0.43	POWDERY ORE	STEEL GREY	66.67	1.05	0.94
12.00	12.50	0.50	0.43	HARD MASSIVE ORE	REDDISH BROWN	65.58	0.93	1.53
12.50	12.80	0.30	0.26	SOFT LAMINATED ORE	REDDISH BROWN	64.07	2.27	2.12
12.80	13.30	0.50	0.43	SOFT LAMINATED ORE	REDDISH BROWN	64.92	1.54	1.87
13.30	13.80	0.50	0.43	SOFT LAMINATED ORE	REDDISH BROWN	64.52	1.89	1.60
13.80	14.40	0.60	0.52	SOFT LAMINATED ORE	REDDISH BROWN	64.97	2.12	2.01
14.40	15.00	0.60	0.52	POWDERY ORE	STEEL GREY	65.48	1.48	1.73
15.00	16.00	1.00	0.86	HARD MASSIVE ORE	STEEL GREY	61.36	1.23	4.02
16.00	17.00	1.00	0.86	FERRUGINOUS CLAY	YELLOWISH BROWN	26.88	8.26	29.58
17.00	17.60	0.60	0.52	FERRUGINOUS CLAY	YELLOWISH BROWN	29.40	4.12	26.52

BOREHOLE NO:MHG-44

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!	
!-----! NESS ! THICK- !	! NESS ! THICK- !	!	!	! % !	! % !	! % !	!	!	
! FROM ! TO !	! (m) ! NESS (m) !	!	!	!	!	!	!	!	
17.60	18.00	0.40	0.34	POWDERY ORE	LIGHT BROWN	59.42	2.81	5.72	
18.00	19.00	1.00	0.86	SOFT LAMINATED ORE	LIGHT BROWN	65.18	1.06	1.77	
19.00	19.20	0.20	0.17	HAEMATITIC ORE	REDDISH BROWN	57.09	1.58	4.71	
19.20	20.00	0.80	0.69	LIMONITIC ORE	YELLOWISH BROWN	40.86	1.49	6.46	
20.00	20.30	0.30	0.26	HAEMATITIC ORE	DARK BROWN	47.81	2.63	6.66	
20.30	20.80	0.50	0.43	FERRUGINOUS CLAY	DARK BROWN	41.85	3.15	7.67	
20.80	21.60	0.80	0.69	HAEMATITIC ORE	YELLOWISH BROWN	42.51	5.24	8.15	
21.60	22.80	1.20	1.03	FERRUGINOUS SHALE	DARK BROWN	21.03	20.21	22.08	
22.80	23.40	0.60	0.52	FERRUGINOUS SHALE	YELLOWISH BROWN	12.75	18.28	27.13	
23.40	24.00	0.60	0.52	HAEMATITIC ORE	STEEL GREY	64.28	2.09	2.42	
24.00	24.50	0.50	0.43	HAEMATITIC ORE	STEEL GREY	64.30	1.19	1.49	
24.50	25.10	0.60	0.52	HAEMATITIC ORE	STEEL GREY	66.11	1.12	0.79	
25.10	26.00	0.90	0.77	POWDERY ORE	STEEL GREY	66.35	0.94	0.74	FEEBLY MAGNETIC
26.00	26.80	0.80	0.69	POWDERY ORE	STEEL GREY	65.15	1.06	0.83	FEEBLY MAGNETIC
26.80	27.60	0.80	0.69	POWDERY ORE	STEEL GREY	65.10	2.24	1.84	FEEBLY MAGNETIC
27.60	28.40	0.80	0.69	POWDERY ORE	STEEL GREY	65.35	1.08	1.30	FEEBLY MAGNETIC
28.40	29.00	0.60	0.52	POWDERY ORE	STEEL GREY	66.72	0.70	0.77	FEEBLY MAGNETIC
29.00	29.50	0.50	0.43	POWDERY ORE	STEEL GREY	66.04	0.87	0.88	FEEBLY MAGNETIC
29.50	30.25	0.75	0.65	POWDERY ORE	STEEL GREY	67.00	0.86	1.05	FEEBLY MAGNETIC
30.25	31.00	0.75	0.65	POWDERY ORE	STEEL GREY	66.73	0.80	0.78	FEEBLY MAGNETIC
31.00	31.50	0.50	0.43	POWDERY ORE	STEEL GREY	64.88	2.92	2.91	FEEBLY MAGNETIC
31.50	32.00	0.50	0.43	POWDERY ORE	STEEL GREY	65.37	2.39	2.36	FEEBLY MAGNETIC
32.00	33.20	1.20	1.03	POWDERY ORE	LIGHT GREY	65.04	3.76	2.99	FEEBLY MAGNETIC
33.20	33.80	0.60	0.52	POWDERY ORE	GREY	62.63	5.48	4.11	FEEBLY MAGNETIC
33.80	35.20	1.40	1.20	MAGNETIC ORE	GREY	50.08	24.59	3.02	MAGNETIC
35.20	36.10	0.90	0.77	MAGNETIC ORE	GREY	40.42	41.05	1.05	MAGNETIC
36.10	36.80	0.70	0.60	MAGNETIC ORE	GREY	38.22	42.90	1.53	MAGNETIC
36.80	37.40	0.60	0.52	MAGNETIC ORE	GREY	38.54	43.14	0.99	MAGNETIC
37.40	38.00	0.60	0.52	MAGNETIC ORE	GREY	28.98	55.70	0.92	MAGNETIC
38.00	38.80	0.80	0.69	MAGNETIC ORE	GREY	29.02	54.72	1.29	MAGNETIC
38.80	39.50	0.70	0.60	MAGNETIC ORE	GREY	33.15	48.76	1.31	MAGNETIC

BOREHOLE NO:MHG-44

DEPTH (M)		THICK-NESS	TRUE THICK-NESS (m)	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)	(m)						
39.50	40.15	0.65	0.56	MAGNETIC ORE	GREY	29.68	53.62	1.16	MAGNETIC
40.15	40.65	0.50	0.43	MAGNETIC ORE	GREY	33.73	49.19	1.21	MAGNETIC
40.65	41.10	0.45	0.39	MAGNETIC ORE	GREY	34.91	47.67	1.31	MAGNETIC
41.10	42.30	1.20	1.03	MAGNETIC ORE	GREY	30.99	50.85	2.16	MAGNETIC
42.30	43.00	0.70	0.60	MAGNETIC ORE	GREY	34.50	47.93	1.34	MAGNETIC
43.00	44.00	1.00	0.86	MAGNETIC ORE	GREY	34.61	46.78	1.45	MAGNETIC

ANALYTICAL RESULTS OF PRIMARY SAMPLES (CORE DRILLING)
SHRI H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA

BOREHOLE NO:MHG-45

LATITUDE : 1663741.602
 LONGITUDE : 664847.119
 REDUCED LEVEL (M): 931.286

DATE OF COMMENCEMENT : 03/03/16
 DATE OF CLOSURE : 07/03/16
 DEPTH DRILLED (M) : 85.00

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	! !	! !	! % !	! % !	! % !	!	!
! FROM ! TO !	! (m) ! NESS (m) !	!	!	!	!	!	!	!
0.00	0.75	0.75	0.65	HAEMATITIC ORE	CHERRY RED	64.98	2.72	2.43
0.75	1.50	0.75	0.65	HAEMATITIC ORE	CHERRY RED	67.02	0.90	0.88
1.50	2.10	0.60	0.52	HAEMATITIC ORE	CHERRY RED	66.79	1.00	1.09
2.10	2.70	0.60	0.52	HAEMATITIC ORE	CHERRY RED	68.40	0.47	0.50
2.70	3.40	0.70	0.60	HAEMATITIC ORE	CHERRY RED	68.18	0.58	0.49
3.40	4.10	0.70	0.60	HAEMATITIC ORE	CHERRY RED	66.67	0.55	0.77
4.10	4.85	0.75	0.65	HAEMATITIC ORE	CHERRY RED	68.10	0.39	0.32
4.85	5.90	1.05	0.90	HAEMATITIC ORE	CHERRY RED	67.32	0.60	0.99
5.90	6.20	0.30	0.26	HAEMATITIC ORE	CHERRY RED	68.00	0.52	0.60
6.20	6.85	0.65	0.56	POWDERY ORE	YELLOWISH BROWN	68.50	0.59	0.35
6.85	7.50	0.65	0.56	POWDERY ORE	YELLOWISH BROWN	68.42	0.51	0.37
7.50	8.00	0.50	0.43	SHALY ORE	YELLOWISH BROWN	63.00	2.65	2.50
8.00	9.25	1.25	1.08	POWDERY ORE	YELLOWISH BROWN	66.61	0.74	0.61
9.25	9.80	0.55	0.47	POWDERY ORE	YELLOWISH BROWN	63.33	0.80	2.04
9.80	10.60	0.80	0.69	HAEMATITIC ORE	YELLOWISH BROWN	66.30	0.49	1.36
10.60	11.40	0.80	0.69	HAEMATITIC ORE	YELLOWISH BROWN	66.98	0.55	0.48
11.40	12.00	0.60	0.52	HAEMATITIC ORE	YELLOWISH BROWN	65.92	0.47	0.90
12.00	12.85	0.85	0.73	HAEMATITIC ORE	YELLOWISH BROWN	65.45	0.88	1.16
12.85	13.35	0.50	0.43	SHALY ORE	YELLOWISH BROWN	64.09	1.82	2.11
13.35	14.70	1.35	1.16	POWDERY ORE	GREY	66.86	0.61	0.50
14.70	15.60	0.90	0.77	POWDERY ORE	LIGHT GREY	67.95	0.38	0.40
15.60	16.35	0.75	0.65	POWDERY ORE	LIGHT GREY	67.45	0.60	0.78
16.35	17.15	0.80	0.69	POWDERY ORE	LIGHT GREY	66.61	0.59	0.76
17.15	17.40	0.25	0.22	SHALY ORE	YELLOWISH BROWN	67.12	0.48	0.56

BOREHOLE NO:MHG-45

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! NESS ! THICK- !			! % !	! % !	! % !		!
! FROM ! TO !	! (m) ! NESS (m) !			!	!	!		!
17.40	18.30	0.90	0.77	BHQ	LIGHT GREY	66.22	0.72	1.18
18.30	19.00	0.70	0.60	POWDERY ORE	YELLOWISH BROWN	66.73	0.62	1.00
19.00	20.30	1.30	1.12	CLAYEY IRON ORE	VIOLET	65.13	0.71	1.47
20.30	20.70	0.40	0.34	POWDERY ORE	LIGHT GREY	67.39	0.58	0.56
20.70	21.05	0.35	0.30	CLAYEY IRON ORE	YELLOWISH BROWN	64.94	0.85	1.94
21.05	21.55	0.50	0.43	POWDERY ORE	GREY	67.34	0.50	0.43
21.55	21.75	0.20	0.17	CLAYEY IRON ORE	YELLOWISH BROWN	63.76	0.63	2.95
21.75	22.10	0.35	0.30	HARD MASSIVE ORE	DARK GREY	66.61	0.47	0.47
22.10	22.65	0.55	0.47	POWDERY ORE	LIGHT GREY	67.94	0.41	0.44
22.65	24.25	1.60	1.38	POWDERY ORE	LIGHT GREY	67.23	0.77	0.72
24.25	25.25	1.00	0.86	POWDERY ORE	LIGHT GREY	66.32	0.64	0.52
25.25	26.05	0.80	0.69	POWDERY ORE	LIGHT GREY	65.62	0.57	0.81
26.05	26.50	0.45	0.39	SHALY ORE	YELLOWISH BROWN	65.20	0.81	1.91
26.50	27.60	1.10	0.95	BLUE DUST	BLUISH GREY	65.91	0.52	0.49
27.60	28.05	0.45	0.39	POWDERY ORE	GREY	64.58	0.61	1.94
28.05	28.80	0.75	0.65	POWDERY ORE	GREY	66.04	0.88	0.93
28.80	29.40	0.60	0.52	POWDERY ORE	GREY	66.47	0.58	0.80
29.40	30.20	0.80	0.69	HAEMATITIC ORE	YELLOWISH BROWN	66.00	0.83	1.46
30.20	30.90	0.70	0.60	POWDERY ORE	GREY	66.89	0.65	0.63
30.90	31.50	0.60	0.52	SOFT LAMINATED ORE	YELLOWISH BROWN	62.03	0.71	2.76
31.50	32.45	0.95	0.82	POWDERY ORE	GREY	66.40	0.59	0.68
32.45	33.20	0.75	0.65	POWDERY ORE	GREY	66.44	0.58	0.64
33.20	33.70	0.50	0.43	HAEMATITIC ORE	YELLOWISH BROWN	65.18	0.63	0.99
33.70	34.70	1.00	0.86	POWDERY ORE	GREY	67.38	0.47	0.39
34.70	35.10	0.40	0.34	POWDERY ORE	GREY	65.63	0.73	0.99
35.10	35.85	0.75	0.65	HARD MASSIVE ORE	GREY	66.45	0.73	0.90
35.85	36.70	0.85	0.73	POWDERY ORE	GREY	66.56	0.53	0.52
36.70	37.30	0.60	0.52	POWDERY ORE	GREY	66.56	0.46	0.54
37.30	38.00	0.70	0.60	POWDERY ORE	GREY	67.01	0.45	0.43
38.00	38.60	0.60	0.52	POWDERY ORE	GREY	66.62	0.47	0.35
38.60	39.30	0.70	0.60	POWDERY ORE	GREY	66.08	0.46	0.36

BOREHOLE NO:MHG-45

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! NESS ! THICK- !			! % !	! % !	! % !		!
! FROM ! TO !	! (m) ! NESS (m) !			!	!	!		!
39.30	40.30	1.00	0.86	POWDERY ORE	GREY	66.27	0.51	0.67
40.30	41.30	1.00	0.86	POWDERY ORE	GREY	66.31	0.49	0.52
41.30	42.30	1.00	0.86	POWDERY ORE	GREY	66.64	0.64	0.58
42.30	43.30	1.00	0.86	POWDERY ORE	GREY	66.62	0.57	0.71
43.30	43.90	0.60	0.52	POWDERY ORE	GREY	66.44	0.56	0.63
43.90	44.65	0.75	0.65	POWDERY ORE	GREY	66.67	0.60	0.82
44.65	45.50	0.85	0.73	POWDERY ORE	GREY	67.34	0.59	0.56
45.50	46.25	0.75	0.65	POWDERY ORE	GREY	66.99	0.54	0.79
46.25	47.00	0.75	0.65	POWDERY ORE	GREY	66.91	0.68	0.78
47.00	47.80	0.80	0.69	POWDERY ORE	GREY	66.68	0.51	0.72
47.80	48.60	0.80	0.69	POWDERY ORE	GREY	67.16	0.58	0.73
48.60	49.30	0.70	0.60	POWDERY ORE	GREY	67.48	0.59	0.49
49.30	50.00	0.70	0.60	POWDERY ORE	GREY	67.37	0.60	0.54
50.00	50.70	0.70	0.60	POWDERY ORE	GREY	67.76	0.66	0.40
50.70	51.70	1.00	0.86	POWDERY ORE	GREY	67.55	0.60	0.54
51.70	53.00	1.30	1.12	FERRUGINOUS CLAY	REDDISH BROWN	17.50	2.30	36.21
53.00	54.55	1.55	1.33	FERRUGINOUS CLAY	REDDISH BROWN	17.50	1.56	37.23
54.55	56.00	1.45	1.25	FERRUGINOUS CLAY	REDDISH BROWN	17.50	17.67	31.36
56.00	57.40	1.40	1.20	FERRUGINOUS CLAY	REDDISH BROWN	22.96	2.12	26.26
57.40	59.50	2.10	1.81	FERRUGINOUS CLAY	REDDISH BROWN	13.97	17.41	27.85
59.50	59.90	0.40	0.34	POWDERY ORE	GREY	63.30	1.85	3.59
59.90	60.50	0.60	0.52	FERRUGINOUS CLAY	GREY	28.77	17.18	20.19
60.50	61.10	0.60	0.52	POWDERY ORE	GREY	67.95	0.58	0.48
61.10	61.80	0.70	0.60	POWDERY ORE	GREY	67.46	0.60	0.56
61.80	62.90	1.10	0.95	POWDERY ORE	GREY	68.03	0.48	0.42
62.90	64.00	1.10	0.95	POWDERY ORE	GREY	68.20	0.39	0.24
64.00	64.80	0.80	0.69	POWDERY ORE	GREY	68.19	0.39	0.33
64.80	65.40	0.60	0.52	POWDERY ORE	GREY	68.07	0.39	0.41
65.40	66.00	0.60	0.52	POWDERY ORE	GREY	67.75	0.42	0.57
66.00	66.70	0.70	0.60	POWDERY ORE	GREY	67.32	0.39	0.56
66.70	67.40	0.70	0.60	POWDERY ORE	GREY	67.10	0.50	0.69

BOREHOLE NO:MHG-45

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	!	!	! % !	! % !	! % !	!	!
! FROM ! TO !	! (m) ! NESS (m) !	!	!	!	!	!	!	!
67.40	68.40	1.00	0.86	HAEMATITIC ORE	DARK BROWN	47.27	7.02	7.50
68.40	69.15	0.75	0.65	HAEMATITIC ORE	DARK BROWN	67.20	0.74	0.66
69.15	70.30	1.15	0.99	HAEMATITIC ORE	DARK BROWN	67.34	0.76	0.62
70.30	71.70	1.40	1.20	CLAYEY IRON ORE	LIGHT BROWN	14.87	18.10	26.39
71.70	73.10	1.40	1.20	CLAYEY IRON ORE	LIGHT BROWN	21.32	18.75	23.36
73.10	75.10	2.00	1.72	CLAYEY IRON ORE	LIGHT BROWN	22.64	20.25	21.33
75.10	76.10	1.00	0.86	POWDERY ORE	GREY	66.56	1.88	1.46
76.10	76.70	0.60	0.52	SOFT LAMINATED ORE	GREY	65.32	3.17	2.64
76.70	77.25	0.55	0.47	SOFT LAMINATED ORE	GREY	66.68	2.04	1.59
77.25	78.00	0.75	0.65	HAEMATITIC ORE	GREY	66.67	1.69	1.11
78.00	78.70	0.70	0.60	HAEMATITIC ORE	GREY	66.69	1.96	1.40
78.70	79.45	0.75	0.65	HAEMATITIC ORE	GREY	66.50	1.86	1.33
79.45	80.20	0.75	0.65	HAEMATITIC ORE	GREY	66.53	1.96	1.29
80.20	80.80	0.60	0.52	HAEMATITIC ORE	GREY	65.98	2.38	1.84
80.80	81.40	0.60	0.52	HAEMATITIC ORE	GREY	65.39	2.63	0.94
81.40	82.30	0.90	0.77	HAEMATITIC ORE	GREY	64.88	3.57	2.00
82.30	83.25	0.95	0.82	HAEMATITIC ORE	GREY	63.22	6.72	2.31
83.25	83.80	0.55	0.47	BHQ	GREY	34.58	48.41	1.24
83.80	85.00	1.20	1.03	BHQ	GREY	36.50	46.30	0.96

ANALYTICAL RESULTS OF PRIMARY SAMPLES (CORE DRILLING)
SHRI H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA

BOREHOLE NO:MHG-46

LATITUDE : 1664365.451
LONGITUDE : 664193.340
REDUCED LEVEL (M): 912.749

DATE OF COMMENCEMENT : 07/03/16
DATE OF CLOSURE : 09/03/16
DEPTH DRILLED (M) : 36.00

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	! !	! !	! % !	! % !	! % !	! !	!
! FROM ! TO !	! (m) ! NESS (m) !	! !	! !	! !	! !	! !	! !	!
0.00	0.60	0.60	0.52	HAEMATITIC ORE	DARK GREY	63.23	1.21	1.98
0.60	1.20	0.60	0.52	HAEMATITIC ORE	DARK GREY	63.09	2.10	1.54
1.20	2.50	1.30	1.12	HAEMATITIC ORE	DARK GREY	65.06	0.78	1.47
2.50	3.00	0.50	0.43	HAEMATITIC ORE	DARK GREY	64.57	0.95	1.60
3.00	3.50	0.50	0.43	HAEMATITIC ORE	DARK GREY	64.52	1.06	1.63
3.50	4.00	0.50	0.43	HAEMATITIC ORE	DARK GREY	64.16	0.92	1.83
4.00	4.70	0.70	0.60	HAEMATITIC ORE	DARK GREY	64.26	0.90	1.81
4.70	5.50	0.80	0.69	HAEMATITIC ORE	DARK GREY	64.40	0.84	1.59
5.50	6.20	0.70	0.60	HAEMATITIC ORE	DARK GREY	65.89	1.08	1.09
6.20	7.00	0.80	0.69	HAEMATITIC ORE	DARK GREY	64.93	0.70	1.35
7.00	7.80	0.80	0.69	HAEMATITIC ORE	DARK GREY	62.89	0.65	2.14
7.80	8.60	0.80	0.69	HAEMATITIC ORE	DARK GREY	61.36	1.52	3.03
8.60	9.10	0.50	0.43	HAEMATITIC ORE	DARK GREY	64.62	0.59	0.75
9.10	9.70	0.60	0.52	HARD LAMINATED ORE	DARK GREY	63.90	0.88	1.91
9.70	10.60	0.90	0.77	POWDERY ORE	STEEL GREY	65.69	0.66	1.33
10.60	11.25	0.65	0.56	POWDERY ORE	STEEL GREY	66.47	0.60	1.04
11.25	11.85	0.60	0.52	POWDERY ORE	STEEL GREY	65.95	1.36	0.90
11.85	12.80	0.95	0.82	POWDERY ORE	STEEL GREY	64.76	0.70	2.02
12.80	13.70	0.90	0.77	POWDERY ORE	STEEL GREY	65.73	0.66	0.76
13.70	14.25	0.55	0.47	POWDERY ORE	STEEL GREY	65.93	0.75	0.52
14.25	14.80	0.55	0.47	POWDERY ORE	STEEL GREY	67.02	0.59	0.63
14.80	15.30	0.50	0.43	POWDERY ORE	STEEL GREY	66.85	0.75	0.77
15.30	15.80	0.50	0.43	POWDERY ORE	STEEL GREY	64.50	1.08	2.01
15.80	16.70	0.90	0.77	POWDERY ORE	STEEL GREY	65.82	0.71	1.57

BOREHOLE NO:MHG-46

! DEPTH (M)	! THICK-! TRUE	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!	
!-----! NESS	! THICK-!			!	!	!		!	
! FROM ! TO	! (m) ! NESS (m)!			!	!	!		!	
16.70	17.60	0.90	0.77	POWDERY ORE	STEEL GREY	65.29	0.93	1.86	FEEBLY MAGNETIC
17.60	18.30	0.70	0.60	POWDERY ORE	STEEL GREY	66.29	1.01	0.93	FEEBLY MAGNETIC
18.30	18.70	0.40	0.34	POWDERY ORE	STEEL GREY	65.96	1.28	0.72	FEEBLY MAGNETIC
18.70	19.20	0.50	0.43	POWDERY ORE	DARK GREY	62.54	6.08	0.58	FEEBLY MAGNETIC
19.20	19.70	0.50	0.43	SILICEOUS IRON ORE	DARK GREY	56.68	13.65	0.67	FEEBLY MAGNETIC
19.70	20.40	0.70	0.60	SILICEOUS IRON ORE	DARK GREY	56.98	14.32	1.31	FEEBLY MAGNETIC
20.40	21.00	0.60	0.52	SILICEOUS IRON ORE	DARK GREY	47.95	28.85	1.53	FEEBLY MAGNETIC
21.00	21.50	0.50	0.43	POWDERY ORE	LIGHT GREY	61.68	6.99	0.60	FEEBLY MAGNETIC
21.50	22.30	0.80	0.69	POWDERY ORE	LIGHT GREY	58.06	15.57	1.04	FEEBLY MAGNETIC
22.30	23.05	0.75	0.65	POWDERY ORE	LIGHT GREY	60.14	8.80	1.66	FEEBLY MAGNETIC
23.05	23.80	0.75	0.65	POWDERY ORE	LIGHT GREY	57.92	11.35	0.41	FEEBLY MAGNETIC
23.80	24.25	0.45	0.39	SILICEOUS IRON ORE	GREY	55.73	17.49	2.22	FEEBLY MAGNETIC
24.25	24.75	0.50	0.43	SILICEOUS IRON ORE	GREY	52.68	19.36	4.52	FEEBLY MAGNETIC
24.75	25.75	1.00	0.86	SILICEOUS IRON ORE	GREY	43.62	28.04	4.01	FEEBLY MAGNETIC
25.75	26.00	0.25	0.22	SILICEOUS IRON ORE	GREY	40.29	35.39	1.45	FEEBLY MAGNETIC
26.00	26.50	0.50	0.43	SILICEOUS IRON ORE	GREY	33.31	49.81	0.99	FEEBLY MAGNETIC
26.50	27.00	0.50	0.43	SILICEOUS IRON ORE	GREY	32.17	51.74	0.72	FEEBLY MAGNETIC
27.00	27.50	0.50	0.43	SILICEOUS IRON ORE	GREY	32.06	51.64	0.83	FEEBLY MAGNETIC
27.50	28.30	0.80	0.69	SILICEOUS IRON ORE	GREY	47.53	30.36	1.36	FEEBLY MAGNETIC
28.30	30.10	1.80	1.55	MAGNETIC ORE	GREY	39.00	43.24	0.92	MAGNETIC
30.10	31.00	0.90	0.77	MAGNETIC ORE	GREY	38.20	44.02	0.95	MAGNETIC
31.00	32.80	1.80	1.55	MAGNETIC ORE	GREY	38.24	44.24	0.78	MAGNETIC
32.80	34.00	1.20	1.03	MAGNETIC ORE	GREY	39.11	42.55	1.02	MAGNETIC
34.00	36.00	2.00	1.72	MAGNETIC ORE	GREY	40.68	40.61	1.03	MAGNETIC

ANALYTICAL RESULTS OF PRIMARY SAMPLES (CORE DRILLING)
SHRI H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA

BOREHOLE NO:MHG-47

LATITUDE : 1663989.760
LONGITUDE : 664378.688
REDUCED LEVEL (M): 951.778

DATE OF COMMENCEMENT : 08/03/16
DATE OF CLOSURE : 09/03/16
DEPTH DRILLED (M) : 43.00

DEPTH (M)	THICK-NESS	TRUE THICK-NESS (m)	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO							
0.00	1.00	1.00	0.86	HAEMATITIC ORE	DARK BROWN	62.51	5.75	3.24
1.00	1.60	0.60	0.52	HAEMATITIC ORE	DARK BROWN	41.55	28.08	5.44
1.60	2.10	0.50	0.43	HAEMATITIC ORE	DARK BROWN	63.38	4.82	2.51
2.10	2.85	0.75	0.65	HAEMATITIC ORE	DARK BROWN	60.23	6.41	4.29
2.85	3.60	0.75	0.65	HAEMATITIC ORE	DARK BROWN	54.66	10.59	8.56
3.60	4.25	0.65	0.56	HAEMATITIC ORE	DARK BROWN	57.09	8.92	7.32
4.25	4.90	0.65	0.56	HAEMATITIC ORE	DARK BROWN	61.29	6.14	4.93
4.90	5.45	0.55	0.47	HAEMATITIC ORE	DARK BROWN	62.90	5.80	3.44
5.45	6.00	0.55	0.47	POWDERY ORE	GREY BROWN	58.35	8.48	7.94
6.00	6.70	0.70	0.60	POWDERY ORE	GREY BROWN	64.41	3.35	2.66
6.70	7.30	0.60	0.52	POWDERY ORE	GREY BROWN	60.98	4.80	4.77
7.30	8.20	0.90	0.77	POWDERY ORE	GREY BROWN	58.69	7.70	6.53
8.20	8.80	0.60	0.52	POWDERY ORE	GREY BROWN	58.97	7.71	7.05
8.80	9.45	0.65	0.56	POWDERY ORE	GREY BROWN	53.77	11.59	10.38
9.45	10.20	0.75	0.65	POWDERY ORE	GREY BROWN	59.46	7.50	6.16
10.20	10.95	0.75	0.65	POWDERY ORE	GREY BROWN	60.05	7.60	6.35
10.95	11.70	0.75	0.65	POWDERY ORE	GREY BROWN	64.65	3.21	2.39
11.70	12.30	0.60	0.52	POWDERY ORE	GREY BROWN	64.70	3.71	2.75
12.30	12.70	0.40	0.34	POWDERY ORE	STEEL GREY	64.34	3.64	2.91
12.70	13.30	0.60	0.52	POWDERY ORE	STEEL GREY	66.87	1.34	1.16
13.30	13.95	0.65	0.56	POWDERY ORE	STEEL GREY	66.72	1.00	0.83
13.95	14.55	0.60	0.52	POWDERY ORE	STEEL GREY	62.84	2.53	3.42
14.55	15.15	0.60	0.52	POWDERY ORE	STEEL GREY	65.94	0.98	1.26
15.15	15.95	0.80	0.69	POWDERY ORE	STEEL GREY	64.10	1.04	2.79

BOREHOLE NO:MHG-47

DEPTH (M)		THICK-NESS	TRUE THICK-NESS (m)	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)	(m)						
15.95	16.80	0.85	0.73	POWDERY ORE	STEEL GREY	66.13	0.86	1.72	
16.80	17.60	0.80	0.69	POWDERY ORE	STEEL GREY	64.25	0.62	2.84	
17.60	18.20	0.60	0.52	POWDERY ORE	STEEL GREY	63.83	0.86	3.23	
18.20	18.95	0.75	0.65	POWDERY ORE	STEEL GREY	66.06	0.87	0.72	
18.95	19.70	0.75	0.65	POWDERY ORE	STEEL GREY	66.39	0.96	0.73	
19.70	20.50	0.80	0.69	POWDERY ORE	STEEL GREY	66.80	0.86	0.58	
20.50	21.40	0.90	0.77	POWDERY ORE	STEEL GREY	66.06	0.89	1.44	
21.40	22.10	0.70	0.60	POWDERY ORE	STEEL GREY	66.61	0.79	0.82	
22.10	22.85	0.75	0.65	POWDERY ORE	STEEL GREY	66.82	0.82	0.78	
22.85	23.65	0.80	0.69	POWDERY ORE	STEEL GREY	66.82	0.71	0.72	
23.65	24.45	0.80	0.69	POWDERY ORE	STEEL GREY	65.76	0.78	1.04	
24.45	26.50	2.05	1.76	FERRUGINOUS CLAY	LIGHT BROWN	47.40	3.10	4.44	
26.50	27.80	1.30	1.12	FERRUGINOUS CLAY	LIGHT BROWN	32.44	17.76	14.97	
27.80	28.95	1.15	0.99	FERRUGINOUS CLAY	LIGHT BROWN	30.23	21.36	16.95	
28.95	30.35	1.40	1.20	FERRUGINOUS CLAY	LIGHT BROWN	29.19	19.87	19.01	
30.35	30.95	0.60	0.52	POWDERY ORE	STEEL GREY	66.61	1.18	1.04	FEEBLY MAGNETIC
30.95	31.60	0.65	0.56	POWDERY ORE	STEEL GREY	65.96	0.96	1.07	FEEBLY MAGNETIC
31.60	32.25	0.65	0.56	POWDERY ORE	STEEL GREY	66.79	0.82	0.92	FEEBLY MAGNETIC
32.25	32.85	0.60	0.52	POWDERY ORE	STEEL GREY	66.95	0.78	0.70	FEEBLY MAGNETIC
32.85	33.45	0.60	0.52	POWDERY ORE	STEEL GREY	66.49	0.79	1.07	FEEBLY MAGNETIC
33.45	34.05	0.60	0.52	POWDERY ORE	STEEL GREY	65.96	0.97	0.67	FEEBLY MAGNETIC
34.05	34.90	0.85	0.73	POWDERY ORE	STEEL GREY	66.29	1.05	1.14	FEEBLY MAGNETIC
34.90	35.75	0.85	0.73	POWDERY ORE	STEEL GREY	65.91	1.75	1.18	FEEBLY MAGNETIC
35.75	36.40	0.65	0.56	POWDERY ORE	STEEL GREY	65.96	1.51	0.88	FEEBLY MAGNETIC
36.40	37.05	0.65	0.56	POWDERY ORE	STEEL GREY	65.64	1.94	1.09	FEEBLY MAGNETIC
37.05	37.55	0.50	0.43	POWDERY ORE	STEEL GREY	64.23	4.03	2.76	FEEBLY MAGNETIC
37.55	37.85	0.30	0.26	SILICEOUS IRON ORE	LIGHT GREY	54.48	21.06	0.88	FEEBLY MAGNETIC
37.85	38.70	0.85	0.73	MAGNETIC ORE	GREY	33.96	43.44	5.30	MAGNETIC
38.70	39.80	1.10	0.95	MAGNETIC ORE	GREY	29.79	48.52	5.10	MAGNETIC
39.80	40.40	0.60	0.52	MAGNETIC ORE	GREY	35.80	47.04	1.13	MAGNETIC
40.40	41.40	1.00	0.86	MAGNETIC ORE	GREY	67.40	0.79	0.54	MAGNETIC
41.40	42.70	1.30	1.12	MAGNETIC ORE	GREY	38.87	43.20	0.80	MAGNETIC
42.70	43.00	0.30	0.26	MAGNETIC ORE	GREY	38.77	43.62	0.63	MAGNETIC

ANALYTICAL RESULTS OF PRIMARY SAMPLES (CORE DRILLING)
SHRI H.G.RANGANGOUD MINE LEASE AREA (ML No. 2148), DIST: BALLARI, KARNATAKA

BOREHOLE NO:MHG-48

LATITUDE : 1663668.843
LONGITUDE : 664613.788
REDUCED LEVEL (M): 962.328

DATE OF COMMENCEMENT : 09/03/16
DATE OF CLOSURE : 12/03/16
DEPTH DRILLED (M) : 74.00

! DEPTH (M)	! THICK-! TRUE !	! LITHOLOGY	! COLOR DETAILS	! Fe	! SiO ₂	! Al ₂ O ₃	! REMARKS	!
!-----! NESS ! THICK- !	! !	! !	! !	! % !	! % !	! % !	! !	!
! FROM ! TO !	! (m) ! NESS (m) !	!	!	!	!	!	!	!
0.00	1.00	1.00	0.86	FERRUGINOUS CLAY	LIGHT GREY	48.74	1.96 16.50	
1.00	2.20	1.20	1.03	FERRUGINOUS CLAY	LIGHT GREY	33.99	2.09 27.79	
2.20	4.00	1.80	1.55	FERRUGINOUS CLAY	LIGHT GREY	40.67	2.08 24.48	
4.00	6.00	2.00	1.72	FERRUGINOUS CLAY	LIGHT GREY	40.35	2.21 24.48	
6.00	9.00	3.00	2.58	FERRUGINOUS CLAY	LIGHT GREY	40.70	7.81 16.57	
9.00	10.75	1.75	1.51	FERRUGINOUS CLAY	LIGHT GREY	47.83	2.86 16.57	
10.75	11.75	1.00	0.86	HARD MASSIVE ORE	DARK GREY	65.03	0.87 1.27	
11.75	12.35	0.60	0.52	HARD MASSIVE ORE	DARK GREY	63.13	1.08 1.67	
12.35	13.00	0.65	0.56	HARD MASSIVE ORE	DARK GREY	62.89	1.21 2.37	
13.00	13.60	0.60	0.52	BLUEDUST+SLO	GREY	67.14	0.63 0.62	
13.60	15.00	1.40	1.20	BLUEDUST+SLO	GREY	67.25	0.65 0.58	
15.00	15.70	0.70	0.60	BLUEDUST+SLO	GREY	67.79	0.60 0.47	
15.70	16.50	0.80	0.69	BLUEDUST+SLO	GREY	66.61	0.72 0.93	
16.50	17.50	1.00	0.86	BLUEDUST+SLO	GREY	67.10	0.70 0.73	
17.50	18.25	0.75	0.65	BLUEDUST+SLO	GREY	67.22	0.71 0.64	
18.25	19.00	0.75	0.65	BLUEDUST+SLO	GREY	65.11	2.51 2.01	
19.00	19.75	0.75	0.65	BLUEDUST+SLO	GREY	67.01	0.64 0.54	
19.75	20.65	0.90	0.77	BLUEDUST+SLO	GREY	67.17	0.69 0.51	
20.65	21.35	0.70	0.60	BLUEDUST+SLO	GREY	68.08	0.64 0.44	
21.35	22.25	0.90	0.77	BLUEDUST+SLO	GREY	67.16	0.69 0.54	
22.25	23.00	0.75	0.65	BLUEDUST+SLO	GREY	66.65	0.83 0.77	
23.00	24.70	1.70	1.46	FERRUGINOUS CLAY	REDDISH BROWN	29.27	1.46 34.17	
24.70	26.10	1.40	1.20	HARD MASSIVE ORE	REDDISH BROWN	43.13	1.57 12.75	WITH CLAY PIECES
26.10	28.00	1.90	1.63	FERRUGINOUS CLAY	LIGHT BROWN	41.51	1.06 15.04	

BOREHOLE NO:MHG-48

DEPTH (M)	THICK- NESS	TRUE THICK- NESS (m)	LITHOLOGY	COLOR DETAILS	Fe %	SiO ₂ %	Al ₂ O ₃ %	REMARKS
FROM	TO	(m)	NESS (m)					
28.00	29.00	1.00	0.86	FERRUGINOUS CLAY	LIGHT BROWN	43.18	1.13	15.04
29.00	31.00	2.00	1.72	FERRUGINOUS CLAY	LIGHT BROWN	37.73	1.61	27.54
31.00	33.90	2.90	2.49	FERRUGINOUS CLAY	LIGHT BROWN	37.44	2.04	29.83
33.90	34.55	0.65	0.56	FERRUGINOUS CLAY	LIGHT BROWN	49.08	1.19	8.41
34.55	36.00	1.45	1.25	FERRUGINOUS CLAY	LIGHT BROWN	45.43	1.08	13.26
36.00	37.20	1.20	1.03	FERRUGINOUS CLAY	LIGHT BROWN	45.17	1.39	9.94
37.20	39.60	2.40	2.06	FERRUGINOUS CLAY	LIGHT BROWN	44.25	1.52	9.94
39.60	41.45	1.85	1.59	FERRUGINOUS CLAY	YELLOWISH BROWN	46.95	1.68	11.47
41.45	42.60	1.15	0.99	FERRUGINOUS CLAY	YELLOWISH BROWN	42.72	1.68	13.77
42.60	43.25	0.65	0.56	FERRUGINOUS CLAY	YELLOWISH BROWN	48.88	1.68	11.47
43.25	44.30	1.05	0.90	FERRUGINOUS CLAY	YELLOWISH BROWN	28.25	20.49	18.52
44.30	45.20	0.90	0.77	FERRUGINOUS CLAY	YELLOWISH BROWN	33.96	15.90	15.64
45.20	46.30	1.10	0.95	FERRUGINOUS SHALE	YELLOWISH BROWN	25.73	19.19	21.12
46.30	47.65	1.35	1.16	FERRUGINOUS CLAY	REDDISH BROWN	26.91	18.98	20.82
47.65	49.00	1.35	1.16	FERRUGINOUS CLAY	REDDISH BROWN	26.64	19.08	20.76
49.00	50.50	1.50	1.29	FERRUGINOUS CLAY	YELLOWISH BROWN	29.11	19.11	19.87
50.50	52.80	2.30	1.98	FERRUGINOUS CLAY	YELLOWISH BROWN	31.56	19.49	18.49
52.80	54.60	1.80	1.55	FERRUGINOUS CLAY	YELLOWISH BROWN	26.12	20.65	19.42
54.60	56.80	2.20	1.89	FERRUGINOUS CLAY	YELLOWISH BROWN	31.36	20.86	16.92
56.80	57.80	1.00	0.86	FERRUGINOUS CLAY	YELLOWISH BROWN	36.16	11.67	11.51
57.80	59.00	1.20	1.03	FERRUGINOUS CLAY	YELLOWISH BROWN	34.50	17.20	14.55
59.00	59.50	0.50	0.43	FERRUGINOUS CLAY	YELLOWISH BROWN	33.95	14.99	13.22
59.50	61.00	1.50	1.29	FERRUGINOUS CLAY	YELLOWISH BROWN	36.61	16.64	14.32
61.00	62.50	1.50	1.29	FERRUGINOUS CLAY	GREY BROWN	37.34	16.39	14.09
62.50	64.00	1.50	1.29	FERRUGINOUS CLAY	GREY BROWN	30.22	19.70	18.81
64.00	65.30	1.30	1.12	FERRUGINOUS CLAY	GREY BROWN	33.91	19.22	17.77
65.30	66.30	1.00	0.86	FERRUGINOUS CLAY	GREY BROWN	24.67	19.37	21.19
66.30	67.50	1.20	1.03	FERRUGINOUS CLAY	GREY BROWN	25.22	19.52	20.82
67.50	68.00	0.50	0.43	FERRUGINOUS CLAY	GREY BROWN	20.99	18.69	23.33
68.00	69.90	1.90	1.63	FERRUGINOUS CLAY	GREY BROWN	20.84	19.14	22.87
69.90	71.20	1.30	1.12	FERRUGINOUS CLAY	GREY BROWN	26.45	19.51	20.20
71.20	72.60	1.40	1.20	LIMONITIC CLAY	YELLOWISH BROWN	14.81	17.93	26.35
72.60	74.00	1.40	1.20	LIMONITIC CLAY	YELLOWISH BROWN	18.94	18.49	24.18

WITH BHQ PIECES
WITH BHQ PIECES

Annexure 6

THE FEASIBILITY REPORT OF MINING OPERATION AT NARASIMHA IRON ORE MINING BLOCK (ML NO 2148) IS FURNISHED AS UNDER

1. GENERAL MINE DESCRIPTION:

Narasimha Iron ore Mining Block (ML No 2148) with an area of 60.66 Ha (as per CEC survey) is falls in Survey of India toposheet No D43E12 (57 A/12), co-ordinates of the ML boundary is given below.

ML corner boundary point	WGS 84	
	Latitude	Longitude
LBC-01	N 15° 02' 34.56274"	E 76° 32' 05.06362"
LBC-02	N 15° 02' 23.77176 "	E 76°31' 53.59217"
LBC-03	N 15° 02'56.30705 "	E 76° 31'23.70140 "
LBC-04	N 15° 03'02.51540"	E 76°31'31.88420 "
LBC-05	N 15° 02'58.78238 "	E 76° 31'43.12497 "

Regional Geology :

The Ballari–Hospet region forms a part of the 'Sandur Schist Belt'. The rock formation belongs to Iron ore stage of Dharwar group of Precambrian schistose rock. The lithological units include green stones which are the metamorphosed basic igneous rocks occupying the valley regions, with Phyllite–quartzite's forming the canoe-shaped amphitheater of hills, trending NNW–SSE and enclosing Sandur. The Phyllites are locally Shaly and the Quartzite's are of the nature of Banded Hematite Jaspers, and Banded Hematite Quartzites, inter banded with each other. The Banded Hematite Jaspers, the important source rocks for the iron ores in the area are prominent in the Northern and Western part of the ranges, whereas the associated Shales become prominent in the Southern and Eastern parts of the area. The iron ores form a capping over the quartzites and Shales and overlie a sequence of Manganiferous Phyllitic rocks.

Lateritisation is widespread in most of the flat topped ridges.

Structurally, the Sandur hills form a tightly folded synclinorium, plunging gently to NNW and the hill ranges broadly delineate the folded limbs of synclines, with close repetition of strata due to minor folds. The strike of the ore bodies is generally parallel to the trend of the hill ranges and dips are often steep, being vertical at number of places. Opposing dips towards NE and SW are found in the Ramandurg and NEB ranges. The iron ore deposits of NEB range from a part of the Ballari-Hospet group of iron ore deposits and occupy the Northern tip of Sandur Synclinorium. These deposits lie on the Northern flanks of Sandur basin.

The general sequences of rock formations found in the area are as given below:

Soil Cover

Laterite/ Lateritised ore

Banded Ferruginous Quartzite/Jasper

Ferruginous shale and Phyllite and

Iron ore formation

The Ballari-Hosapete region covers part of the highly folded and metamorphosed Dharwarian formations (Archean) of the Karnataka State. The hill ranges and contained valleys in the region constitute the "Sandur Synclinorium" with aerial trend of NW-SE to NNW-SSE. The strata have been tightly folded into isoclinal anticlines and synclines in the synclinorium. The weathering and denudation cycles have subsequently carved out valleys in the anticlines and hills in the syncline. The iron ore deposits of Ballari-Hosapete constitute part of Ramanadurg range of the "Sandur Synclinorium". The ore bearing localities, south of Ballari-Hosapete railway line comprises of Ramanadurg, Kumaraswamy, Donimalai, Thimmappanagudi and Devadarigudda sections along the eastern and western regions of the Sandur hills.

Geology of the Mining Block:

Geologically the iron ore deposit at Narasimha Iron Ore Mine belongs to Donimalai

formation. The general strike of the formation is NW to SE and iron ore crop is visible all along the strike length of 1200 m. The width of the deposit varies from 160 m to above 200 m. The dip is 65° to 70° The rock

formations in the mine lease area are as follows:

Laterite mixed with iron ore

Banded Hematite Quartzite (BHQ)

Iron ore reef

Phyllite / Shale

The deposit occurs as a reef (at 45% Fe cut-off). Although there are no structural disturbances observed in the lease area, the recovery of iron ore is 90%. Balance 10% constitutes intercalated waste such as shales/phyllite, BHQ etc.

2. EXPLORATION:

Exploration carried out by MECL:

The drilling was taken up to estimate the iron ore reserves; MECL conducted Diamond Core drilling and RC drilling involving 579.7 m (10 Bhs) and 2701.0 m (38 Bhs). Total 3280.7 m (48 Bhs), 3174 Nos samples were analysed.

The summary of diamond Core drilling boreholes and RC drilling boreholes that have been drilled in grid pattern 100 m X 100 m MECL so far is tabulated below.

Year	No of Boreholes		Total depth		Prospected by
	Core drilling	RC drilling	Core drilling	RC drilling	
2015-16 (February to March 2016)	10	38	579.70	2701.00	MECL

Source: MECL exploration data as provided along with the tender document during e-auction process.

3. RESERVE ASSESSMENT:

- 1) Geological & Net Geological Reserve have been estimated by MECL, bulk density of 3.47 t / Cu.m considered for calculation purpose. Mineable reserves have not been estimated.
- 2) As bulk density assumed in the estimation of reserves is high, considering the nature of the ore characteristics the bulk density considered as 3.47 t/cu.m and 95% recovery of the net geological reserves as mineable by ICFRE, the details of reserves is as tabulated below.

(Quantity in Million Tones)

Category	UNFC Code	Geological Reserves (MECL)	Net Geological Reserves (90% Geological Reserves by MECL)	Mineable reserves at 95% recovery
Proved	111	68.37	61.53	58.45
Probable	122	2.00	1.8	1.71
	Total	70.37	63.33	60.16
	Grade		Wt. Avg. 58.84%	

Based on the detailed exploration data conducted by MECL, 50 m on either side of the iron ore intersection of the borehole has been placed under (111), the next 50 m under (122). However, based on geological inference and the behavior of the iron ore formations an influence of 10-15 m along the down depth has been estimated and placed under (121) category of UNFC.

3) Based on the MECL data MSPL Limited has been reclassified the reserves / resources and estimated. By considering the MECL sections the area where the bore holes are drilled at 100 m interval, the reserves are categorized as proved reserves (111) to the lowest depth, beyond that lowest depth the reserves are categorized as probable reserves (121 & 122). Some reserves are beyond ultimate pit limit and are categorized as measured mineral resources (211). Some of the reserves are beyond the ultimate pit limit and beyond the proved depth area categorized as Inferred Mineral Resources (333). The reserves / resources calculation by cross section method, category wise are reclassified as on 01-06-2019 (under UNFC Category).

	UNFC Code	Quantity in million tons	Grade % Fe
A. Total Mineral Reserve			At 45% Fe Cut-off
Proved Mineral Reserve	111	47.43	
Probable Mineral Reserve	121 and 122	0.96	
Sub Total		48.40	
B. Total Remaining Resources			
Feasibility Mineral Resource	211	14.12	
Prefeasibility Mineral Resource	221 and 222	-	
Measured Mineral Resource	331	-	
Indicated Mineral Resource	332	-	
Inferred Mineral Resource	333	0.81	
Reconnaissance Mineral Resource	334	-	
Sub Total		14.93	
Total Reserve (111) + Resources(211+333)		63.33	

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

Hematitic Silicious Ore are characterising by alternate bands of hematite and silicious material, BHQ are originated in mid-oceanic condition/transition zones, by volcanic eruption process, it indicates it is a hard rock/BHQ.

As per the prepared borehole data, longitudinal & vertical sections and analysis report the depth persistent of litho-logies are varies. The deeper boreholes cross sections analysis indicates the percentage of silica content is increasing and hardness of BHQ rock is also increased.

After plotting the ore body in LV section, it indicates depth persistent of litho-logs varies, due to considering these geological, lithological & analytical results. Based on the geological setup of the ore body the iron ore analysis +35%Fe to 45%Fe is meagerly and not consistent so that, we have not assessed / calculated Heamatatic Siliceous Iron Ore.

4. PRODUCTION SCHEDULE:

The updated category wise reserves and resources as on 01-06-2019 is 48.40 MMT and 14.93 MMT respectively. However at the present rate of production capacity 0.77 MTPA, the life of the mine will be 63 years. Whereas LOI issued has been for period of 50 years.

5. MINING METHOD:

The existing geometry of the benches are irregular, it is proposed to maintain the height of the bench is 10 m and width of bench will be more than 10 m with road gradient maintained at 1:16. Pit slope angle will be at 36° to 45° and bench slope angle will be 70°. It will be maintained as per statutory requirement, the benches are being providing with connecting ramps which is having the gradient 1:16 with hair pin curves and in cases where the bench to bench connection at the bottom/face, the gradient is 1:10 will be mentioned for a distance of not exceeding 100 m as per the statutory requirements.

Narasimha Iron Ore Mine is being operated by open cast mining method with high mechanization comprising of hydraulic excavators and dumpers combinations. It is proposed to work fully mechanized method of operations. The present RL minimum m RL is 905 and maximum m RL is 980, The advance of benches will be extended towards north west to south east making pits during the first five year period.

It is proposed to work between coordinates E 663700 to 664980 N 1663400 to 1664500 for five year plan period.

Narasimha Iron Ore Mine is being operated by open cast mining method with high mechanization comprising of hydraulic excavators and dumpers combinations. There is no change in proposal method of excavation.

For the conceptual period it is proposed the height and width of the benches are about 10 m, with haul road width more than 10 m with gradient maintained at 1:16. Pit slope angle is maintained at 36° to 45° and bench slopes are 70°. To win the blocked ore 14.12 MMT under 211 category additional area is required, accordingly we are requesting the state government in future.

Estimation of ore and waste is calculated up to the life of the mine. The ore to overburden tonnage ratio is 1:0.29. Processed ore will be dispatched to MSPL Pellet Plant for its captive use.

6. BENEFICIATION:

Processing of ROM: Mobile crushing and screening plant (150 TPH) – 2Nos

ROM comes to the crushing & screening plant through the trucks and gets delivered to grizzly. Oversize of grizzly flows directly to one number jaw crusher. Jaw crusher product passes through one triple deck screen (40, 20, 10 mm opening), with the lowest deck as 10 mm. -10 mm material from this screen is diverted to product stockpile, whereas the -20+10mm goes to one number tertiary crusher. +20 mm material goes to one number secondary crusher. The product of secondary crusher goes to same triple deck screen and follows path as described above.

Product of tertiary crusher goes to one vibrating screening of 10 mm. -10 mm material reports to the product stockpile, whereas +10mm material goes back to tertiary crusher. Thus product of 100% -10mm is produced out of the crushing and screening plant. The product which is coming out from crushers will be loaded to the Tippers / Dumpers and it will be transported and unloaded in to the designated stock piles. The external tippers will utilised for the dispatch of products from stock piles/Crushers.

There is no beatification process at mine site.

7. MARKETING:

The total ROM ore produced from this mine will be crushed and screened the ore will be dispatched to MSPL Pellet Plant for its captive use. Physical specification of ore is 100% -10 mm, the chemical composition of processed ore at 45% Fe cut-off grade with Wt. Avg. 54.76% Fe for the five plan period.

The present sale prize for calibrated ore, below 55% Fe is Rs 1463/- per ton and fines Rs. 1079/- per ton on the basis of information of IBM for the month of May 2019.

8. INFRASTRUCTURE:

The mining lease is located in Kumaraswamy Reserve forest, Dharmapur village, Sandur taluk, Ballari district, Karnataka state.

Major site services are proposed at the mine for workshop, store, electric sub station, first aid room, water quality, canteen, mine office, HSD layout, computer section. The manpower employed at Narasimha Iron ore

mining block for mining and related operations is 195 (Highly Skilled - 50, Skilled-70, Semi-Skilled -55, Un-Skilled- 20) and 28 statutory requirement.

9. ENVIRONMENTAL REQUIREMENTS:

The mining block has environmental clearance. The Mining Plan (including Progressive mine closure plan) to be obtained from Indian Bureau of Mines, Bengaluru, and consent for operation from SPCB. The final mine closure plan will be submitted at the time of final closure. The reclamation and rehabilitation plans were prepared by ICFRE and approved by CEC. The annual capacity of the production is 0.77 MTPA fixed by CEC.

10. OTHERS LIKE LEGAL FACTORS LIKE TRIBAL ISSUES, NATIONAL PARKS ETC.,:

Nil.

11. ECONOMIC EVALUATION:

Budget for Proposed Mining				
Activities	Areas of investment	Method of Calculation	Basics	Expenses (In Lakh Rs.)
Capital Investment				4246.55
I	Land			1011.90
a	Land cost expenditure	Rs 15.60 Lakh / Ha. For forest land	Area: 64.86 Ha. Forest land (ML area & road)	1011.90
b	Cost on relief and rehabilitation action plan		Rehabilitation not required	0.00
c.	compensation to the land outstees		No land outstees	0.00
d.	Cost of acquiring surface Rights		Not required as it is Forest land	0.00
II.	Mining			2380.00
a.	Cost of Infrastructure & equipments		Mechanized mining	2380.00

III.	Environmental protection			799.65
a.	Pollution Control (check dam, gully plug, settling tanks, water tanker, etc.)			
	Garland Drain			799.65
	Retaining Walls			
	Settling ponds			
	Plantation, Terrecing			
	Water Tanker			
	Bund with stone boulders			
	Masonary check dam			
	Gully plugs			
	Reclaming area under encroachment			
IV.	Socio-economic development			50
a.	Infrastructure development (Edu, Medical, etc)			
i.	Educational facilities	Free Scholarship for higher education in the buffer zone		15
ii.	Medical facilities	Health check up of villagers villages in buffer zone & workers		10
iii.	Others			5
b.	Income Generation Activities	Financial support for interest free loans	Financial Support to SHG	20
V.	Occupational Health & Safety			5
a.	Infrastructure & PPEs			5
VI	Payment to Govenment-Auction Charges			10381.09
a	Stamp duty for Registrtion of MDPA			2889.29

b	Payments regarding Exploration,DGPS survey & RR preparation,etc		804.62
c	Upfront Paymnet including all installments		6687.17
	Total Capital Investment		14627.64
			Say Rs. 14627 lakhs

Budget for Proposed Mining					
Activities	Areas of investment	Method of Calclation	Basics	Expenses (In Lakh Rs.)	Cost per tonne in Rs.
Recurring Expenditure				3,555.00	461.69
I	Mining				
a.	Expenditure for infrastructure and equipment maintenance		15 % of direct investment for infrastructure & maintenance	357.00	46.36
b.	Mining of ore and waste	Rs. Per ton	Rs. 170 / ton	1,309.00	170.00
c.	Salaries & Wages of 141staffs	No of workers X Wages	Rs. 1,40,777/- per Annum	198.50	25.78
d.	Royalty on mineral & miscellaneous	Rs. Per ton	Royalty 15% on Sale Price, NMET -2% on Royalty	1,271.17	165.09
ii.	Socio-economic development -DMF- 10% on royalty			124.62	16.19
a.	Crop Damage Compensation				0.00
b.	Corporate Social Responsibility	Payment to SPV -10% on sale Value /DMF 10% on Royalty			0.00
c.	Income Generation Activities				0.00
d.	Community Health checkup				0.00

iii.	Occupational Health & Safety				0.00
a.	For routine checkup	141 persons X per annum	Budget Rs.2000/- per annum per employee	2.82	0.37
b.	Medical aid as under ESI scheme		Rs.2544/- per annum per employee	3.59	0.47
c.	Budget for training		per year	10.00	1.30
d.	Compensation for accident and injuries	Rs. 100,000 X Anticipated rate of injuries (No of workers)	Anticipated rate of Injury : 1%	1.41	0.18
iv.	Environment Management				0.00
a.	Maintenance of Pollution control Facilities		30 % Capital Investment	239.90	31.16
b.	Dust Suppression & Pollution Control			12.00	1.56
c.	Environmental Monitoring			15.00	1.95
d.	Environmental division			10.00	1.30
	Total Recurring Expenditure			3,555.00	461.69
				Say Rs. 462 / -	

Capital investment including Pre -emptive expenses:		4246.55	Lakhs
Capital investment for Mining and Environmental Management:		3234.65	Lakhs
(Environmental controle,social development etc)			
Consideration of per tonne Working cost as on date is given below			
Recurring cost (Rs/MT)		Rs/tonne	
Expenditure on cost of Mining		242.14	
Expenditure for Socio-economic development		16.19	
Expenditure for Occupational Health and safety		2.31	
Expenditure for Environmental Management		35.96	
Expenditure on royalty ,DMF,NMET		165.09	
Total		461.69	
Value of Mineral at pit head	Rs/tonne	1079.00	
Lessee has to pay 129.90% on sale price as auction money	Rs/tonne	1401.621	
Summary of Viability:			
Expenditure calculated at Working cost Rs 461.69/- per tonne and Revenue at Rs 1079 /-per tonne,IRR found for 20 years is 20%. Hence this project is viable.			
Considerations:			
1.Sale price of Iron ore lumps & fines considered as per the IBM inputs, May '2019 data			
2. Below 55% fe lumps cost- Rs 1463/- per tonne			1463
3. 55% fe Fines cost-Rs 1079/- per tonne			1079
4. Considered dispatch of 100% fines for our captive plant			

S. SHIVAKUMAR

M.Sc.Geology

AGM (Exploration)

NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED
(ERSTWHILE LESSEE OF Sri. H.G.RANGANGOUD (ML.No.2148)

ESTIMATION OF ORE RESERVES / RESOURCES at 45% Fe cut off AS ON 01-06-2019 (AS PER MECL BULK DENSITY 3.47 T/M3 AND 90% OF GEOLOGICAL RESERVES)

SECTION	AREA (Sq.m)					SECTIONAL INFLU	VOLUME (Cu.m)					TONNAGE (Bulk Density-3.47 t/Cu.m)					
	111	122	211	333	TOTAL		111	122	211	333	TOTAL	111	122	211	333	TOTAL	90 % Recovery
S-1	599	0	782	94	1475	88.00	52712	0	68816	8272	129800	182911	0	238792	28704	450406	405365
S-2	7795	0	1295	0	9090	101.20	788854	0	131054	0	919908	2737323	0	454757	0	3192081	2872873
S-3	7731	0	349	0	8080	102.30	790881	0	35703	0	826584	2744358	0	123888	0	2868246	2581422
S-4	11277	0	673	0	11950	98.40	1109657	0	66223	0	1175880	3850509	0	229795	0	4080304	3672273
S-5	5234	0	1780	0	7014	99.10	518689	0	176398	0	695087	1799852	0	612101	0	2411953	2170758
S-6	8074	0	2084	0	10158	100.00	807405	0	208400	0	1015805	2801695	0	723148	0	3524843	3172359
S-7	17264	0	5186	0	22450	102.00	1760928	0	528972	0	2289900	6110420	0	1835533	0	7945953	7151358
S-8	21048	0	6248	0	27296	100.20	2109010	0	626050	0	2735059	7318263	0	2172392	0	9490655	8541590
S-9	20411	0	7523	2483	30417	101.50	2071717	0	763585	252025	3087326	7188856	0	2649638	874525	10713019	9641718
S-10	8772	3142	3294	0	15208	98.10	860533	308230	323141	0	1491905	2986050	1069559	1121301	0	5176910	4659219
S-11	13265	0	1469	0	14734	98.30	1303950	0	144403	0	1448352	4524705	0	501077	0	5025782	4523204
S-12	18757	0	7400	0	26157	104.00	1950728	0	769600	0	2720328	6769026	0	2670512	0	9439538	8495584
S-13	9913	0	6330	0	16243	107.30	1063665	0	679209	0	1742874	3690917	0	2356855	0	6047772	5442995
TOTAL	150140	3142	44413	2577	200272	1300.40	15188728	308230	4521553	260297	20278808	52704887	1069559	15689789	903229	70367464	63330717
											90 % Recovery	47434398	962603	14120810	812906	63330717	

SECTION	IN MILLION TONS							Weighted Average Grade %		
	RESERVES			RESOURCES			GRAND TOTAL	Fe	SiO2	Al2O3
	111	122	TOTAL	211	333	TOTAL				
S-1	0.16	0.00	0.16	0.21	0.03	0.24	0.41	58.48	4.49	4.51
S-2	2.46	0.00	2.46	0.41	0.00	0.41	2.87	58.64	10.54	2.14
S-3	2.47	0.00	2.47	0.11	0.00	0.11	2.58	56.46	12.08	3.61
S-4	3.47	0.00	3.47	0.21	0.00	0.21	3.67	54.23	16.42	3.71
S-5	1.62	0.00	1.62	0.55	0.00	0.55	2.17	55.23	15.39	2.64
S-6	2.52	0.00	2.52	0.65	0.00	0.65	3.17	57.26	10.65	3.97
S-7	5.50	0.00	5.50	1.65	0.00	1.65	7.15	63.80	3.23	2.54
S-8	6.59	0.00	6.59	1.96	0.00	1.96	8.54	61.26	4.29	3.79
S-9	6.47	0.00	6.47	2.38	0.79	3.17	9.64	58.35	6.58	4.57
S-10	2.69	0.96	3.65	1.01	0.00	1.01	4.66	60.49	5.86	2.63
S-11	4.07	0.00	4.07	0.45	0.00	0.45	4.52	53.14	6.69	8.46
S-12	6.09	0.00	6.09	2.40	0.00	2.40	8.50	59.88	2.91	4.79
S-13	3.32	0.00	3.32	2.12	0.00	2.12	5.44	57.82	3.43	6.37
TOTAL	47.43	0.96	48.40	14.12	0.81	14.93	63.33	58.84	6.54	4.25

RESERVES / RESOURCES		
UNFC CODE	In Tons	In Million Tons
111	47434398	47.43
121 & 122	962603	0.96
TOTAL	48397001	48.40
211	14120810	14.12
333	812906	0.81
TOTAL	14933716	14.93
GRAND TOTAL	63330717	63.33

NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED
(ERSTWHILE LESSEE OF Sri. H.G.RANGANGOUD (ML.No.2148)

ESTIMATION OF WASTE

SECTION	AREA (Sq.m)			SECTIONAL INFLU	VOLUME (Cu.m)					TONNAGE (Bulk Density-2.00 t/Cu.m)				
	Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated	TOTAL	Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated	TOTAL
S-1	0	0	148	88.00	0	0	13024	5271	18295	0	0	26048	10542	36590
S-2	442	0	313	101.20	44730	0	31676	78885	155291	89461	0	63351	157771	310583
S-3	0	0	1221	102.30	0	0	124908	79088	203996	0	0	249817	158176	407993
S-4	1344	1278	1696	98.40	132250	125755	166886	110966	535857	264499	251510	333773	221931	1071714
S-5	2024	3473	1032	99.10	200578	344174	102271	51869	698893	401157	688349	204542	103738	1397786
S-6	905	4149	2108	100.00	90500	414900	210800	80741	796941	181000	829800	421600	161481	1593881
S-7	244	4290	0	102.00	24888	437580	0	176093	638561	49776	875160	0	352186	1277122
S-8	797	2209	0	100.20	79859	221342	0	210901	512102	159719	442684	0	421802	1024204
S-9	2098	765	0	101.50	212947	77648	0	207172	497766	425894	155295	0	414343	995532
S-10	1704	4536	0	98.10	167162	444982	0	116876	729020	334325	889963	0	233753	1458041
S-11	2907	1898	1060	98.30	285758	186573	104198	130395	706924	571516	373147	208396	260790	1413849
S-12	4515	711	0	104.00	469560	73944	0	195073	738577	939120	147888	0	390146	1477154
S-13	6126	0	0	107.30	657320	0	0	106366	763686	1314640	0	0	212733	1527373
TOTAL	23106	23309	7578	1300.40	2365553	2326898	753764	1549696	6995910	4731106	4653796	1507527	3099392	13991820
SUMMARY														
PARTICULAR		ORE		DEVELOPMENT		RATIO								
TONNAGE		48397001		13991820		0.29								
VOLUMETRIC		18250927		6995910		0.38								
TONS / CU.M		48397001		6995910		0.14								

ANNEXURE - 8 (A)

NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED, ML.No.2148 (ERSTWHILE LESSEE OF Sri. H.G.RANGAN GOUD)
DEVELOPMENT & PRODUCTION FOR THE 1 ST YEAR

ORE

SECTION	AREA (Sq.m)	SECTIONAL INFLU	VOLUME (Cu.m) 90% Recoveary	TONNAGE (Bulk Density- 3.47 t/Cu.m)	At 45% Cut- off Grade		
					Fe	SiO2	Al2O3
S-1	599	88.00	47441	164620	59.90	5.30	3.57
S-2	1319	101.20	120107	416771	55.02	13.10	2.17
S-3	0	102.30	0	0	0.00	0.00	0.00
S-4	0	98.40	0	0	0.00	0.00	0.00
S-5	0	99.10	0	0	0.00	0.00	0.00
S-6	0	100.00	0	0	0.00	0.00	0.00
S-7	0	102.00	0	0	0.00	0.00	0.00
S-8	0	100.20	0	0	0.00	0.00	0.00
S-9	0	101.50	0	0	0.00	0.00	0.00
S-10	0	98.10	0	0	0.00	0.00	0.00
S-11	352	98.30	31141	108061	49.48	1.99	11.80
S-12	248	104.00	23213	80548	47.50	4.17	12.86
S-13	0	107.30	0	0	0.00	0.00	0.00
TOTAL	2518		221902	770000	54.50	8.94	4.94

DEVELOPMENT

SECTION	AREA (Sq.m)			SECTIONAL INFLU	VOLUME (Cu.m)				TOTAL	TONNAGE (Bulk Density-2.00 t/Cu.m)					TOTAL
	Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated		
S-1	148	0	0	88.00	13024	0	0	5271	18295	26048	0	0	10542	36590	
S-2	0	0	0	101.20	0	0	0	13345	13345	0	0	0	26690	26690	
S-3	0	0	0	102.30	0	0	0	0	0	0	0	0	0	0	
S-4	0	0	0	98.40	0	0	0	0	0	0	0	0	0	0	
S-5	0	0	0	99.10	0	0	0	0	0	0	0	0	0	0	
S-6	0	0	0	100.00	0	0	0	0	0	0	0	0	0	0	
S-7	0	0	0	102.00	0	0	0	0	0	0	0	0	0	0	
S-8	0	0	0	100.20	0	0	0	0	0	0	0	0	0	0	
S-9	0	0	0	101.50	0	0	0	0	0	0	0	0	0	0	
S-10	0	0	0	98.10	0	0	0	0	0	0	0	0	0	0	
S-11	10	0	0	98.30	983	0	0	3460	4443	1966	0	0	6920	8886	
S-12	0	0	0	104.00	0	0	0	2579	2579	0	0	0	5158	5158	
S-13	90	0	0	107.30	9657	0	0	0	9657	19314	0	0	0	19314	
TOTAL	248	0	0		23664	0	0	24656	48320	47328	0	0	49312	96640	

SUMMARY			ORE TO OB RATIO
PARTICULAR	ORE	DEVELOPMENT	
TONNAGE	770000	96640	
VOLUMETRIC	221902	48320	
TONS / CU.M	770000	48320	0.06

NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED, ML.No.2148 (ERSTWHILE LESSEE OF Sri. H.G.RANGAN GOUD)
DEVELOPMENT & PRODUCTION FOR THE 2 ND YEAR

ORE

SECTION	AREA (Sq.m)	SECTIONAL INFLU	VOLUME (Cu.m) 90% Recoveary	TONNAGE (Bulk Density- 3.47 t/Cu.m)	At 45% Cut- off Grade		
					Fe	SiO2	Al2O3
S-1	0	88.00	0	0	0.00	0.00	0.00
S-2	1244	101.20	113301	393156	55.56	13.36	1.86
S-3	467	102.30	42996	149195	50.09	22.87	2.45
S-4	0	98.40	0	0	0.00	0.00	0.00
S-5	0	99.10	0	0	0.00	0.00	0.00
S-6	0	100.00	0	0	0.00	0.00	0.00
S-7	0	102.00	0	0	0.00	0.00	0.00
S-8	0	100.20	0	0	0.00	0.00	0.00
S-9	0	101.50	0	0	0.00	0.00	0.00
S-10	271	98.10	23927	83025	53.74	3.34	4.94
S-11	235	98.30	20790	72143	59.30	1.23	5.23
S-12	223	104.00	20888	72481	57.16	2.27	7.06
S-13	0	107.30	0	0	0.00	0.00	0.00
TOTAL	2440		221902	770000	54.81	11.94	3.11

DEVELOPMENT

SECTION	AREA (Sq.m)			SECTIONAL INFLU	VOLUME (Cu.m)				TOTAL	TONNAGE (Bulk Density-2.00 t/Cu.m)					TOTAL
	Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated		
S-1	0	0	0	88.00	0	0	0	0	0	0	0	0	0	0	
S-2	109	0	0	101.20	11031	0	0	12589	23620	22062	0	0	25178	47240	
S-3	0	0	5	102.30	0	0	512	4777	5289	0	0	1023	9555	10578	
S-4	0	0	0	98.40	0	0	0	0	0	0	0	0	0	0	
S-5	0	0	0	99.10	0	0	0	0	0	0	0	0	0	0	
S-6	0	0	0	100.00	0	0	0	0	0	0	0	0	0	0	
S-7	0	0	0	102.00	0	0	0	0	0	0	0	0	0	0	
S-8	0	0	0	100.20	0	0	0	0	0	0	0	0	0	0	
S-9	0	0	0	101.50	0	0	0	0	0	0	0	0	0	0	
S-10	0	0	0	98.10	0	0	0	2659	2659	0	0	0	5317	5317	
S-11	0	0	0	98.30	0	0	0	2310	2310	0	0	0	4620	4620	
S-12	0	0	0	104.00	0	0	0	2321	2321	0	0	0	4642	4642	
S-13	109	0	0	107.30	11696	0	0	0	11696	23391	0	0	0	23391	
TOTAL	218	0	5		22727	0	512	24656	47894	45453	0	1023	49312	95788	

SUMMARY			ORE TO OB RATIO
PARTICULAR	ORE	DEVELOPMENT	
TONNAGE	770000	95788	0.12
VOLUMETRIC	221902	47894	0.22
TONS / CU.M	770000	47894	0.06

ANNEXURE - 8 (C)

NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED, ML.No.2148 (ERSTWHILE LESSEE OF Sri. H.G.RANGAN GOUD)
DEVELOPMENT & PRODUCTION FOR THE 3 RD YEAR

ORE

SECTION	AREA (Sq.m)	SECTIONAL INFLU	VOLUME (Cu.m) 90% Recoveary	TONNAGE (Bulk Density- 3.47 t/Cu.m)	At 45% Cut- off Grade		
					Fe	SiO2	Al2O3
S-1	0	88.00	0	0	0.00	0.00	0.00
S-2	1086	101.20	98910	343219	59.69	7.94	1.72
S-3	728	102.30	67027	232584	52.65	19.82	2.12
S-4	0	98.40	0	0	0.00	0.00	0.00
S-5	0	99.10	0	0	0.00	0.00	0.00
S-6	0	100.00	0	0	0.00	0.00	0.00
S-7	0	102.00	0	0	0.00	0.00	0.00
S-8	0	100.20	0	0	0.00	0.00	0.00
S-9	370	101.50	33800	117284	50.66	4.65	5.56
S-10	251	98.10	22165	76913	46.37	4.53	6.30
S-11	0	98.30	0	0	0.00	0.00	0.00
S-12	0	104.00	0	0	0.00	0.00	0.00
S-13	0	107.30	0	0	0.00	0.00	0.00
TOTAL	2435		221902	770000	54.86	10.69	2.88

DEVELOPMENT

SECTION	AREA (Sq.m)			SECTIONAL INFLU	VOLUME (Cu.m)				TOTAL	TONNAGE (Bulk Density-2.00 t/Cu.m)					TOTAL
	Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated		
S-1	0	0	0	88.00	0	0	0	0	0	0	0	0	0	0	
S-2	123	0	0	101.20	12448	0	0	10990	23438	24895	0	0	21980	46875	
S-3	0	0	90	102.30	0	0	9207	7447	16654	0	0	18414	14895	33309	
S-4	0	0	0	98.40	0	0	0	0	0	0	0	0	0	0	
S-5	0	0	0	99.10	0	0	0	0	0	0	0	0	0	0	
S-6	0	0	0	100.00	0	0	0	0	0	0	0	0	0	0	
S-7	0	0	0	102.00	0	0	0	0	0	0	0	0	0	0	
S-8	0	0	0	100.20	0	0	0	0	0	0	0	0	0	0	
S-9	21	0	0	101.50	2132	0	0	3756	5887	4263	0	0	7511	11774	
S-10	0	0	0	98.10	0	0	0	2463	2463	0	0	0	4926	4926	
S-11	0	0	0	98.30	0	0	0	0	0	0	0	0	0	0	
S-12	0	0	0	104.00	0	0	0	0	0	0	0	0	0	0	
S-13	0	0	0	107.30	0	0	0	0	0	0	0	0	0	0	
TOTAL	144	0	90		14579	0	9207	24656	48442	29158	0	18414	49312	96884	

SUMMARY			ORE TO OB RATIO
PARTICULAR	ORE	DEVELOPMENT	
TONNAGE	770000	96884	
VOLUMETRIC	221902	48442	
TONS / CU.M	770000	48442	0.06

**NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED, ML.No.2148 (ERSTWHILE LESSEE OF Sri. H.G.RANGAN GOUD)
DEVELOPMENT & PRODUCTION FOR THE 4 TH YEAR**

ORE

SECTION	AREA (Sq.m)	SECTIONAL INFLU	VOLUME (Cu.m) 90% Recoveary	TONNAGE (Bulk Density- 3.47 t/Cu.m)	At 45% Cut- off Grade		
					Fe	SiO2	Al2O3
S-1	0	88.00	0	0	0.00	0.00	0.00
S-2	1246	101.20	113483	393787	58.65	8.01	1.67
S-3	177	102.30	16296	56548	62.23	5.22	1.97
S-4	0	98.40	0	0	0.00	0.00	0.00
S-5	0	99.10	0	0	0.00	0.00	0.00
S-6	0	100.00	0	0	0.00	0.00	0.00
S-7	0	102.00	0	0	0.00	0.00	0.00
S-8	0	100.20	0	0	0.00	0.00	0.00
S-9	576	101.50	52599	182520	50.18	5.34	5.98
S-10	82	98.10	7240	25122	46.37	4.53	6.30
S-11	20	98.30	1769	6140	43.92	1.57	15.45
S-12	326	104.00	30514	105882	47.50	4.19	12.86
S-13	0	107.30	0	0	0.00	0.00	0.00
TOTAL	2427		221902	770000	54.85	6.48	4.51

DEVELOPMENT

SECTION	AREA (Sq.m)			SECTIONAL INFLU	VOLUME (Cu.m)				TOTAL	TONNAGE (Bulk Density-2.00 t/Cu.m)				TOTAL
	Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated	
S-1	0	0	0	88.00	0	0	0	0	0	0	0	0	0	0
S-2	71	0	0	101.20	7185	0	0	12609	19794	14370	0	0	25219	39589
S-3	0	0	0	102.30	0	0	0	1811	1811	0	0	0	3621	3621
S-4	0	0	0	98.40	0	0	0	0	0	0	0	0	0	0
S-5	0	0	0	99.10	0	0	0	0	0	0	0	0	0	0
S-6	0	0	0	100.00	0	0	0	0	0	0	0	0	0	0
S-7	0	0	0	102.00	0	0	0	0	0	0	0	0	0	0
S-8	0	0	0	100.20	0	0	0	0	0	0	0	0	0	0
S-9	0	0	0	101.50	0	0	0	5844	5844	0	0	0	11689	11689
S-10	65	0	0	98.10	6377	0	0	804	7181	12753	0	0	1609	14362
S-11	0	23	0	98.30	0	2261	0	197	2458	0	4522	0	393	4915
S-12	0	0	0	104.00	0	0	0	3390	3390	0	0	0	6781	6781
S-13	0	0	0	107.30	0	0	0	0	0	0	0	0	0	0
TOTAL	136	23	0		13562	2261	0	24656	40478	27123	4522	0	49312	80957

SUMMARY				ORE TO OB RATIO
PARTICULAR	ORE	DEVELOPMENT		
TONNAGE	770000	80957	0.11	
VOLUMETRIC	221902	40478	0.18	
TONS / CU.M	770000	40478	0.05	

**NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED, ML.No.2148 (ERSTWHILE LESSEE OF Sri. H.G.RANGAN GOUD)
DEVELOPMENT & PRODUCTION FOR THE 5 TH YEAR**

ORE

SECTION	AREA (Sq.m)	SECTIONAL INFLU	VOLUME (Cu.m) 90% Recoveary	TONNAGE (Bulk Density- 3.47 t/Cu.m)	At 45% Cut- off Grade		
					Fe	SiO2	Al2O3
S-1	0	88.00	0	0	0.00	0.00	0.00
S-2	1240	101.20	112938	391894	59.02	7.42	1.68
S-3	331	102.30	30475	105749	55.27	15.92	2.05
S-4	0	98.40	0	0	0.00	0.00	0.00
S-5	0	99.10	0	0	0.00	0.00	0.00
S-6	0	100.00	0	0	0.00	0.00	0.00
S-7	0	102.00	0	0	0.00	0.00	0.00
S-8	0	100.20	0	0	0.00	0.00	0.00
S-9	617	101.50	56399	195706	48.91	5.23	7.46
S-10	0	98.10	0	0	0.00	0.00	0.00
S-11	0	98.30	0	0	0.00	0.00	0.00
S-12	236	104.00	22090	76651	47.50	4.17	12.86
S-13	0	107.30	0	0	0.00	0.00	0.00
TOTAL	2424		221902	770000	54.79	7.71	4.31

DEVELOPMENT

SECTION	AREA (Sq.m)			SECTIONAL INFLU	VOLUME (Cu.m)				TOTAL	TONNAGE (Bulk Density-2.00 t/Cu.m)				TOTAL
	Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated		Fer. Shale / Clay / Shaly Ore / Limonatic Shale	BHQ / Altered BHQ	BMQ / Magnetitic ore	10% Waste Intercalated	
S-1	0	0	0	88.00	0	0	0	0	0	0	0	0	0	0
S-2	94	0	38	101.20	9513	0	3846	12549	25907	19026	0	7691	25097	51814
S-3	0	0	103	102.30	0	0	10537	3386	13923	0	0	21074	6772	27846
S-4	0	0	0	98.40	0	0	0	0	0	0	0	0	0	0
S-5	0	0	0	99.10	0	0	0	0	0	0	0	0	0	0
S-6	0	0	0	100.00	0	0	0	0	0	0	0	0	0	0
S-7	0	0	0	102.00	0	0	0	0	0	0	0	0	0	0
S-8	0	0	0	100.20	0	0	0	0	0	0	0	0	0	0
S-9	0	0	0	101.50	0	0	0	6267	6267	0	0	0	12533	12533
S-10	0	0	0	98.10	0	0	0	0	0	0	0	0	0	0
S-11	0	0	0	98.30	0	0	0	0	0	0	0	0	0	0
S-12	0	0	0	104.00	0	0	0	2454	2454	0	0	0	4909	4909
S-13	0	0	0	107.30	0	0	0	0	0	0	0	0	0	0
TOTAL	94	0	141		9513	0	14383	24656	48551	19026	0	28765	49312	97102

SUMMARY				ORE TO OB RATIO
PARTICULAR	ORE	DEVELOPMENT		
TONNAGE	770000	97102	0.13	
VOLUMETRIC	221902	48551	0.22	
TONS / CU.M	770000	48551	0.06	

Annexure - 9(a)

NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED, ML.No.2148 (ERSTWHILE LESSEE OF Sri. H.G.RANGAN GOUD)				
RECLAMATION & REHABILITATION MEASURES TO BE TAKEN FOR THE FIRST YEAR				
ITEMS	DETAILS	PROPOSED AREA (Ha)	PROPOSED QUANTITY	PROPOSED EXPENDITURE (LACS)
1	2	3	4	5
RECLAMATION & REHABILITATION OF MINED OUT PIT/LAND/AREA	(i) Backfilling	-	-	0
	(ii) Afforestation on backfilled area	-	-	0
	(iii) Others (Please specify) e.g. Afforestation on exhausted benches	-	-	0
	(iv) Pisciculture	-	-	0
	(v) Converting into water reservoir	-	-	0
	(vi) Picnic spot	-	-	0
STABILIZATION & REHABILITATION OF DUMPS (within & Out side lease)	(i) Terracing	7 Ha	7 Ha	14.00
	(ii) Pitching	-	-	0
	(iii) Construction of Parapet Wall / Retaining Wall at the toe of dumps (including foundation,PCC , toe walls & Garlan drainage etc...)	-	Toewall-1223 mts, Garland drainage-383 mts	22.16
	iv)Garland drainage along the road	4090 mt	4090 mt	6.81
	(iv) Construction of Check dams along slope of vallies etc. (SMCD,LBCD,LWCD,BWCD,GCD etc...)	-	SMCD-1,LBCD-7,GCD-2,	11.96
	(v) Construction of Settling ponds (SST,ST,RWHP etc.)	-	-	0.00
	(vi) Desilting of Settling ponds, channels	-	-	0
	(vii) Afforestation on dumps			
	(viii) others (Coir- Matting)	7 Ha	7 Ha	70
REHABILITATION OF BARREN AREA (Out side lease)	(i) Afforestation (Green belt building in Ha)	1.285 Ha	1.285 Ha	3.31
	(ii) others (Road Plantation in KM)	1.53 KM	1.53KM	1.2
	Mining pit area			
	Others (CEC area)	7.22 Ha	7.22 Ha	12.56
ENVIRONMENTAL MONITORING (Core zone)	(i) Ambient Air Quality	-	4 stations	5.00
	(ii) Water Quality	-	4 stations	
	(iii) Noise level data	-	4 stations	
	(iv) Ground Vibration	-		0
	(v) Others (Please Specify)	-		0
ENVIRONMENTAL MONITORING (Buffer zone)	(i) Ambient Air Quality	-	4 stations	5.00
	(ii) Water Quality	-	4 stations	
	(iii) Noise level data	-	4 stations	
	(iv) Ground Vibration	-	-	0
	(v) Others (Please Specify)	-	-	0
Total				151.99

Annexure - 9(b)

NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED, ML.No.2148 (ERSTWHILE LESSEE OF Sri. H.G.RANGAN GOUD)				
RECLAMATION & REHABILITATION MEASURES TO BE TAKEN FOR THE SECOND YEAR				
ITEMS	DETAILS	PROPOSED AREA (Ha)	PROPOSED QUANTITY	PROPOSED EXPENDITURE (LACS)
1	2	3	4	5
RECLAMATION & REHABILITATION OF MINED OUT PIT/LAND/AREA	(i) Backfilling	-	-	0
	(ii) Afforestation on backfilled area	-	-	0
	(iii) Others (Please specify) e.g. Afforestation on exhausted benches	-	-	0
	(iv) Pisciculture	-	-	0
	(v) Converting into water reservoir	-	-	0
	(vi) Picnic spot	-	-	0
STABILIZATION & REHABILITATION OF DUMPS (within & Out side lease)	(i) Terracing	-	-	0
	(ii) Pitching	-	-	0
	(iii) Construction of Parapet Wall / Retaining Wall at the toe of dumps (including foundation,PCC , toe walls & Garlan drainage etc...)	-	Toe wall-137 mt ,Garland drain -111 mts	3.82
	(iv) Construction of Check dams along slope of vallies etc. (LBCD,BWCD,GCD etc...) for Dump	-		0
	(v) Construction of Settling ponds (SST,ST,RWHP etc.)	-		0.00
	(vi) Desilting of Settling ponds, channels	-		0
	(vii) Afforestation on dumps	-		0
	(viii) others (Coir- Matting)	-		0
REHABILITATION OF BARREN AREA WITHIN LEASE (Out side lease)	(i) Afforestation (Green belt building)	1.285 Ha	1.285 Ha	3.31
	(ii) others (Road Plantation)	1.53 KM	1.53KM	1.2
	Mining pit area			
	Others (CEC area)	7.22 Ha	7.22 Ha	12.56
ENVIRONMENTAL MONITORING (Core zone)	(i) Ambient Air Quality	-	4 stations	5.00
	(ii) Water Quality	-	4 stations	
	(iii) Noise level data	-	4 stations	
	(iv) Ground Vibration	-		0
	(v) Others (Please Specify)	-		0
ENVIRONMENTAL MONITORING (Buffer zone)	(i) Ambient Air Quality	-	4 stations	5.00
	(ii) Water Quality	-	4 stations	
	(iii) Noise level data	-	4 stations	
	(iv) Ground Vibration	-		0
	(v) Others (Please Specify)	-		0
Total				30.89

Annexure - 9(c)

NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED, ML.No.2148 (ERSTWHILE LESSEE OF Sri. H.G.RANGAN GOUD)				
RECLAMATION & REHABILITATION MEASURES TO BE TAKEN FOR THE THIRD YEAR				
ITEMS	DETAILS	PROPOSED AREA (Ha)	PROPOSED QUANTITY	PROPOSED EXPENDITURE (LACS)
1	2	3	4	5
RECLAMATION & REHABILITATION OF MINED OUT PIT/LAND/AREA	(i) Backfilling	-	-	0
	(ii) Afforestation on backfilled area	-	-	0
	(iii) Others (Please specify) e.g. Afforestation on exhausted benches	-	-	0
	(iv) Pisciculture	-	-	0
	(v) Converting into water reservoir	-	-	0
	(vi) Picnic spot	-	-	0
STABILIZATION & REHABILITATION OF DUMPS (within & Out side lease)	(i) Terracing	-	-	0
	(ii) Pitching	-	-	0
	(iii) Construction of Parapet Wall / Retaining Wall at the toe of dumps (including foundation,PCC , toe walls & Garlan drainage etc...)	-	Toe wall-137 mt ,Garland drain -111 mts	3.82
	(iv) Construction of Check dams along slope of vallies etc. (LBCD,BWCD,GCD etc...)	-	-	0
	(v) Construction of Settling ponds (SST,ST,RWHP etc.)	-	-	0.00
	(vi) Desilting of Settling ponds, channels	-	-	0
	(vii) Afforestation on dumps	-	-	0.00
	(viii) others (Coir- Matting)	-	-	0
REHABILITATION OF BARREN AREA WITHIN LEASE (Out side lease)	(i) Afforestation (Green belt building)	Maintenance cost		1.00
	(ii) others (Road Plantation)	1.53 KM	1.53KM	1.2
	Mining pit area			
	Others (CEC area)	7.22 Ha	7.22 Ha	12.56
ENVIRONMENTAL MONITORING (Core zone)	(i) Ambient Air Quality	-	4 stations	5.00
	(ii) Water Quality	-	4 stations	
	(iii) Noise level data	-	4 stations	
	(iv) Ground Vibration	-		0
	(v) Others (Please Specify)	-		0
ENVIRONMENTAL MONITORING (Buffer zone)	(i) Ambient Air Quality	-	4 stations	5.00
	(ii) Water Quality	-	4 stations	
	(iii) Noise level data	-	4 stations	
	(iv) Ground Vibration	-		0
	(v) Others (Please Specify)	-		0
Total				28.58

Annexure - 9(d)

NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED, ML.No.2148 (ERSTWHILE LESSEE OF Sri. H.G.RANGAN GOUD)				
RECLAMATION & REHABILITATION MEASURES TO BE TAKEN FOR THE FOURTH YEAR				
ITEMS	DETAILS	PROPOSED AREA (Ha)	PROPOSED QUANTITY	PROPOSED EXPENDITURE (LACS)
1	2	3	4	5
RECLAMATION & REHABILITATION OF MINED OUT PIT/LAND/AREA	(i) Backfilling	-	-	0.00
	(ii) Afforestation on backfilled area	-	-	0.00
	(iii) Others (Please specify) e.g. Afforestation on exhausted benches	-	-	0.00
	(iv) Pisciculture	-	-	0.00
	(v) Converting into water reservoir	-	-	0.00
	(vi) Picnic spot	-	-	0.00
STABILIZATION & REHABILITATION OF DUMPS (within & Out side lease)	(i) Terracing	-	-	0.00
	(ii) Pitching	-	-	0.00
	(iii) Construction of Parapet Wall / Retaining Wall at the toe of dumps (including foundation,PCC , toe walls & Garlan drainage etc...)	-	Toe wall-137 mt ,Garland drain -111 mts	3.82
	(iv) Construction of Check dams along slope of vallies etc. (LBCD,BWCD,GCD etc...)	-		0.00
	(v) Construction of Settling ponds (SST,ST,RWHP etc.)	-		0.00
	(vi) Desilting of Settling ponds, channels	-		0.00
	(vii) Afforestation on dumps	-		0.00
	(viii) others (Coir- Matting)	-		0.00
REHABILITATION OF BARREN AREA WITHIN LEASE (Out side lease)	(i) Afforestation (Green belt building)	Maintenance		0.50
	(ii) others (Road Plantation)	Maintenance		1.00
	Mining pit area			0.00
	Others (CEC area)	Maintenance		5.00
ENVIRONMENTAL MONITORING (Core zone)	(i) Ambient Air Quality	-	4 stations	5.00
	(ii) Water Quality	-	4 stations	
	(iii) Noise level data	-	4 stations	
	(iv) Ground Vibration	-		0.00
	(v) Others (Please Specify)	-		0.00
ENVIRONMENTAL MONITORING (Buffer zone)	(i) Ambient Air Quality	-	4 stations	5.00
	(ii) Water Quality	-	4 stations	
	(iii) Noise level data	-	4 stations	
	(iv) Ground Vibration	-		0.00
	(v) Others (Please Specify)	-		0.00
Total				20.32

Annexure - 9(e)

NARASIMHA IRON ORE MINES OF M/s. MSPL LIMITED, ML.No.2148 (ERSTWHILE LESSEE OF Sri. H.G.RANGAN GOUD)				
RECLAMATION & REHABILATION MEASURES TO BE TAKEN FOR THE FIFTH YEAR				
ITEMS	DETAILS	PROPOSED AREA (Ha)	PROPOSED QUANTITY	PROPOSED EXPENDITURE (LACS)
1	2	3	4	5
RECLAMATION & REHABILITATION OF MINED OUT PIT/LAND/AREA	(i) Backfilling	-	-	0
	(ii) Afforestation on backfilled area	-	-	0
	(iii) Others (Please specify) e.g. Afforestation on exhausted benches	-	-	0
	(iv) Pisciculture	-	-	0
	(v) Converting into water reservoir	-	-	0
	(vi) Picnic spot	-	-	0
STABILIZATION & REHABILITATION OF DUMPS (within & Out side lease)	(i) Terracing	-	-	0
	(ii) Pitching	-	-	0
	(iii) Construction of Parapet Wall / Retaining Wall at the toe of dumps (including foundation,PCC , toe walls & Garlan drainage etc...)	-	Toe wall-137 mt ,Garland drain -111 mts	3.82
	(iv) Construction of Check dams along slope of vallies etc. (LBCD,BWCD,GCD etc...)	-	-	0
	(v) Construction of Settling ponds (SST,ST,RWHP etc.)	-	-	0
	(vi) Desilting of Settling ponds, channels	-	-	0
	(vii) Afforestation on dumps	-	-	0
	(viii) others (Coir- Matting)	-	-	0
REHABILITATION OF BARREN AREA WITHIN LEASE (Out side lease)	(i) Afforestation (Green belt building)	Maintenance		0.50
	(ii) others (Road Plantation)	Maintenance		1.00
	Mining pit area			0.00
	Others (CEC area)	Maintenance		5.00
ENVIRONMENTAL MONITORING (Core zone)	(i) Ambient Air Quality	-	4 stations	5.00
	(ii) Water Quality	-	4 stations	
	(iii) Noise level data	-	4 stations	
	(iv) Ground Vibration	-		0
	(v) Others (Please Specify)	-		0
ENVIRONMENTAL MONITORING (Buffer zone)	(i) Ambient Air Quality	-	4 stations	5.00
	(ii) Water Quality	-	4 stations	
	(iii) Noise level data	-	4 stations	
	(iv) Ground Vibration	-		0
	(v) Others (Please Specify)	-		0
Total				20.32

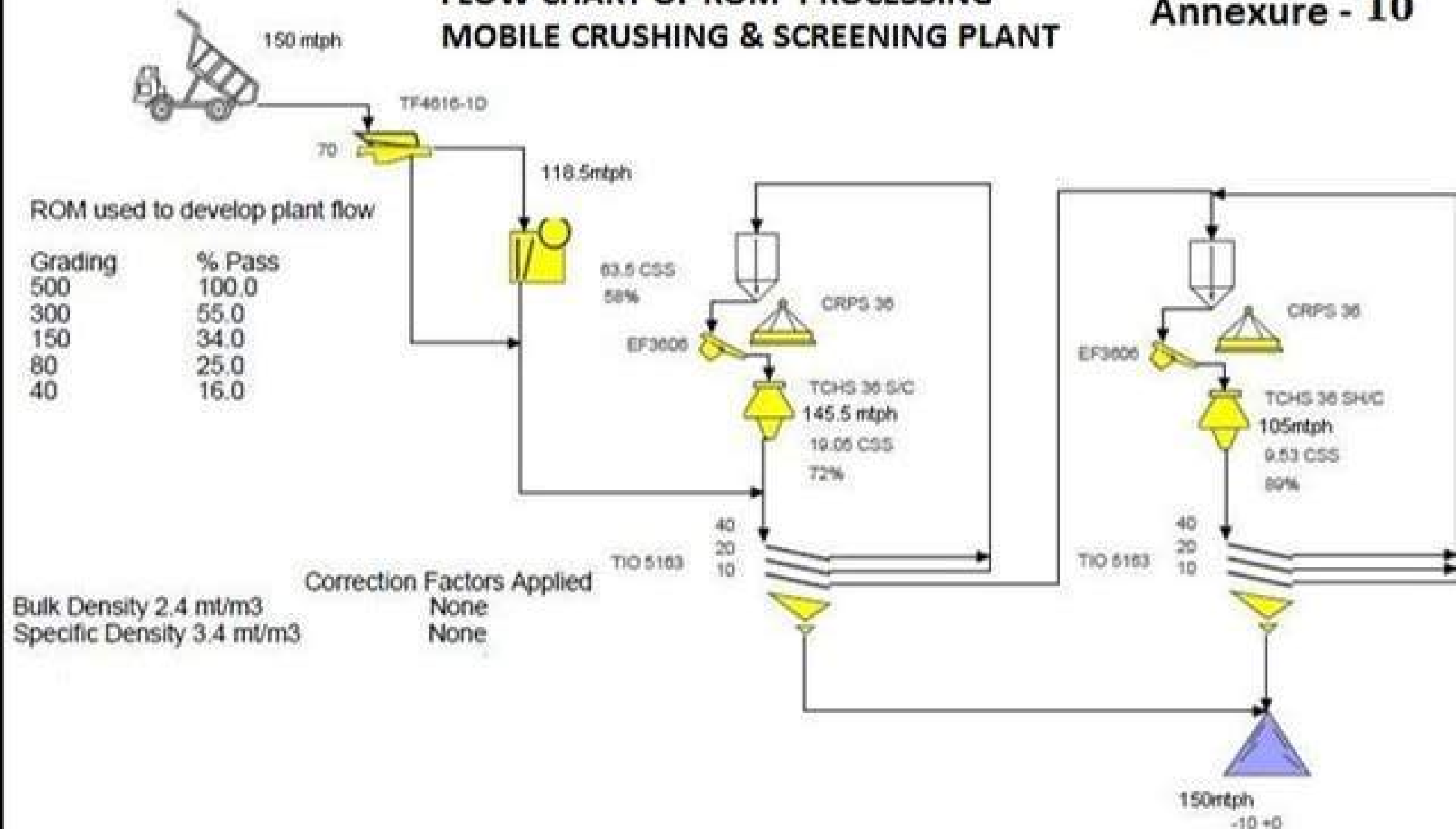
Table 7.2. Implementation Schedule of Mitigation/ Engineering Measures for NIOM (ML No. 2148) of M/s. MSPL Limited (erstwhile SIOM)

Type	Particulars of work	Years																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Dump & Encroached area Management																					
EID/ID	Toe wall at the toe of waste dump	√																			
	Garland drain	√																			
PTD	Toe wall at the toe of waste dump	√	√	√	√	√															
	Garland drain	√	√	√	√	√															
Encroached area as per CEC	Afforestation	√	√	√	(II nd and III rd year includes gap plantation and Maintenance)																
Surface water management																					
Gully plugs	Loose Boulder check dam (dump)	√																			
	Logwood (dump)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Brushwood (dump)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Check dams	Gabion/Wire crate check dam	√																			
	Stone masonry check dam	√																			
	Loose Boulder check dam	√																			
Greenbelt development		√	√	(II nd and III rd year includes gap plantation and Maintenance)																	
Afforestation		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Avenue plantation on roads		√	√	√	(Including gap plantation and Maintenance)																
Environmental monitoring & watch –ward		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Note- Maintenance of all engineering and biological measures will be done in subsequent year

FLOW CHART OF ROM PROCESSING MOBILE CRUSHING & SCREENING PLANT

Annexure - 10



Annexure - 11



WORKING PIT-1



WORKING PIT-2



BOUNDARY PILLAR – BP1



BOUNDARY PILLAR - BP4



INACTIVE DUMP – ID-1



PROPOSED TEMPORARY DUMP AREA – (PTD-1)



FINES STOCK



C.ORE STOCK

