MINING PLAN
(As per Rule 24A of MCR, 1960)

&

PROGRESSIVE MINE CLOSURE PLAN
(As per Rule 23 B of MCDR, 1988)

for

Bolani Ores Mines
(1321.45 ha ML in Keonjhar District, Orissa)

of

Steel Authority of India limited
Raw Materials Division

Prepared by

DILIP KUMAR (BASU) BOSE
Regd no : RQP/CAL/098/88 A
11/A , Akshay Dutta Lane,
Calcutta - 700 006

पत्र संख्या 314 (3)/ 2009 एमसीसीएम (मध्य)/एमपी/
~~एमएस~~/पीएमसीपी. 23 दिनांक 13/01/2010
द्वारा अनुमोदित किया गया।
Approved vide letter No.314(3)/.....
MCCM(CZ)/MP/MS/PMCP.....dated.....

November, 2009

अनुमोदित
APPROVED

Date of Lease Execution	=	11.03.2002
Date of Lease Expiry	=	11.04.2010
Area in Forest	=	1225.78ha (RF 1181.66ha+KF 44.12 ha)
Category of mine	=	"A" Fully mechanised
Proposed Financial Years	=	2010-11 to 2014-15

13/1/10

खान नियंत्रक (मध्यांचल)
Controller of Mines (Central Zone)
भारतीय खान ब्यूरो
Indian Bureau of Mines

REGISTERED

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES
MCCM CENTRAL ZONE

No. 314(3)/2009-MCCM(CZ)/MP-23 Nagpur, Dated 13th January, 2010

To,

M/s Steel Authority of India Limited,
Industry House, 10, Camac Street,
KOLKATA – 700 017

Sub. : Approval of Mining Plan alongwith Progressive Mine Closure Plan of Bolani Iron mines of M/s Steel Authority of India Limited, over an area of 1321.45 hectares, in Keonjhar district of Orissa, submitted under rule 24A of MCR, 1960 for renewal of mining lease.

Reference:- 1. Your RQP's letter no. NIL dated 25.05.2009
2. This office letter. of even no. dated 05.11.2009.
3. Your RQP's letter no. NIL dated 30.11.2009.

Sir,

In exercise of the powers conferred by Clause (b) of Sub-Section (2) of Section 5 of Mines & Minerals (Development & Regulation) Act, 1957 read with Government of India Order No. S.O.445 (E) dated 28.4.1987; I hereby approve the above said mining plan. This approval is subject to the following conditions: -

i) This Mining Plan is approved without prejudice to any other laws applicable to the mine/area from time to time whether made by the Central Government, State Government or any other authority.

ii) It is clarified that this approval of Mining Plan does not, in any way, imply the approval of the Government in terms of any other provisions of the Mines & Minerals (Development & Regulation) Act, 1957 or the Mineral Concession Rules, 1960 and any other laws including the Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 and the rules made there under.

iii) It is clarified that this approval of the Mining Plan is subject to the provisions of Forest (Conservation) Act 1980, Forest Conservation Rules 1981 and other relevant statutes, orders and guidelines as may be applicable to the lease area from time to time.

iv) It is further clarified that the approval of Mining Plan is subject to the provisions of the Mines Act 1952 and Rules & Regulations made thereunder including submission of notice of opening, appointment of manager and other statutory officials.

v) The execution of Mining Plan shall be subjected to vacations of prohibitory orders / notices, if any.

vi) This approval for mining operations and associated activities is restricted to the mining lease area only. The mining lease area is as shown on the statutory plans under Rule 28 of Mineral Conservation and Development Rules 1988, by the Lessee/RQP/Applicant, and Indian Bureau of Mines has not undertaken verification of the mining lease boundary on the ground.

vii) If anything is found to be concealed as required by the Mines Act in the content of the mining plan and the proposals for rectification has not been made, the approval shall be deemed to have been withdrawn with immediate effect.

viii) The approval of mining operations and associated activities is restricted to the mining lease area only.

6th Floor, 'D' Block, Indira Bhawan, Civil Lines, Nagpur – 440102
Email : com_cz@ibm.mah.nic.in ; Fax : (0712) 2565603 Telephone : (0712) 2565603

ix) This approval is given for the received proposals as applicable from this date.

x) At any stage, if it is observed that the information furnished in the document are incorrect or misleading or wrong, the approval of the document shall be revoked with immediate effect.

xi) Yearly report as required under rule 23E (2) of MCDR, 1988 setting forth the extent of protection and rehabilitation works carried out as envisaged in the approved progressive mine closure plan and if there is any deviations, reasons thereof shall be submitted before 1st July of every year.

xii) The Mining Plan is approved without prejudice to any other order or direction from the court of competent jurisdiction.

xiii) Your attention is invited to the Supreme Court interim order in W.P.(C) No.202 dated 12-12-96 for compliance. The approval of Mining Plan is, therefore, issued without prejudice to and is subject to the said directions of the Supreme Court.

xiv) The Financial Assurance submitted by you for Rs. 11150250/- which is valid upto 31.03.2015 and next Financial Assurance shall be submitted on or before 31.03.2015.

xv) The Scheme of Mining will be due for submission on 01.12.2014.

xvi) A copy of Environment Impact Assessment-Environment Management Plan (EIA-EMP) as approved by MOEF (Ministry of Environment & Forest) shall be submitted to IBM immediately after approval by MOEF.

xvii) The Environmental Monitoring Cell established by the company shall continue monitoring ambient air quality, dust-fall rate, water quality, soil sample analysis and noise level measurements at various stations established for the purpose both in the core zone and buffer zone as per requirement of Environment Guidelines and keeping in view IBM's circular No. 3/92 & 2/93 season wise every year or by engaging the services of an Environmental 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.

Yours faithfully,

Encl. : Two copies of approved mining plan

13/11/X

(Ranjan Sahai)
Controller of Mines (CZ)

Copy for information to :-

1. Shri Dilip Kumar (Basu) Bose, RQP, 11/A, Akshay Dutta Lane, Kolkata 700 006.
2. The Director of Mines Safety, Directorate General of Mines Safety, Chaibasa Region, At & Post Chaibasa, District – Singhbhum West alongwith one copy of approved mining Plan.
3. The Director of Mining, Directorate of Mining & Geology, Government of Orissa, Head of the Department Building, New Capital, Bhubneswar 751 001 Orissa.

(Ranjan Sahai)
Controller of Mines (CZ)

30th November, 2009.

BROJO-DHAM
11/A, Akshay Dutta Lane,
Calcutta - 700 006
Phone : (033) 2530 8200
e-mail : dkbbolani@yahoo.com

The Controller of Mines (CZ),
Indian Bureau of Mines,
Indira Bhawan, 6th flr., D' Block,
Civil Lines,
Nagpur 440 102.

Dear Sir,

Sub. Approval of Mining Plan alongwith PMCP of Bolani Iron Mines of SAIL, over 1321.45 ha in Keonjhar Dist., Orissa, u/R 24A of the MCR, 1960, for renewal of mining lease.

Reference your letter no.314(3)/2009-MCCM(CZ)/MP-23, dated 05.11.2009, I beg to submit herewith the abovementioned Mining Plan (MP) alongwith PMCP. The MP has been modified in the light of your scrutiny comments and directives.

2. The MP is submitted in five copies. Each copy consists of three volumes. Vol.1 contains the texts of the MP, PMCP, all the annexures (Anx.) except no.13 (Lease Deed), the photographs and a CD. Vol.2 has the Anx.13 (Lease Deed), and Vol.3 has all the plans (Drgs.).

3. In the sheet kept after Anx.1 to your said letter is mentioned - para wise - the page no. of the text (and of our action) where modification/revision occurs.

4. The copy of the Financial Assurance (Bank Guarantee)* and a Certificate*(signed by the Lessee) cannot be attached as m/s SAIL have not provided those to the undersigned till date. He is, however, told that both these documents have been despatched from SAIL's Head Office in New Delhi, to the Calcutta office of the Raw Materials Division.

5. I shall be grateful if you kindly accord approval early.

Thanking you,

Yours faithfully,

Encl.

Dilip Kumar (Basu) Bose
Registration No. RQP/CAL/098/03/A

* P.S.
Both have been received at Nagpur on 02/12/09 by e-mail, Copies of print-outs thereof are attached herewith.

PTO

MINING PLAN
(As per Rule 24A of MCR, 1960)

&

PROGRESSIVE MINE CLOSURE PLAN
(As per Rule 23 B of MCDR, 1988)

for

Bolani Ores Mines
(1321.45 ha ML in Keonjhar District, Orissa)

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Steel Authority of India limited
Raw Materials Division

Prepared by

DILIP KUMAR (BASU) BOSE
Regd no : RQP/CAL/098/88 A
11/A , Akshay Dutta Lane,
Calcutta - 700 006

पत्र संख्या 314 (3)/2009 एमसीसीएम (मध्य)/एमपी/
~~एमएस~~/पीएमसीपी. 23 दिनांक 13/01/2010
द्वारा अनुमोदित किया गया।
Approved vide letter No.314(3)/.....
MCCM(CZ)/MP/MS/PMCP.....dated.....

November, 2009

अनुमोदित
APPROVED

Date of Lease Execution	=	11.03.2002
Date of Lease Expiry	=	11.04.2030
Area in Forest	=	1225.78ha (RF 1181.66ha+KF 44.12 ha)
Category of mine	=	"A" Fully mechanised
Proposed Financial Years	=	2010-11 to 2014-15

13/1/10

खान नियंत्रक (मध्यांचल)
Controller of Mines (Central Zone)
भारतीय खान ब्यूरो
Indian Bureau of Mines

C O N T E N T S

CD - Kept in the bag

अनुमोदित
APPROVED

Dilip Kumar Basu Bose
Registration No. RQP/CAL/088/88/A

LIST OF ANNEXURES

Anx. 1 Letter of approval of the Scheme of Mining, 2007, from the Controller of Mines, IBM, dt.24.5.07

Anx. 1a MOEF's letter no.3-11015/470/2006-IA.II(M), dt.4.12.07

Anx. 1b Consent Order no.70, dt.16.07.08, of SPCB, Orissa.

Anx. 1c Certificate of RQP

Anx. 2 Notice u/R 108 of MMR, 1961, from Director of Mines Safety, Chaibasa, dt.15.12.1995.

Anx. 3 Letter dt.12.05.08, from DCOM, IBM, BBSR, Pointing out violation u/MCDR, 1988

Anx. 4 Letter dt.01.07.08, from GM, BOM, to IBM, reporting rectification/compliance

Anx. 5 Air quality monitoring reports for Jan-Mar,07, Apr-Jun.07, Oct-Dec.07, Jan-Mar.08, Apr-Jun.08

Water quality analysis reports dt.22.05.08, by SPCB, for Oct-Dec.07, Jan-Mar.08, Apr-Jun.08, Jul-Sep.08

Noise monitoring report for Jan-Jun.08

Anx. 6 IBM's letter dt.17.09.08, granting permission to prepare some plans in the scale of 1:5000.

Anx. 7 Technical Report of MECON

Anx. 8a Note stating details of exploration with Tables 1 & 1A

Anx. 8b Table 2, Details of Mining excavation/development & production (year-wise).

Anx. 8c List of personnel (statutory & others)

Anx. 8d List of community development works done by BOM

Anx. 9 Report on study of Trial Blast with site mixed Slurry explosives, by CMPDIL, Ranchi.

Anx.10 Hydrological Report : Identification & Assessment of available water resources for use in SAIL mines in Barajamda area.

Anx.11 Biological Reclamation Plan

Anx.12 Bank Guarantee (Existing)

Anx.13 Lease Deed (In a separate folder, marked Volume 2)

Anx.14 Letter of the GM, SAIL-BOM, dt.20.11.09, to the COM (CZ), IBM, Nagpur.

Anx.15 List of Mining Leases held by SAIL.

अनुमोदित
APPROVED

Dilip Kumar Basu Bose
Registration No. RQP/CAL/098/88/A

LIST OF DRAWINGS

Drg. No.	Title
1.	Key Plan
2.	Surface Plan
3.	Surface Geological Plan
4.	Geological X-section of F'area
5.	Longitudinal section of F'area
6.	Geological X-section of G'area
7.	Longitudinal section of G'area
8.	Geological X-section of D'area & Panposh
9.	Longitudinal section of D'area & Panposh
10.	Typical slice plan of F'area - 785 mRL
11.	- Ditto. - - 765 ,,
12.	Typical slice plan of G'area - 875 ,,
13.	- Ditto. - - 865 ,,
14.	Typical slice plan of D'area - 512 ,,
15.	- Ditto. - - 500 ,,
16.	Pit Development plan of F'area for 2010-2011
17.	- Ditto. - ,, 2011-12
18.	- Ditto. - ,, 2012-13
19.	- Ditto. ' ,, 2013-14
20.	- Ditto. - ,, 2014-15
21.	Composite plan of F'area for 2010-15
22.	Pit Development Plan of G'area for 2010-11
23.	- Ditto. - 2011-12
24.	- Ditto. - 2012-13
25.	- Ditto. - 2013-14
26.	- Ditto. - 2014-15
27.	Composite plan of G'area for 2010-15
28.	Pit Development plan of D'area for 2010-11
29.	Ditto. - ,, 2011-12
30.	- Ditto. - ,, 2012-13
31.	- Ditto. - ,, 2013-14
32.	- Ditto. - ,, 2014-15
33.	Composite plan of D'area for 2010-15
34.	Pit Development plan of Panposh for 2010-11
35.	- Ditto. - ,, 2011-12
36.	- Ditto. - ,, 2012-13
37.	- Ditto. - ,, 2013-14
38.	- Ditto. - ,, 2014-15
39.	Composite plan of Panposh for 2010-15
40.	Environment Plan
41.	Conceptual Mining Plan
42.	Financial Assurance Plan
43.	Process Flow-diagram (schematic) of the Ore Processing Plant
44.	Tailing Pond Stage I (Sections)
45.	Environment Management Plan

APPROVED

Dilip Kumar Basu Bose
Registration No. RQP/JAL/098/88/A

Contents

LIST OF PHOTOGRAPHS

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Slide – 2 : View of G – Mining Area

Slide – 3 : F - Area OB dump rehabilitated through afforestation

Slide – 4 : D - Area OB dump rehabilitated through afforestation

Slide – 5 : Boulder wall around F - Area OB dump

Slide –6 : Boulder wall around Panposh OB dump

Slide – 7 : Back filling in progress in the southern side of F-Area

Slide – 8 : Afforestation in old tailing Pond areas

Slide – 9 : Recent afforestation undertaken on F-area OB dump

Slide – 10 : Haul Road dust suppression in F & G Mininmg areas

Dilip Kumar Basu Bose

APPROVED

Dilip Kumar Basu Bose
Registration No. HQr/CAL/098/88/A

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES
MCCM CENTRAL ZONE

REGISTERED

No. 314(3)/2009-MCCM(CZ)/MP-23 Nagpur, Dated 5th November, 2009

To,

M/s Steel Authority of India Limited,
Industry House, 10, Camac Street,
KOLKATA – 700 017

Sub. : Approval of Mining Plan alongwith Progressive Mine Closure Plan of Bolani Iron mines of M/s Steel Authority of India Limited, over an area of 1321.45 hectares, in Keonjhar district of Orissa, submitted under rule 24A of MCR, 1960 for renewal of mining lease.

Reference:- Your RQP's letter No. NIL dated 25.05.2009

Sir,

This has reference to the letter cited above on the subject. The Mining Plan of your Bolani Iron mines has been examined by field visit to the area by Shri S. Tiu, RCOM Bhubneswar Regional Office dated 26.08.2009 and subsequently in this office. The deficiencies observed in the Mining Plan are enclosed herewith vide Annexure-I.

You are therefore advise you to carry out the necessary modification in the Modifications in Approved Mining Plan in the light of our comments vide Annexure-I and submit the same in **05 (five)** copies to this office within a period of **30 (thirty)** days from the date of issue of this letter for further necessary action.

The parawise clarification and the manner in which the deficiencies are attended should invariably be given while forwarding the modified copies of the Modifications in Approved Mining Plan. It may be noted that no further extension of time in this regard will be entertained and the mining plan will be considered for rejection if not submitted within above due date and the deficiencies are not attended completely.

Yours faithfully,

Encl:- Annexure-I

अनुमोदित
APPROVED

Sd/-
(Ranjan Sahai)
Controller of Mines (CZ)

Copy along with annexure-I for information and necessary action to Shri Dilip Kumar (Basu) Bose, RQP, 11/A, Akshay Dutta Lane, Kolkata 700 006.

5/11/09
(Ranjan Sahai)
Controller of Mines (CZ)

6th Floor, 'D' Block, Indira Bhawan, Civil Lines, Nagpur – 440102
Email : com cz@ibm.mah.nic.in : Fax : (0712) 2565603 Telephone : (0712) 2565603

Annexure-I

SCRUTINY ON MINING PLAN OF BOLANI IRON ORE MINE OF M/S STEEL AUTHORITY OF INDIA LTD OVER AN AREA OF 1321.45 HA IN KEONJHAR DISTRICT SUBMITTED UNDER RULE 24A OF M.C.R., 1960.

01 Page 1. Para 1: Name, Address, Phone, Fax & E-mail no. of Nominated owner may be given.

02. There are four major easterly flowing nalas within the leasehold area. Out of these four nala three are perennial in nature. All the nalas should be shown boldly in the plans.

03. Future exploration programme is restricted to the so far established mineralized zone only. It is better to propose the future exploration programme in such a manner so that total leasehold area may be explored and the mineralized zone in totality may be established within the leasehold area.

04. In the description of ore bodies specially in 'B', 'C', Panposh, 'D','E', 'F', & 'G' areas, ore body may be described in details with respect to the physical & chemical properties and preferably grade of the ore in each area may be established. The chemical & mineralogical analysis of old fines dumps may be included within the text for assessing the beneficiation characteristics.

05 Page 8 Para d: A concrete time bound proposal for exploration with cut of 45% shall be incorporated for assessing the reserves/resources.

06. UNFC codification has not been done in proper way. It is required to follow the prescribed proforma of UNFC classification and inference may be drawn for the proper code of the reserve.

07. Grade wise resources from 45-50% Fe, 50-55% Fe and 55-58% Fe should be furnished.

08. In the geological plan a few dumps have been shown within the mineralized area. The reason of such dumping may be explained in the text in relevant chapter.

09. Heading of the chapter "Mineral Processing" may be changed as "Beneficiation. It is reported that there is a practice of blending of ore of Kiriburu-Meghataburu mine with that of Bolani mine to reduce the alumina content. This aspect should be dealt with in beneficiation chapter with a vivid description of the method of processing of ore.

APPROVED

10. It is proposed that the rate of production will be enhanced from 5 million tonn per year to 12 million tonn per year. For this purpose, there will be enhance of production in "F" area 1.96 million ton, in "G" area 2.92 million tonns, in "D" area 1.90 million tonns and in Panposh area 0.6 million tonns. The reason of diversity of increase target in different area may be described in the text.

11. In PMCP the area to be degraded during the proposed five years planned period & In conceptual period and their reclamation / rehabilitation measures should be furnished in the following table.

Response to scrutiny comments in Anx.1 of IBM's letter dt.5.11.09.

IBM's para no.	Response/Action
01	Furnished in pp.1A
02	Done as directed
03	Prepared as advised, vide pp.10
04	Described as directed, vide pp.8-9, 9a-c
05	Proposed as advised, vide pp.10
06	Given in pp.11-12
07	Furnished in pp.12
08	Reason stated in pp.27
09	Heading changed as advised, vide pp.29 For information about blending with ore of Kiriburu mine, vide letter of GM-BOM at Anx.14
10	Explained in pp.13
11	Furnished in Table RR, after pp.54
12	Shown as directed
13	Furnished in pp.22
14	Plan has been revised
15	Furnished (Drg.No.45)
16	Done as directed
17	Error is regretted: correction done
18	Furnished, vide pp.1B-1C
19	,, ,, Anx.15
20	,, ,, pp.1A-1B
21	,, ,, pp.1D
22	,,
23	,,

APPROVED

Dilip Kumar Basu; Bose
Registration No. RQP/CAL/098/88/A

25th May, 2009.

BROJO-DHAM
11/A, Akshay Dutta Lane,
Calcutta - 700 006
Phone : (033) 2530 8200
e-mail : dkbbolani@yahoo.com

The Regional Controller of Mines,
Indian Bureau of Mines,
Mahani Complex, 2nd floor,
308, District Centre,
Chandrasekharpur,
Bhubaneswar 751 056.

Dear Sir,

Mining Plan (u/R 24A of MCR, 1960)
including PMCP (u/R23F of MCDR, 1988)
for 1321.45 Ha (5.10 sq miles) ML of the
SAIL-Bolani Ores Mines, Keonjhar Dt., Orissa.

I beg to refer to the discussion the undersigned had in your office on 20.04.09, with you and Shri Dash, on your "pre-submission scrutiny remarks" (copy attached).

2. The said Mining Plan has been modified/revised in the light of that discussion and is resubmitted herewith in duplicate (2 sets).

3. Each set consists of three volumes. Vo.1 contains the text, the annexures (Anx.) and a few drawings (Drg.). Vol.2 is the copy of the Lease Deed. Vol.3 holds the balance drawings.

4. In the sheets attached to the copy of your aforesaid 'REMARKS', which are indexed in red ink, mention has been made index-wise of the page of the text (and of our action) where modification/ revision occurs.

5. A Demand Draft no.918374, dated 19.5.09, for Rs.14,000/- (Rs.Fourteen thousand only), being the Fee for scrutiny, drawn in favour of UCO Bank Account, RCOM, Kolkata, is also attached.

6. As this Mining Plan, after approval, is to be attached to the application, already due, for renewal of the concerned Lease, I shall be grateful if the approval is accorded early.

Thanking you,

Encl.

Yours faithfully,

Dilip Kumar Basu Bose

Dilip Kumar Basu Bose
Registration No. RQP/CAL/098/88/A

PRE SUBMISSION SCRUTINY REMARKS ON MINING PLKAN OF BOLANI IRON ORE MINE OF M/S STEEL AUTHORITY OF INDIA LTD. SPREQAD OVER AN AREA OF 1321.45 HA IN KEONJHAR DISTRICT OF ORISSA

1. In the cover page, date of lease execution, date of expiry, lease area in ha, area in forest, district, category of mine, proposed financial years. A consent letter from nominated owner should be enclosed. A copy of lease deed should enclosed. Copy of environmental and forest clearance and consent from Pollution Control Board should be enclosed. Copy of R.Q.P certificate should be enclosed.

3. In Para 2, instead of single point latitude and longitude, latitude and longitude representing the entire area should be furnished.

4. In Para 3. details of exploration already carried out in the area should be furnished. Future exploration should be proposed in form of core drilling at a grid interval of 100 x 100 m covering the entire potentially mineralized zone with depth up to end of mineralization in proposed five years period.

The method of reserves estimation, reserves estimation parameters, copy of borehole logs considered for reserves calculation, details of calculation should be furnished.

The detailed justification for designating UNFC codification should be furnished.

Grade wise resources from 45-50% Fe, 50-55% Fe and 55-58% Fe should be furnished.

Average grade ore should be furnished. Chemical analysis of few samples should be furnished to support the claim. The cut off grade should be mentioned.

5. In Para 4, year-wise location of development, direction of advancement, reduced level up to which it will be worked should be furnished. The year-wise development details should be furnished based on sectional area method detailing the sections considered, total run of mine, saleable ore, sub grade, over burden, mineral reject, intercalated waste, stripping ratio, dimension of quarries etc in tabular manner. The detailed bench geometry to be maintained to achieve targeted production should be furnished. The methodology to be adopted to achieve enhanced production should be furnished. Detailed calculation for financial year-wise bench wise production should be furnished. Unit of ore : over burden should be furnished. Instead of area wise details, year-wise details should be furnished. A summary of development and production from the entire mine should be furnished. The saleable ores to be produced each year should be mentioned.

Detailed calculation for requirement of machinery to meet the enhanced production requirement should be furnished.

The proposed rate of production when mine is fully developed should be mentioned. Based on available reserves and proposed production, life of the mine should be furnished.

6. Format of Mining Plan as provided in guide lines in R.Q.P circulars should be strictly followed.

7. In Para 4 (f), Exploration already carried out, areas already covered, areas to be taken up for exploration, ultimate extent and size of quarry, final slope angle at the close of mine, ultimate capacity of mine, sub-grade generation in conceptual stage and its storage should be furnished. The post mining land use should be furnished in tabular manner. Reclamation and rehabilitation measures for entire degraded land in conceptual stage should be furnished. Afforstation to be carried out in the conceptual

stage should be furnished. Proposals for simultaneous backfilling of mined out area during the life of the deposit should be planned out and should be proposed.

8. In Para 4, employment potential, employment distribution pattern, statutory employment etc should be furnished.

9. In Para 6, quantity of water to be encountered quality of water should be furnished.

10. In Para 7, mineral rejects have been which has not been mentioned in year-wise generation tables. The mineral rejects should be defined. As such sub-grade and mineral rejects should not be differentiated.

11. In Para 7 (c), the dumping should be by retreat dump method. The individual terrace heights may be limited to about 10m . Each terrace should have inward slope with catch drains at the inward side of the terrace. The catch drains of the individual terrace should be connected to the garland drain outside the periphery of the dump. These catch drains should preferably have half concrete open pipes followed by settling tanks to avoid wash offs. Each terrace should also have a provision of berms at the outer end to reduce gully formation due to rain water wash offs.

12. In Para 10 (b), the feed grade, size, recovery%, out put grade and chemical analysis of tailings should be furnished. The quantity of yearly tailing generation due to enhanced production should be furnished.

13. In Para 11, existing human settlement in Bolani lease area should be furnished.

14. In Para 11 (c), environment management measures like, programme of afforstation, stabilization and vegetation of dumps, measures for air pollution, measures to control erosion / sedimentation of water, measures for minimizing adverse affects on water regime, measures for ground vibration, socio economic benefit out of mining etc should be furnished.

15. In Para 4.1 of PMCP, the area to be degraded during the proposed five years planned period & in conceptual period and their reclamtion / rehabilitation measures should be furnished should be furnished. supported with the following table and the same may be depicted on plans with proper reference in the text.

Reclamation And Rehabilitation Proposal of Mined out land

Year	Pit No.	Mined out area at the beginning	Additional area proposed during the year	Total area	Area Reclaimed & Rehabilitated during the year.	Mined out area at the end of the year.

16. In Para 4.2, a copy of the hydrological study and water balance chart may be enclosed and following information may be provided and location of all such check dams may be shown on plan and referred in the text.

Water Quality

Year	Location	Particulars and size (L x B x H) of Check dam to be constructed				

The rainwater discharge plan should be explained in text and should be shown on Environment Management Plan. The analysis of constituents of water discharge out of the leasehold area should be within permissible limit by constructing a series of settling tanks. Necessary garland drainage should be constructed around the quarry and should be shown on plan

17. In Para 4.4 of PMCP, the waste likely to be generated in plan period and conceptual stage, dump area, height, reclamation and rehabilitation measures in conceptual stage should be furnished. The information may be provided as per the following tables and manner of terracing/ stabilization may be shown on plans /sections:

Waste Dump

Year	Dump No.	Nature of Dump i.e. OB reject. etc.	Area at the beginning of the year.	Additional area during the year	Area Rehabilitated during the year.	Balance area at the end of the year

Construction of Retaining wall

Year	Location	Size and length of retaining wall to constructed during the year (LxHxW)				

The dumping should be by retreat dump method. The individual terrace heights may be limited to about 10m . Each terrace should have inward slope with catch drains at the inward side of the terrace. The catch drains of the individual terrace should be connected to the garland drain outside the periphery of the dump. These catch drains should preferably have half concrete open pipes followed by settling tanks to avoid wash offs. Each terrace should also have a provision of berms at the outer end to reduce gully formation due to rain water wash offs.

18. In Para 6 &7 of PMCP, the year-wise proposal should be furnished as per the table below:

Items	Details	Area (ha)	Quantity	Expenditure (Rs.)	Remar
		Proposed	Proposed	Proposed	
(A) Reclamation & Rehabilitation of Mined out area	(i) Backfilling				
	(ii) Afforestation on the backfilled area.				
	(iii) Others (please specify) eg. Afforestation on exhausted benches				
	(iv) Pisciculture				
	(v) Converting into water reservoir.				
	(vi) Picnic Spot				
(B) Stabilization & Rehabilitation of Dumps (With Lease)	(i) Terracing				
	(ii) Pitching				
	(iii) Construction of Parapet Walls/ Retaining wall at toe of dumps				

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	(iv) Construction of Check Dams along slope of valties etc.				
	(v) Construction of Settling Ponds (Garland drain etc.)				
	(vi) Desilting of settling ponds, channels.				
	(vii) Afforestation on dumps				
	(viii) Others (Please specify)				
(C) Rehabilitation Of Barren Area Within Lease	(i) Afforestation (Green belt building)				
	(ii) Others (Please specify)				
(D) Environmental Monitoring (Core zone & Buffer Zone separately)	(i) Ambient Air Quality				
	(ii) Water Quality				
	(iii) Noise Level Survey				
	(iv) Ground Vibration				
	(v) Others (Please specify)				
	TOTAL				

Note: to be given year-wise for the entire proposal in PMCP. Under Remarks-Location etc. may be given

19. In Para 8 of PMCP, as per Annual Return 2007-08, area under mining- 331 ha used for waste disposal- 16 ha, occupied by plant, building etc- 74.65 ha, reclaimed and rehabilitated -9 ha . Therefore, correct land use based on recent survey should be furnished. Accordingly existing land use should be changed in all relevant part of the text. It is incorrect to clime the proposed area as fully reclaimed and rehabilitated.

20. Resolution of board of Directors and undertaking by Nominated Owner to implement the proposals should be furnished.

Plates

1. In Key Plan, flows direction of river / nala should be shown.

2. In Surface Plan , plan should be legible. Reduced level are not legible. The different areas as designated for development purpose should be clearly shown.

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3. In Geological Plan, the proposed year-wise exploration should be shown.

4. Geological section used for reserves estimation should be furnished

5. In Environment Management Plan, it is observed that some old dumps have been proposed for re-handling. The year-wise quantity to be re-handled should be reflected in mining chapter. The mining operations have been proposed in 5 areas. The operations should be restricted to two to three areas for systematic mining. The areas proposed for pellet plant etc have not been proved barren. Therefore no activity should be carried out till the area is proved barren.

6. In Conceptual Plan, manner of reclamation and rehabilitation should be indicated. Reduced level at the conceptual stage should be shown.

7. A Environment Plan at a scale of 1 : 5000 should be furnished.

Response reference to IBM's pre-submission scrutiny remarks on Mining Plan for Bolani Ores Mines of SAIL's 1321.45 Ha ML in Keonjhar Dist., Orissa.

IBM Sl.No.	Index no. thereto	Page no.	Action
1.	i	Cover page	Stated
	ii	,,	,,
	iii	,,	,,
	iv	,,	,,
	v	,,	,,
	vi	,,	,,
	vii	,,	,,
	viii	Just after the 'List of Photo-graphs'	Furnished
	ix		Furnished in a separate folder marked, Volume 2 Anx.13
	x	Vide Anx.1a	Furnished
	xi	,, Anx.1b	,,
	xii	,, Anx.1c	,,
3.	i & ii	2	Stated
4	i	Vide Anx.8a	
	ii	8	,,
	iii	IBM official clarified on 20.4.09, that	
	iv	these information were sought in respect of	
	v	Additional Reserves proved in last 5-years. No additional reserve was proved since 2005.	
	vi	9	Given
	vii	10	Stated
	viii	9	,,
	ix	Vide Table 1 of Anx.8a	
	x	9	Mentioned
5.	i	Vide Pit Dev. plans	
	ii	as well as Table 2	
	iii	at Anx.8b	
	iv		
	v & vii		
	vi	13	Stated
	viii	12	Given
	ix	18 & 19	,,
	x	13	,,
	xi	14	Stated
6.		The Format used was shown to the IBM officer on 20.4.09. It was issued by IBM, under Circular no. N-11013/1/MP/95-CCOM, dt.20.02.1997, to the RQPs as Guideline.	
7.	i & ii	Vide Anx.8a	
	iii	8	Furnished
	iv	15	Stated
	v	13	,,
	vi	12	,,
	vii	16	Given
	viii	61-Table A	
	ix	16-Table	
	x	61-Table A	

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Dilip Kumar Basu Bose
Registration No. RQP/CAL/038/98/A

IBM Sl.no.	Index no. thereto	Page no.	Action
8.	i	36	Given
	ii	Vide also Anx.8c	
	iii		
9.	i & ii	24	,,
10.		25	Stated
11.		26	
12.	i	38	Furnished
	ii	Vide Anx.8b	
13.		41	Stated
14.	i	61-Table A	
	ii	61-Table B	
	iii	45	,,
15.		61-Table A	
16.	i	Vide Anx.10	
	ii	54	
	iii & v	53	
	iv	Vide Anx.5	
	vi	52	
17.	i	56	,,
	ii	57	,,
18.		61-Table A	,,
		62- ,, B	,,
		63 ,, C	,,
		64 ,, D	,,
19.		66	,,
20.		Just before 47	Furnished

PLATES

1. Key Plan	Shown as asked for.
2. Surface plan	Deficiencies corrected
3. Geological plan	Shown
4. Geological sections :	IBM official clarified on 20.4.09, that such sections were sought in respect of additional reserves proved in past 5-years. No additional reserve was proved since 2005.
5. Old fines dumps	No date and quantity of refunding have been fixed yet. And, there will be none in next 5-years.
6. Waste & ob dumps	56-Table RLs are shown on Drg.no.41
7. Environment plan	Furnished - Drg.no.40

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Dilip Kumar Basu Bose
Registration No. RQP/CAL/098/88/A

स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
STEEL AUTHORITY OF INDIA LIMITED
रॉ मेटेरियल्स डिवीज़न
RAW MATERIALS DIVISION

GOVT. OF INDIA-INDIAN BUREAU OF MINES

CONSENT LETTER

The Mining Plan along with Progressive Mine Closure Plan in respect of 5.1 Sq. Mile Lease of Bolani Ore Mines over an area of 1321.45 hectares at Bolani in District Keonjhar of Orissa has been prepared as per Rule-24 A of MCR, 1960 by RQP, Sri Dilip Kumar Bose, (RQP Regn. No. RQP/CAL/098/88A.)

I request the Regional Controller of Mines, Bhubaneswar Region/ Controller of Mines, Central Zone, Indian Bureau of Mines to make further correspondence regarding modification of the Mining Plan with the said Recognised Qualified Person at his following address: -

Sri Dilip Kumar Bose
11A, Akshay Dutta Lane,
Kolkata – 700006.

Ph. No. (033) 25308200
E-Mail: - dkbbolani@yahoo.com

I, hereby, undertake that all the modifications so made in the Mining Plan along with Progressive Mine Closure Plan by the above RQP may be deemed to have been made with my knowledge & consent and shall be binding on me in all respect. I have understood the content of Mining Plan along with Progressive Mine Closure Plan and agree to implement the same in accordance with the law.

Signature of the applicant (In full)

Director (Personnel) & I/c RMD
Steel Authority of India Limited
Ispat Bhawan, Lodi Road, New Delhi-110003

Name in block letters: GANATANTRA OJHA

Date: 06.04.09
Place: N. Delhi

Address: DIRECTOR (PERSONNEL) & I/c RMD
AND
NOMINATED OWNER OF THE MINES
STEEL AUTHORITY OF INDIA LIMITED
ISPAT BHWAN, LODI ROAD
NEW DELHI – 110003.

APPROVED

स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
STEEL AUTHORITY OF INDIA LIMITED
रॉ मेटेरियल्स डिवीज़न
RAW MATERIALS DIVISION

CERTIFICATE

The provisions of Mines Act, Rules & Regulations made there under have been observed in the Mining Plan of 5.1 sq mile lease of Bolani Ore Mine over an area of 1321.45 hectares at Bolani in District Keonjhar of Orissa under M/s Steel Authority of India Limited, Raw Materials Division and where specific permission 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.

Signature of applicant (In full)

Name in block letters: GANATANTRA OJHA

Date: 23-01-07
Place: DELHI

Address: DIRECTOR (PERSONNEL) & I/c RMD
AND
NOMINATED OWNER OF THE MINES
STEEL AUTHORITY OF INDIA LIMITED
ISPAT BHWAN, LODI ROAD
NEW DELHI - 110003

इण्डस्ट्री हाउस, 10, कैमेक स्ट्रीट, कोलकाता - 700 017 दूरभाष : कार्यालय - 033 - 2282-2316/0462/3385 फैक्स : + 91-33-2282-0422 / 5830 ई-मेल : rmdsail@gmail.com वेबसाइट : www.sail.co.in
Industry House, 10, Camac Street, Kolkata - 700017 Telephone : (O) 2282-2316 / 0462 / 3385 Fax : + 91-33-2282-0422 / 5630 E-mail : rmdsail@gmail.com Website : www.sail.co.in

C E R T I F I C A T E

1. Certified that the provisions of The Mineral Concessions Rules, 1960, and The Mineral Conservation And Development Rules, 1988, have been observed in this MINING PLAN for Bolani Ores Mines of Steel Authority of India Limited, for an area of 5.10 square miles (1321.45 Ha) in Keonjhar District of Orissa, and wherever specific permission is required the applicant will approach the concerned authorities of Indian Bureau of Mines for granting permission.

2. The information furnished in the said MINING PLAN are true and correct to the best of my knowledge and belief.

PLACE - Calcutta
DATE - 30.11.2009

Dilip Kumar Basu Bose
Registration No. RQP/CAL/098/88/A

APPROVED

C E R T I F I C A T E

1. Certified that the provisions of The Mines Act, 1952, and Rules and Regulations made thereunder, have been observed in this MINING PLAN for Bolani Ores Mines of Steel Authority of India Limited for an area of 5.10 square miles (1321 Ha) in Keonjhar District of Orissa, and wherever specific permission is required the applicant will approach the DGMS.

2. The information furnished in the said MINING PLAN are true and correct to the best of my knowledge and belief.

PLACE - Calcutta
DATE - 30.11.2009

Dilip Kumar Basu Bose
Registration No. MQ-/CAL/098/88/A

FOREWORD

The present tenure of this lease over 5.10 sq. miles area of Bolani Ores Mines (BOM) in Keonjhar District, Orissa will end on 09.04.2010.

This Mining Plan, prepared under Rule 24A of MCR, 1960, upon approval by IBM, will accompany the renewal application of BOM, made in Form J, prescribed in the MCR, 1960.

The rate of run of mine production from the mine is planned to go up w.e.f 2010-11, from current 5.65 Million tones per year (Mtpy) to 12.0 Mtpy. Detail planning of this expansion is given in the Technical Report prepared by MECON Limited placed at Anx. 7.

30th November, 2008

Dilip Kumar (Basu) Bose
Registration No. ..Q./CAL/098/88/A

MINING PLAN

1. GENERAL

a) Name of Applicant:	:	Steel Authority of India Limited (SAIL)
b) Status of applicant	:	A Public Sector Undertaking
c) Minerals occurring	:	Hematitic iron ore
Intends to mine	:	Hematitic iron ore
d) Period granted	:	Initially granted for 30 years from 10.4.1960 First renewal granted for 20 years from 10.04.1990
Proposed to be applied	:	20 years w.e.f 10.04.2010
e) Name of RQP etc	:	Shri Dilip Kumar (Basu) Bose, 11/A, Akshay Dutta Lane, Kolkata-700 006 Phone No. : 03325308200 Email : dkbbolani@yahoo.com Registsration No. RQP/CAL/098/88A [valid upto 28.09.2010] (A copy of the certificate is at Anx. 1c)
f) Prospecting Agency	:	All exploration, geological mapping, digging trial pits, driving of adits, for detailed prospecting has been done by the Company's own personnel (qualified geologists and mining engineers). Diamond drilling though done by outside agencies, was carried out as per instructions [viz., fixation of grids, selection of sites etc. of the Co's engineers]. Logging of cores, trial pit and adit walls was done by Company's personnel.
g) Ref No. & Date of Consent letter from the State Government.	:	Not applicable

A copy of the Lease Deed is placed in Anx. 13. A copy of the Mining Plan, Forest clearance letter and that of the consent of State Pollution Control Boards are furnished at Anx 1a and Anx 1b respectively.

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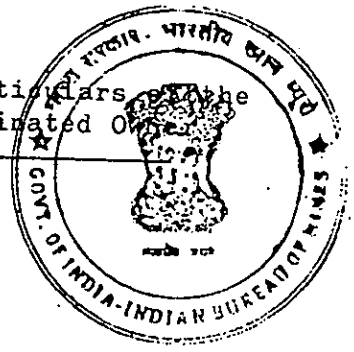
18/11/10
नियंत्रक (मध्यांचल)
Controller of Mines (Central Zone)
भारतीय खान ब्यूरो
Indian Bureau of Mines

Dilip Kumar Basu Bose
Registration No. : RQP/CAL/098/88/A

Particulars of the
Nominated Officer



Name : Ganatantra Ojha

Address: Director (Personnel)
Steel Authority of India Limited
Ispat Bhawan, Lodi Road
New Delhi-110003

Phone No: (011) 24367259
24368097

Fax No: (011) 24367015

E-Mail : dp.sail@sailex.com

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Dilip Kumar Basu Bose
Registration No : Q /SAL/098/88/A

नाम
NAME G. OJHA

नि. सं.
PERNO 27683

पदनाम
DESIG- DIRECTOR (PERS)

STEEL AUTHORITY OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ISPAT BHAWAN, LODI ROAD, P.O.B. No:3049, NEW DELHI-110 003

धारक के हस्ताक्षर Signature of Holder

जारीकर्ता प्राधिकारी Issuing Authority

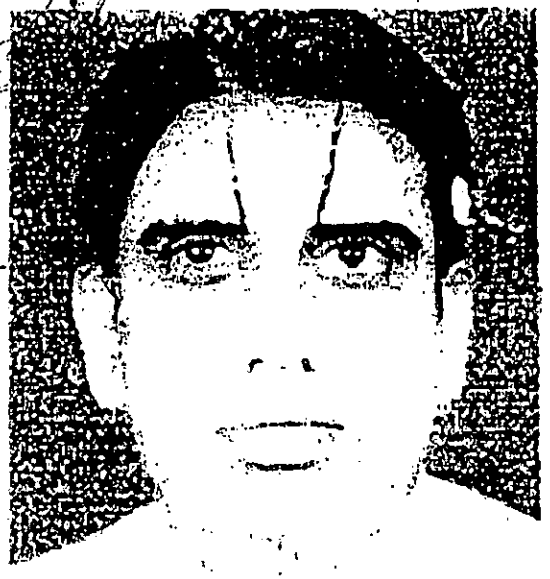
रक्त समुह
BLOOD GROUP:
A+

Siepmann's

स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
(भारत सरकार का प्रतिष्ठान)
इस्पात भवन, लोदी रोड, पो. बो. नं.3049, नई दिल्ली - 110003.

स्थाई लेखा संख्या /PERMANENT ACCOUNT NUMBER

AACPO2074N



नाम /NAME

GANATANTRA OJHA

पिता का नाम /FATHER'S NAME

DWARIKA OJHA

जन्म तिथि /DATE OF BIRTH

26-01-1950

हस्ताक्षर /SIGNATURE

G. Ojha

आयकर आयुक्त, रांची

COMMISSIONER OF INCOME-TAX, RANCHI

1C

No-Record/6454/1461 dt. 1-2-1974

Form I. R.

CERTIFICATE OF INCORPORATION

No. 6454 of 1972-73

I hereby certify that STEEL AUTHORITY OF INDIA PRIVATE deleted
LIMITED Sd/- illegible
Addl. R.O.C. Delhi & Haryana.
is this day incorporated under the Companies Act, 1956 (No. I of 1956) and that the Company is Limited.

Given under my hand at NEW DELHI
this TWENTY-FOURTH (4th) day of JANUARY (MAGHA)
One thousand nine hundred and SEVENTY THREE (SAKA-1894)

Registrar of Companies

Sd/-
(S. KUMAR)
Registrar of Companies
DELHI & HARYANA

TRUE COPY

for Registrar of Companies
Delhi & Haryana

1/2/74

1/2/74

प्रमाणित सत्यापित प्रतिलिपि
Certified to be True Copy
देवेन्द्र कुमार / DEVINDER KUMAR
सचिव / Secretary

2 LOCATION AND ACCESSIBILITY

a) Details of area : Bolani (22° 6'N & 85° 18'E) is situated in the Keonjhar District, Orissa, near the State boundary with Jharkhand. The nearest passenger Railway station is at Barbil, about 8 km from Bolani to the East, on the Rajkharswan (RKSN) - Barbil (BBN) branch of the SE Railway, about 400km from Howrah. The major part of the lease covers about 5 km stretch on Eastern slope of the famous Bonai Range. The iron ore mines of Kiriburu and Meghahatuburu (both belonging to SAIL) lie on the adjacent western part of the hill in the West Singhbhum District of Jharkhand.

District & State	:	Keonjhar District of Orissa State
Taluka	:	Barbil
Village	:	Balagoda
Khasra No.	:	Not applicable
Plot No.	:	As stated in the Lease Deed (Anx. 13)
Block Range	:	Barbil Range
Falling series	:	Not applicable
Lease area (Hect)	:	1321.45 Ha

Whether the area is recorded to be in Forest : Yes, in Karo Reserve Forest

Ownership/occupancy

	Area	Owner/occupancy	Govt's letter no. granting surface right
1. Karo RF	- 1031.89 Ha	- SAIL-BOM	No. 892, dt: 06.10.1971
2. Govt. W/L	- 275.81 Ha	- SAIL-BOM	No. 949, dt: 12.04.1960
3. Tenants' land	- 10.47 Ha	- SAIL-BOM	No. M-504, dt: 25.06.1973

Existence of public road, railway line if any nearby & approximate distance

District Board Road from Barbil to Kiriburu passess just outside the lease. Fully electrified Broad gaugue Railway line RKSN-Barbil Branch of South Eastern Railway comes upto the border of the lease. The stretch from Barbil to Bolani is only for goods (ore) traffic.

Topo-sheet No.	=	73 F/8
Latitude	=	22° 05'08" N to 22° 07'58"N
Longitude	=	85° 17' E to 85° 19' 05"E

Dilip Kumar Basu Bose

Registration No. Q/SAL/093/83/A

Land use pattern :	Forest	=	R/F Karo R/F	- 1181.66 Ha
	Agricultural	=		- 2.21 Ha
	Grazing	=		- Nil
	Village Forest	=		- 45.12 Ha
	Waste land/Barren	=		- 92.46 Ha

b) The Key plan (Drg No.1) - prepared from topo-sheet in the scale of 1:50,000, shows lease area boundaries, its location - vicinity and access routes.

Dilip Kumar Roy

Dilip Kumar Roy
Registration No. Q/[illegible]/(GC)/[illegible]

3 GEOLOGY & EXPLORATION

Topography & Drainage pattern

The lease area covering about 5 km stretch of the Bonai range is a continuous mass of hill slope between southern lease boundary and the Panposh nala. South of Panposh the area is warped with formation of a deep parallel trough dividing Panposh ridge from the main range.

The hill rises to about 920m AMSL, and is about 380m above local valley. The hill slope is quite steep while the valley has gentle rolling topography.

Drainge is easterly. Four major easterly flowing nalas (three of them, viz., Chapua, Jhikaria and Pansposh are perennial) dissect the hill in deep gorges.

Most of the hill is inside Karo Reserved Forest. The area occurs in the Survey of India topo-sheet No. 73F/8.

General Geology

The area reveals existence of the following formations in their order of distribution:

i) BHQ & Iron ore
ii) Laterite,
iii) Tuff-phyllite,
iv) Shale

There are roughly two parallel iron ore-BHQ bands running along the stretch of the area and striking approximately 30° - 210°. Between them excepting around '5000' grid line, occurs laterite of considerable but not constant areal extent. In the trial pit No. 2750/10, and bore hole No. 1750/12/2, this laterite is found underlain by tuffaceous shale. In the Pansposh area the lower ore body is overlain by phyllite.

Along the foothills occurs another band of laterite – several trial pits and an adit (No. 7000/0) in which reveal existence of kaolinitic shale beneath. All these formations belong to the Iron Ore Series of Archaean age.

The general sequence of the formations in the lease area is thought to be as follows:

BHQ -- Iron ore (Western band)
Laterite – tuff-shale – Phyllite
BHQ -- Iron ore (Central band)
Laterite – shale (lower) kaolinitic and sometimes manganiferous.

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Structure

All the formations (laterite being an alteration product not considered) are conformable. The general strike is broadly 30°–210°, with a gentle (8° to 10°) northern plunge. The dip is usually towards 300° and in amount varies between 20° to 80°. The dip recorded in the lower shale is around 30° but the central ore band dips at a steeper angle varying from 40° to 80° while the upper ore band again has gentler (between 20° & 30°) dip.

Dilip Kumar Basu Bose
Registration ... L/098/88/A.

The area has been fairly extensively faulted. The major fault is a vertical one and follows the Panposh Nala westwards turning southwest just after the 7000' grid line. The continuity further southwest has been broken down into a series of parallel strike faults with tension cracks in between (vide Drg. No. 3). The faults traverse iron ore and BHQ/BHJ. No displacement is seen. But along the faults and tension cracks extensive brecciation and fracturing have taken place.

Lithology

Lower Shale No surface exposure is seen but a number of trial pits along or just west of the Base Line and an adit (7000/0) revealed its existence beneath laterite and float BHQ capping. The shale, white to pink in colour, is fairly hard, compact, often kaolinitic and sometimes phyllitic. Near its upper contact with iron ore it is altered to bedded iron ore dipping conformably. In fact, all "K' area ore seems to be shale altered. But thickness of such ore is little and never to be exceeding 6 m (20 ft).

BHQ Within the mapped area the major exposure is along the Chapua nala, in between the F and B-C ore bodies but along the same horizon. Smaller outcrops occur just west of B-C-area and also in the Panposh-dissection of the J- area.

Usually hard massive (weathering loosens compactness), the rock consists of alternating bands of chalcedony (white) or jasper (pink) and haematite containing varying proportions of silica and iron oxide colour is variable. Darker ones are more ferruginous while light Coloured ones have higher silica. Thickness of the bands is also variable, individual bands ranging between 1mm to a few mm. In the 'tom' blocks near TP 3750/10 banding is completely disrupted. Nearly all the exposures exhibit effects of compression in tight and slightly upturned folding of various dimensions and frequent faulting (minor) along the axis.

The lower horizon is more than 900m (3000') wide and the upper one is about 600m (2000') wide (Drg No. 3).

Tuff-Phyllite On the top of the Panposh ridge (nala side), near its contact with the iron ore, the rock appears to be gritty sandstone and fairly coarse-grained. But laterally northwards and further west (all along the road-cutting on either side of the nala) it is buff coloured fine grained hard massive phyllite dipping steeply (NW). The occasional siliceous bands were transformed into pseudo-BHQ.

Higher up on the hill no shale or phyllite outcrop has been come across on the surface, but trial pit (2750/10) and bore-hole (1750/12/2) have encountered tuff beneath the top laterite.

Dilip Kumar Basu Bose
Registration No. L/098/88/A

Laterite Both the bands of laterite are secondary formations produced as result of ground water action on shale, tuff, phyllite on one hand and iron ore on the other. On average the lower band is more ferruginous (48% to 55% Fe.) than the upper one (30% to 45% fe). This may apparently be due to greater enrichment of the former from both the float ore and the basic intrusives encountered in several trial pits in this area.

Iron ore The ore in both the bands is in situ reef type with persistent strike and dip. Compressive force resulted in minor folding and crumpling all over the area, particularly in the lower band. Weathering is quite prominent at a few places and the ore has turned soft lateritic.

Physical features

Almost in all the occurrences ore near surface is hard massive with structural features not evident. But with depth laminations became distinct exhibiting, joints, folds, faults – all structural features. Generally with depth ore gets softer ending finally with blue dust. But in the two ore bodies of Panposh and F area – exposed and explored maximum – the picture is diametrically opposite. Ore in these bodies remain hard right upto the bottom while soft ore and blue dust occur as pockets in between. Colour of such hard ore at depth, in spite of high iron content, is yellowish grey. Another feature seen in F-area is horses of banded jasper. Thin bedded and friable, these are usually devoid of any interbanded hematite. Ore beneath these horses is soft and powdery. All the deposits have on surface a few patches of brownish lateritic ore or laterite both of which can be weathered. Inside the bodies there are occasional pockets of yellow ochre.

Chemical Quality

Iron content in the ore – hard and laminated types in particular – varies rather widely from below 58% at surface to above 65% at depth, the increase being progressive. It is around 61% at 15-20m below surface, 62% at 25-30m, 64% around 40m and so on.

Silica (Sio_2) and alumina (Al_2O_3) on the other hand, decrease with depth, the former from above 4% to around 1%, and the latter from above 5% to around 1%, near about 50-60m below surface.

Other impurities, given below, are negligible:-

P = 0.06%
S = 0.20%
Mg0 = 0.5%
Ca0 = 0.2%
Mn = 0.08%

Mineralogy

Microscopic examination of ore samples shows both hematite and magnetite / martite) together with goethite and some limonite.

Dilip Kumar Basu Boss
Registration No. L/098/88/A

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Scale of Plan 25 Rods
Leased
Contour
Road
Stream
Pipeline

LEGEND
Ore Area
Contours
Boundary
N
Balam Colony
0001 M
W 1000
W 2000
W 3000
W 4000
2000
2200
2400
2600
2800
1000
500
0
500
1000

Ore bodies

Reconnoitre exploration in late fifteen with 6-7m deep pits in (150 x 300)m grid led to broad demarcation of ten (10) ore bodies, named 'A', 'B', 'C' areas etc (vide plan along side). Detailed geological mapping in 1964-65, in 1:2000 scale, of the deposit boundaries delineated.

'A' and 'K' are foothill float ore.

B' & C area

Irregular in shape, lower half of the deposit stretches from Jhikaria Nala in the south to Balagoda nala in the north dissected almost centrally by Panposh nala. The section between Panposh nala and Balagoda nala is known as Panposh deposit. Upper half is located between Champua nala in the south to a tributory of Panposh nala in the north. Currently it is B-C area.

Physically ore in the south of Panposh Nala differs from that in the north. While Panposh ore, barring a (10-15)m thick friable to blue dust band 65-70m below surface is hard massive high Fe. low gangue. SMS grade ore [65.2% Fe, 0.6% SiO_2 , 1.1% Al_2O_3) upto 120m below surface , ore in the south is medium hard lateritic and weathered at the north edge. At places, however, it is hard limonitic, as seen in the tongue south of Jhikaria nala. It is BF grade ore, average analysis being 59.4%Fe, 3.7%SiO_2, 3.4% Al_2O_3.

Although a few holes had ore continuing till 80m below surface, at many places, however, it was shallow reducing to 'mutti' within (10-12) m from surface as found in course of mining.

Both the sectors have been worked extensively since inception, Panposh mechanically and B-C manually.

D-area

Located between Balagoda nala and Limtur nala (last northern lease boundary) at the NE corner of the lease this lenticular deposit is wider (450m) in the north 700m part than in the south. Ore in top 35-40m is medium hard to soft laminated weathered having high alumina [59.3% Fe, 4.7% Al_2O_3). BF grade.

Core drilling in early nineteen found ore persisting upto 72m below surface and much of it is hard laminated good quality (64.5% Fe, 1.50% SiO_2 , 1.75% Al_2O_3)

The ore body was being mined since early seventees manually. Since 2005 AD it is being worked by contractor with machines.

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F-area

This Ore body occurs all over the nearly 1200 m long flat topped ridge adjoining southern lease boundary, about 800 m wide and limited on north and south by two faults that which flow Chapua and Pacheri nalas respectively.

Ore is principally developed on the eastern slope as an open lens with ends attenuated. Barring a few laterised patches, outcrops are of hard massive and hard laminated ore. Crumplings and folds of small amplitudes are seen. Almost on all sides the ore body is bound by faults that have distorted bedding and caused fracturing / breciation. Mild magnetism recorded near southern tip may be due to impact of thrust. Predominant mineral is hematite, followed by goethite, martite etc. Intense hydration took place all over eastern slope and penetrated to considerable depth converting hematite to goethite.

Three adits penetrated the deposit upto end of mineralisation. Those and bore holes revealed persistence of hard ore beyond 70 m depth (avg. 76m).

Grade of ore is high, average analysis being 63.3% Fe. 1.38% SiO_2 and 3.20% Al_2O_3. Alumina reduces sharply in depth, dropping below 1% beneath 30m.

The area is being mined mechanically since 1977.

G-area

Located at the hill-top along the Western lease boundary just to west of B-C ore deposit, this ore body is more than 1000 m long and on average 60m wide. Bore holes found are persisting upto 80 m below surface.

Hard massive bedded in the south, ore becomes softer at the centre and a little lateritic in the north. After 12-15m below surface ore becomes soft friable. Grade is medium to high, average being 62.9% Fe, 2.55% SiO_2, 2.07% Al_2O_3. Mining of the deposit began in early eightees manually and was switched over to machine mining in late ninetees.

E-area

This nearly 2 km long ore body having average surface width of about 260m occurs all along western lease boundary from NW corner in thick forest. Ore on surface is hard massive to hard laminated (well bedded) exhibiting strike (conforming to regional 30^0 - 210^0 with a small northern plunge of 8^0-10^0) and dip (towards 300^0) varying in amount from 20^0 to 60^0. After initial shallow pits, only probe was geological mapping. Samples from shallow pits assayed 60.2% Fe.

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b) The geological plan with contours in the scale of 1:5000 (permission letter from IBM No. 11013/61/MP/89-CCOM, dt: 16.12.2004, in this respect, is given at Anx. 6) is Drg. No. 3. It shows ore bodies, deposits to be worked in 5 years from 2010 AD, other geological formations, dip, strike, and locations of past exploratory pits, adits and bore holes. A note giving chronology of exploration done and a table containing information obtained are at Anx. 8a.

c) Geological cross sections (lease boundary to lease boundary) through ore bodies to be worked in 5 years from 2010 AD, are in Drg No. 4,6,8 and longitudinal sections, in Drg. No 5, 7, & 9.

Iron Ore Fines

Results of chemical analysis of fines lying in old dumps are given in the annexed pages 9a, 9b, and 9c.

Minerals found are dominantly hematite with a little goethite, martite, limonite, lepidocrocite.

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CHEMICAL LABORATORY
PROSPECTING DIVISION
R M D , ROURKELA.

Annexure IV

Raw materials : Iron ore (Fines)
Ref.No. RMD/99/3211/DP/LAB/IRON/

Date. 12-1-99

Analysis report of Iron ore Fines from Bolani Iron Ore Mines.

DUMP-NO-1

Sl. No.	Sample particulars & Nos.		RADICALS % Fe	% SiO2	% Al2O3	% L O I	
1.	FD / 1 / 1 /	1	56.70	6.20	6.25	5.70	56.00
2.		2	55.80	5.50	7.62	6.35	5.18
3.		3	57.20	4.20	6.20	7.20	7.32
4.		4	54.70	4.80	8.98	7.22	
5.		5	55.60	5.20	7.55	7.20	
6.	FD / 1 /2 /	1	57.20	3.50	7.52	6.45	57.02
7.		2	57.00	4.00	7.25	6.50	3.30
8.		3	57.20	3.40	7.50	6.70	7.21
9.		4	56.70	2.70	6.90	8.50	
10.		5	57.00	2.90	6.88	7.95	
11.	FD / 1 /3/	1	58.20	4.00	5.20	7.00	56.25
12.		2	57.20	3.70	6.30	7.56	3.42
13.		3	56.70	3.10	7.48	7.60	6.02
14.		4	55.70	2.86	7.50	9.30	
15.	FD /1 /4 /	1	61.00	2.80	4.50	5.20	62.60
16.		2	63.00	2.60	3.50	3.60	2.5
17.		3	64.20	2.00	2.89	3.02	3.6
18.		4	62.20	2.60	3.70	4.40	
19.	FD / 1 / 5/	1	62.80	3.50	2.75	3.70	6.16
20.		2	62.00	3.60	3.92	3.52	3.24
21.		3	63.20	2.80	3.16	4.00	1.5
22.		4	59.60	4.00	5.20	5.00	
23.		5	60.40	3.00	4.90	5.26	

QA

(5) Annexure-II (Contd)

Sl.No.	B.H No.	sample	RADICALS % Fe	% SiO_2	% Al_2O_3	% LOI	
	Fines Dump No. 3						
31.	FD/3/1/	1 L	64.00	2.00	1.98	4.40	62.46
32.		2 F	62.20	2.08	4.22	4.26	2.22
33.		3 L	63.20	1.82	3.00	4.60	3.49
34.		4 F	62.40	2.04	3.96	4.30	
35.		5 L	62.60	2.20	3.00	4.66	
36.		6 F	60.40	3.20	4.80	5.06	
37.	FD/3/2	1 L	62.40	2.00	3.10	5.30	62.74
38.		2 F	62.20	1.80	4.00	4.90	2.25
39.		3 L	62.80	2.20	2.80	4.90	2.93
40.		4 F	63.40	3.00	1.80	4.20	

dy 62.5/226/83

Dy. Manager (Chem)
Prosp. Division,
RMD, Rourkela.

To
The Manager (Geol)
Bolani Iron Ore Mines,
Bolani.

RAW MATERIAL DIVISION
DRILLING & PROSPECTING
CHEMICAL LABORATORY, ROURKELA.

Ref. No. RMD/99/3211/DP/LAB/IRON/

Analysis report of Bore-hole Iron ore samples of from Bolani Iron Ore Mines.

Sl. No.	B. H. No.	Sample No.	RADICALS			
			% Fe	% SiO2	% Al2O3	% LOI
1.	FD/1/8/	1	63.50	2.10	2.74	4.14
2.		2	60.40	3.40	4.78	5.10
3.		3	60.20	3.80	4.82	5.12
4.		4	62.40	2.60	3.30	4.60
5.		5	62.20	2.20	4.02	4.50
6.	FD/1/9/	1	62.60	2.06	3.86	4.22
7.		2	61.40	2.80	4.40	4.75
8.		3	61.00	2.66	4.55	5.26
9.		4	58.40	3.60	5.92	6.60
10.		5	59.00	3.66	5.90	6.50
11.	FD/1/10/	1	58.60	4.00	5.50	6.30
12.		2	59.40	4.60	4.25	5.35
13.		3	61.20	2.80	4.45	4.72
14.		4	61.20	2.84	4.45	4.82
15.		5	61.60	2.40	4.60	4.55
16.		6	59.50	3.34	5.25	6.00
17.	FD/1/11/	1	58.50	3.48	5.96	6.46
18.		2	60.00	3.20	4.76	5.96
19.		3	59.00	2.48	5.98	6.60

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To
The Manager, Geo.
Bolani Iron ore Mines,
Bolani.

Dy. Manager (Chem)
Prosp. Division, RMD
Rourkela.

d) FUTURE EXPLORATION PROGRAMME

YEAR	LOCATION	Nos. Of Bore holes	Grid Pattern	Average Depth in Metres	Metres
2010-11	F-Area	12	100M* 100M staggared with existing bore holes	75	900
	G-Area	12	100M* 100M staggared with existing bore holes	75	900
	J-Area	7	100M* 100M staggared with existing bore holes	75	525
	D-Area	11	100M* 100M staggared with existing bore holes	75	825
	Panposh	24	100M* 100M staggared with existing bore holes	75	1,800
	Total	66			4,950
2011-12	Panposh	13	100M* 100M staggared with existing bore holes	75	975
	E-Area	47	100M* 100M staggared	75	3,525
	Total	60			4,500
2012-13	E-Area	46	100M* 100M staggared	75	3,450
	B&C-Area	16	100M* 100M staggared with existing bore holes	75	1,200
	Total	62			4,650
2013-14	B&C -Area	59	100M* 100M staggared with existing bore holes	75	4,425
	Total	59			4,425
2014-15	B&C-Area	61	100M* 100M staggared with existing bore holes	75	4,575
	Total	61			4,575
Grand Total		308			23,100

With a view to prove total mineralisation of the entire leasehold there will be drilling also in areas having no ore on surfaces per programme given below:

Year	Location	Number of holes
2010-11	West of F'area upto lease boundary	7
2011-12	East of F & B-C areas upto lease boundary barring roads, houses and installations	6
2012-13	Between B-C & G areas	2
	Between Panposh & J area	2
2013-14	Between Panposh - D' area and E' area	5
2014-15	East of Panposh - D' area and lease boundary barring staff colony	3
	Total	25

The grid pattern of these holes will be 500m2 staggered. Holes willbe drilled upto bottom of mineralisation; otherwise upto 25m below surface.

Drilling inside forest will be after permission from the Forest Department.

Cut off grade for this exploration will be 45% with specific aim of assessing reserves of ore of grades 45-50% Fe, 50-55% Fe. And 50-58% Fe. The time schedule given hereinabove will be followed scrupulously with the aim of completing the entire programme by March, 2015.

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e) Ore Reserves [As on 01.04.2010 - updated]
Figures for the entire leasehold have been categorized as per UNFC code and is given in the table below:

Area (ore bodies)	Reserves		Resources	
	Million tonnes	UNFC code	Million tonnes	UNFC code
D' area	25.97	111	0.68	221
E' area	--	--	7.6	333
F' area	45.22	111	6.2	221
G (including J area)	61.99	111	14.86	221
Panposh	4.54	121	--	--
B-C	--	--	92.03	333
Total	137.72 million tonnes		121.37 million tonnes	

Detail justification for designating UNFC codification

Iron ore deposits in this lease hold of BOM are strata bound, having low to moderate dips with simple folds and faults and occur right from surface.

D', F' & G' The tonnages hitherto termed 'proved' (less quantities extracted) for these deposits determined through detailed exploration by close grid drilling (holes reaching bottom of mineralisation) pitting, supplemented (in F'area) by long adits, and evaluation through intense sampling and analysis deserve, as per norms specified by UNFC, the code G1.

Easy accesibility, amenability to processing determined through several laboratory tests, ore grades matching consumers' demand lead to assignment of Code F1.

Consecutive mining plans and reports (four of which approved by IBM) about working these deposits successfully over the years ascertain excellent economic viability to earn the codification of E1.

However, the parts of reserve in the peripheries, like that along lease boundary and inside reserve forest (as in F'area) have hindered economic viability as well as feasibility. Hence these tonnages are given the code of 221.

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Registration /098/88/A

Panposh : Here wide exposure of the ore body as a result of uninterrupted mining for four decades, excellent quality (SMS Grade) and easy accessibility attract codes of G1 and E1. Feasibility, however, suffers a set back due to a statutory embargo (restriction imposed by DGMS for a violation). Hence the reserve available is given the code of 121.

B' - C' : Information about reserve and its quality occurring below hand-mined benches is meagre. Dumps of hand sorted fines, waste and overburden are left out on all the benches. The reserve, therefore, is inferred and is to be assigned the code 333, uncertain in all respect, economic, feasibility and geological.

E' : The degree of uncertainty about ore in this deposit is no less - location is remote, terrain difficult and within reserve forest and geological exploration (mapping and widely spaced shallow pitting) rudimentary. Hence the reserve inferred here is to be given the codification of 333.

Cut-off grade : 57% Fe.
While assessing additional reserves, after core drilling since 1989-90, in D' and G' area the cut-off point was lowered to 55% Fe.

Average Grade :

Area	Fe.%	SiO_2	Al_2O_3
F'	62.00	2.60	3.40
D'	64.58	1.75	1.58
G'	63.93	2.07	2.55

Classification of ore grade-wise has not been done because assay variation does not follow a definite pattern. Instead classified according to physical characteristics like hardness, lamination, extent of lateritisation etc., and shown in geological slice plans and sections.

Estimation of reserve of ore of following grades sought by IBM, is given below:

(45 - 50) % Fe = 4.20 Million tonnes
(50 - 55) % Fe = 9.91 Million tonnes
(55 - 58) % Fe = 8.32 Million tonnes

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These figures are for F' and G' areas combined. Assessment of reserve in other areas is in progress.

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Registration No. Q/L/098/88/A

4 MINING

(a) Mining, which began in this lease in 1960, is open cast. Till 2005 AD, there used to be both machine mining and manual mining. At present as well as in the 5 years from 2010 AD, there is and will be all mechanised work. The process is conventional top slicing by shovel-dumper combination.

It is proposed to continue work in all the four existing quarries viz., F' and G areas at Hill-top, and D'area and Panposh, at the foothills. Work in Panposh, however, is subject to clearance from DGMS.

Mining at hill-top, will be departmental, but that at D area and Panposh will be by contractor who will bring his own fleet of machines.

Details of bench geometry quarry-wise is given in the table below:

	BENCH		
Pit	**Length (m) approximately**	**Height (m)**	**No. of Benches to be worked per year**
D-Area	250	6	3 nos. in first year 3 nos. in other 4 years
F-Area	2740	10	2 nos. in first 4 years 3 nos. in 5th year
G-Area	1750	10	3 nos. in first 2 years 2 nos. in rest 3 years
Panposh	180	6	4 nos. in first year 3 nos. in second year 2 nos. in remaining years

From the current rate of around 4 million tpy, rate of r.o.m production is going to be 12.0 million tpy from 2010-11. Of this quantity, a maximum of 9.88 million tpy can be had from F' and G' area pits at hill-top. The balance tonnage, 2.12 million tpy, will be obtained from the foothill quarries of D'areas and Panposh. Multiple point mining is in order to minimise assay fluctuation.

The reason for restriction at hill-top is the capacity of the Hill-top primary Crushing plant.

(b) **Development & Production**

Detail calculation of year-wise development and production, quarry-wise, are furnished in the table at **Anx. 8b**. A summary thereof, for the entire mine is given below. R.O.M. from F' and G'area, besides sizing, are washed in the main Ore Processing Plant, while that from D' area and Pansposh are only crushed and dry screened at the 600 tph plant located near the railway siding.

Dilip Kumar Basu Bose

Registration No. Q / DAL/008.08/A

SUMMARY * OF MINING : Excavation/Development & Production
(for entire mine)

Year	OB+Waste m³	R.O.M Ore m³	Stripping Ratio Ore : OB+Waste	PRODUCTION (MILLION TONNES) R.O.M Ore 1m³=3 tonnes	Saleable ore		Slime (Tailings)	Sub-grade ore	Mineral Reject
					Lumps	Fines			
2010-11	0.595	4.04	1:0.15	12.00	2.5(1.39w)	8.43(6.57w)	1.357	Vide Para 4(b)	Vide Para
2011-12	0.505	4.00	1:0.13	12.00	2.06(1.40w)	8.46(6.60w)	1.474		
2012-13	0.51	4.00	1:0.13	12.00	1.94(1.28w)	8.55(6.69w)	1.514		
2013-14	0.475	3.94	1:0.12	12.00	1.98(1.32w)	8.90(7.04w)	1.513		
2014-15	0.478	4.00	1:0.12	12.00	1.94(1.28w)	8.53(6.67w)	1.513		

* For detail break-up vide **Anx.8b**
w = Washed quantity

Sub-grade ore

At Bolani there is no regular production/generation of sub-grade ore these days. Any extracted material appearing below grade, i.e., having iron (Fe) content below 57%, and/or having high gangue (SiO_2 and/or Al_2O_3) is stacked on the bench floor itself. At the first available opportunity it is blended with superior grade r.o.m., and fed to the Ore processing Plant.

However, the big heaps of fines (-10mm in size) produced till mid-eightees (before washing of ore, fines, began) and stacked near railway siding, can be termed sub-grade ore, for, these ores are acceptable to the consuming steel plants only after either washing (physical up-gradation), or blending with high Fe blue dust (assay up-gradation). As on 31.03.2009, stock of such material in one heap is 3.11 million tonnes, and in another, 96,000 tonnes approximately. In the past several million tonnes of these fines were reclaimed and despatched after blending.

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In the present system of ore processing there is no generation of such fines as mining in all the ore bodies has gone down quite below surface where high-alumina ore does not usually occur.

13/1/15

खान नियंत्रक (मध्यांचल)
Controller of Mines (Central Zone)
भारतीय खान ब्यूरो

Dilip Kumar Basu Mazumdar
Registration No. 2 .../098/02/A

Methodology to achieve target production

(a) Augmenting fleet of mining equipment by deploying higher capacity dumpers and excavators, alongwith strengthening of dumping platform to permit use of 120 tonnes.

(b) Augmentation of capacity of HT Crushing plant, conveying and stacking system up to secondary stockpile.

(c) Installation of tertiary crusher to limit lump size to -30mm

(d) Augmentation of capacity of secondary stockpile.

(e) Augmentation of the capacity of the wet screening, providing simultaneous operation of BO and DO circuits, replacement of existing DD screen by higher capacity screens, replacement of rake classifiers by spiral classifiers, and augmentation of capacities of product conveyors.

(f) Reclamation of overflow water from tailing pond.

(g) Provision of pit-head primary crusher at D" area (& Pansposh), and transportation of crushed ore by conveyor to 600 tph Crushing-Screening Plant (near Loading Plant).

(h) Replacement of secondary jaw crusher in the 600 tph plant by a Cone Crusher to produce -30mm lumps.

(i) PLC based automation & control.

(j) GPS for tracking mobile equipment.

(k) Strengthening of manpower.

c) Year-wise plans & sections

Drg. Nos. 16-20, 22-26, 28-32, 34-38 have pit development plans and sections of F', G', D' areas and Panposh quarry, showing year-wise mining sites and waste dumps for the five years, from 2010-11 to 2014-15.

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d) Composite plans & Sections

Drg. Nos. 21, 27, 33 & 39 are the requisite composite plans with sections.

e) Proposed rate of production when mine is fully developed

12.0 million tonnes per year (Mtpy) of run-of-mine ore.

Dilip Kumar Sinha Deputy
Registration No. 2 (CAL/09.2011)

Expected life of mine

At the stated rates of production, ore reserves (including 'resources') in F', G' and D' areas will last till 2023 AD. If by then the availability of resource ore (indicated reserve) in B'-C' area (92.03 Mt) and E' area (17.6 Mt), making a total of about 100 Mt is confirmed, the life of the mine, @ 12.0 Mtpy extraction, will get extension of another 8 years, i.e., upto 2031 AD.

(f) **Conceptual Mining Plan**

From a modest beginning in april, 1960, as a supplier of unwashed lump iron ore @ one million tpy to only Durgapur Steel Plant, Bolani Ores Mines (BOM) has had almost continuous evolution and expansion to making at present gross despatch of 4 Mtpy (lump and fines together), closely sized ore of rigid chemical grade to more than one steel plant.

In that trend, the period commencing in 2010, will witness a quantum jump in rate of production to 12.0 Mtpy in order to supply 10 Mtpy of finished product (lumps+fines) having further stringent specifications as mentioned below:

Product	Size	Fe%	SiO_2%	Al_2O_3%
Lump	(-30+6)mm	65.0	2.0 max	2.0 max
Fines	-6 mm	64.5	2.0 max	2.0 max

Total gangue in either product is not to exceed 4.0%.

The pattern of work, open cast mining, has remained the same but the scale has gone up. And, from mixed mode of manual and mechanised work, it has switched over to fully mechanised mining.

The technical report prepared by MECON (Anx. 7) gives the outline of expansion planned. The steps to attain higher rate of production is given above (Methodology)

According to the same Report, a 4.0 Mtpy pellet plant will be installed to produce pellets by using beneficiated as well as old fines lying in the dumps.

So long the reserves last, mining will continue in the existing ore bodies. Switch over to B' -C' and E' areas will require relocation of the main Ore Processing Plant because for logistics reason, r.o.m. From either of the latter areas can not be fed to the present plant. The road to hill top, from the administrative office and township at the foothills will also have to be relocated. Need will be there for another tailing pond.

Exploration already carried out : Vide Note at Anx. 8a

Dilip Kumar Basu Bose

Registration ... 2 /CAL/098/88/A

Areas already covered : All the ore bearing areas come across during geological mapping : A,B,C,D,E,F,G,H,J, K but not all to the full extent.

Areas to be taken up for exploration : Vide para 3 (d)

After exhaustion of hematitic ore, major iron-bearing material available in the lease will be BHQ (Banded Hematite Quartzite). Depending upon circumstances prevailing at that time, process and strategy are to be worked out for mining BHQ.

The other ferruginous material, laterite, which also has considerable occurrence in this lease may not attract steel plants (consumers) because of its high alumina content that hinders blast furnace operation. If BHQ and laterite are worked, life of the mine will get extended by many more years.

Pit	Ultimate Dimension (Approx) L x B (m)	Final MRL (Pit bottom)	Final Slope Angle	Remarks
B' - C' area (ex-Panposh)	2200 x 700	600	10° to 30°	As has been seen all over Bolani by bore holes and adits, inclination of the ore base varies not only from ore body to ore body, but even in the same body at different points. Ultimate pit slope angle, therefore, will also vary.
Panposh	900 x 600	520	20° to 45°	
D' area	650 x 350	452	17° to 30°	
F' area	2500 x 400	715	7° to 45°	
G' area (including J area)	2200 x 700	780	12° to 30°	

Environment Condition

None of the steps proposed for aforesaid mine expansion will affect present satisfactory status of environment (by exceeding limits of air, water and noise pollution or causing land erosion), including natural drainage and ground water storage.

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Post mining land use

No top-soil was found in any of the ore bodies so far worked, nor any significant quantity of waste rock (evident from low stripping ratio) as could be used for back filling of the excavated areas. Hence when mining will come to a halt upon exhaustion of ore, the benches except marginally back filled with whatever waste rock available, will have to be biologically reclaimed (afforested), Restoration of topography will never be possible. Vide Table in following page.

Dilip Kumar Basu Bose
Registration No : Q/GAL/098/88/A

POST MINING LAND USE

Sl. No.	Land use during Mining	Area up to 2010 (Ha)	Area up to 2030 (Ha)	Post Mining Land use	Area (ha)
1	Mining	336.10	4681.14	Reclamation by back filling and afforestation and water body etc	545.00 + 15.00
2	Storage of top soil	0	0.00		
3	OB Dump	10.93	28.76	Afforested	28.76
4	Mineral Storage	4.65	20.46	Afforested	20.46
5	Infrastructure	16.72	86.83	Decommissioned and afforested	86.83
6	Roads and conveyor	26.86	45.36	Plantation and conversion of public road	45.36
7	Railways	0	0.00		0
8	Green belt	76.21	218.72	Green Belt	218.12
9	Tailing Pond	10.00	10.00	Afforested	10.00
10	Effluent Treatment Plant	1.20	1.20	Decommissioned & afforested	1.20
11	Mineral Separation Plant	2.20	2.20	Decommissioned & afforested	2.20
12	Township	47.64	47.64	Left for community use/handed over to State Government	47.64
13	Magazine	1.00	1.00	Decommissioned & afforested	
14	Exploration	0	* 220.00	Mining will be done over that area from 2015 to 2030	0
	Total	**533.51**	**1143.29**		**1,110.57**

* included in Sl. No. 1 (Mining)

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Reclamation & rehabilitation measures for entire degraded land and Afforestation in conceptual stage, besides proposal for simultaneous back-filling during life of the mine

Stated in Table A on page 61 .

(g) i) Salient features of mode of working

Mode of work in all the pits of F',G',D, areas and Panposh is conventional open cast mechanised (shovel-dumper combine) mining. Bench height in F' and G'areas is 10 m., and in D' area 6m Panposh quarry now closed for rectification of a violation, when opens will have 6m. high benches.

Bench floors are kept sufficiently wide as to permit smooth manouvre and movement of dumpers.

Haul roads to hill-top plant hopper from F' and G' area has effective width of 20m., gradient 1 in 16, and bundhs on slope side. Road surface is maintained smooth by graders and moist by water sprinklers.

ii) Lay-outs of mine faces and sites for waste dump

Benches are carved out along the contours in G' area (along NE-SW) but obliquely in F' area (along NE-SW, & NW-SE). Extraction is multi-point for the sake of quality control. Except for first 2 years in G' area, two benches will be mined at a time in both the quarries. G' area in first 2-years will have 3 benches working. Benches in D' area from N-S alignment will turn to E-W

Waste dump in F' area is to the west of the pit outside pit limit. Because of exhaustion of ore in some benches back filling has been done. G'area, because of its long benches, has three waste dumps the older one to the south and since hand mining days is within mineralised area. It is planned to be shifted further south in the barren zone. The recent one is to the NE, beyond ore boundary. Drg. Nos. 16 to 20 and Nos. 22 to 26 show these features in F' and G' area respectively.

(iii) Extent of Mechanisation

Entire mining is being done by machines. As stated earlier, work in the foot hill pits will be done contractually, the contractor will bring his own fleet of machines. Calculation herein given is for departmental work to be done in F' and G' areas:

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Gross excavation (Million tonnes)

	F'	G'
ROM. Ore/year	= (3.85+5.52) = 9.48	
Overburden + Waste rock/year	= (0.17+0.23) = 0.40	
	Total =9.88	

No. of days/yr. = 300
No. of shifts/day = 3
Hours/Shift = 6.6 Approx.
Effective Hrs./day = (3x6.6)= Say 20
Effective Hrs/Yr. = 300 x 20 = 6000

Tonnes to be excavated/hour = 9,880,000/6000
= 1647
= Say 1650

1. **Calculation for drills**

Hole dia = 150mm.
Hole depth = 11m (including 10% sub grade)
Hole spacing = 5m x 5m.
Rate of penetration = 5m/hr (avg.)
Yield of blasted material/hole = 900 tonnes (on the basis of 3 mt./m³)
Machine availability = 60% [taking into account time for shifting rod changing as well]
Machine utilisation = 70%
Effective hrs./shift = 3.64

As each pit will have 3 sites of work, one for development (removal of overburden/waste rock) and two for ore, running need will be for 6 machines, and total requirement, on the basis of 60% availability, 9 units. The mine presently has 5 units. MECON has projected for additional 4 units. MECON also projected need for 2 Nos. Wagon drills for 100 mm dia secondary holes (Anx. 7).

List of existing Drilling machines

Sl. No.	Type	No	Dia of hole (mm)	Size/ Cap.	Make/ Model	Motive Power	HP/KW
1	Elect. Powered	1	150	11.5M	IDM-20E	Electricity	160 KW
2	Diesel Powered	1	150	11.5M	LMP RBH-6-100	Diesel	380HP
3	- do -	3	150	11.5M	IR-ROTOCOL	Diesel	400 HP

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2. **Loading equipment (Shovels)**

Bucket capacity	- 4.6 m3/5.5m3/8m3 (Now in use) (Proposed)
Fill factor	- 80%
No. Of passes/Hr.	- 100
Tonnage factor for blasted ore	- 2.5t/m3
Tonnage handled/Hr.	- 920 by 4.6 m3 unit] 1100 by 5.5 m3 unit] Excvn./ Hr. = 1650 Mt 1600 by 8.0 m3 unit]
Availability	- 65%
Utilization	- 65%
Effective hrs/shift	- 3.38

Because each of the two quarries will mine in two benches, running need will be for 4 units. Based on availability and utilisation factors, total need will be for 9.5 , i.e 10 units. To provide for due maintenance in the face of 3 shift operation sufficient standby is essential. At the same time some rationalisation (reduction in no. of units to reduce load of maintenance, and that of working points, quality permitting, for effective supervision) is called for. As a move in this direction projection is made for 2 additional units of 8 m³ size by MECON (Anx. ٢).

List of existing Shovels

Sl. No.	Type	No.	Buckets cap in M³	Make/ Model	Motive Power	HP
1	Hydraulic	2	4.5	BEML PC-1000	Diesel	542
2	- do -	2	5.5	HM H-121	Diesel	720
3	Rope shovel	4	4.6	HEC	Electricity	250 KW

3. **Haulage and transport equipment**

a). **Haulage within mining lease hold (by Dumpers)**

Calculation

Excvn. / Hr	- 1650 tonnes
Round trip haul distance	- 4 Km. (avg)
Travelling speed	- 20 kmph
Loading time	- 2.5 - 3 min. (incl. Spotting)
Unloading time	- 1 min. (- do -)
Total cycle time	- 16 min.
Availability	- 65%
Utilisation	- 75%
No. of trips/Hr.	- 3.75

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With the above parameters is to be added the factor of distribution (guided by ore quality) to minimum 4 working spots (two in each quarry). Total need will be of 28 Nos. of 50t. Units. As the large fleet can pose traffic as well as maintenance problem, there will be switch over to 100 capacity units. MECON has estimated additional requirement of 7 Nos. of that size units (Anx. 7).

List of existing dumpers

Sl. No.	Type	No.	size/cap.	Make/ Model	Motive Power	HP
1	Rear dump	15	50 tonnes	BEML HP 2W 50	Diesel	635

From D' area to mine 2.52 million tpy r.o.m, working 6m high benches, only 12 day light hours, dumpers plying through residential colony at restricted speed, for 300 days/year, the rate per hour is

$$\frac{2520000}{300 \times 12} = 700 \text{ tonnes}$$

To achieve this the contractor has deployed one 150mm dia drilling machine, one 1.2 M^3 bucket shovel and 4 nos. Of 10-12 tonner dumpers each carrying on average 11 tonnes.

Therefore, for the entire 12 million tpy of mining the equipment list will be as below:

Area	Equipment & capacity	Requirement		Existing	Proposed addition (capacity)
		Running	Total		
	Drills				
F' + G'	150mm dia	6	9	5	4 (150mm dia)
D	- do -	1	2	1	
	Shovels				
F' + G'	4.5 to 5.5m^3 bucket	4	10	8	2 (8m^3 bucket)
D	1.2 m^3 bucket	1	1	1	
	Dumpers				
F' + G'	50 tonner	18	28	15	7 (100 Tonner)
D	11-12	4	6		
	Dozer				
F' + G'		6	10	8	2

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b) Transport from mine-head to the destination (consuming steel plant):

From the mining point ore goes by conveyor through the ore processing plant to wagon loading plant. Wagons loaded by conveyors are moved by Railways to consuming steel plants of Durgapur (round trip distance 640 Km) and Bokaro (530 Km).

Miscellaneous

a). Operation

For opening new benches, making roads, clearing boulders after blasting bull dozers are necessary. Requirement norm is one in each working bench. Total need, on the basis of 65% availability and 65% utilisation, is for 9.5 i.e. 10 units. The mine has now 8 units. MECON's recommendation is for 2 No. additional units (Anx 7).

Another machine required to keep the haul road surface smooth and clean is motor grader. F' and G' areas being adjacent pits, hence running need is for one and total need is for 2 Nos.

For dust suppression, on haul roads, constant sprinkling of water is essential. The mine has 2 Nos. at present. In view of longer working hours (3 shifts) MECON has perceived need for 2 more units (Anx. 7).

MECON has also felt need for hydraulic rock breaker (alternate to secondary boulder blasting) and estimated need for 2 units (Anx. 7).

b) Other Machineries deployed

Sl. No	Type	No	Size/Cap	Make/ Model	Motive Power	HP
1	Dozers	4	D-355A-3	BEML	Diesel	410
2	Dozers	2	D-355	BEML	Diesel	410
3	Dozers	1	D-355A	BEML	Diesel	410
4	Dozers	1	D-155	BEML	Diesel	320
	Total	8				
5	Grader	2	GD605 R2	BEML	Diesel	145
6	Water Sprinkler	1	HPGW-28K1	BEML	Diesel	380
7	Water Sprinkler	1	ALWS 16 K1	BEML	Diesel	350

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5 BLASTING

a) **Broad parameters**

Hole depth	-	11m (for 10m high benches) 6.5m (for 6m high benches)
Hole dia.	-	150mm (for 11m deep holes) 100mm (for 6m deep holes)
Spacing	-	5.5m to 7m for 11m deep holes 3.5m to 4m for 6m deep holes
Burden	-	4.5m to 5.5m for 11m deep holes 2.5m to 3 m for 6m deep holes
Charge/hole	-	80kg to 100kg for 11m deep holes 25kg to 35kg for 6m deep holes

Manner and Sequence of blasting - To minimise vibration and noise, generally single row blasting is done. In case of multiple row blasting delay or relay detonators (depending upon formation and nature of ore) are used.

Maximum number of Holes blasted in a round - 34

b) **Types of explosives used** - i) Slurry
ii) OCG / GN

c) **Powder factor** -

In Ore	- 5.5 to 8.0
In OB/Waste rock/ Development	- 6.0 to 9.0

d) **Whether secondary blasting is needed** - Need is occasional for removal of toes, when any. For this short depth 100mm dia inclined holes are drilled and OCG / GN explosives are used.

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e) **Storage of explosives** - There are three magazines details of which are given in the next sheet. Locations can be seen in the Surface Plan (Drg No. 2).

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STORAGE OF EXPLOSIVES

MAGAZINE NO. 1	
LICENCE NO. (E-25 (14) - 145/i/OR-174/EX)	
Class-2	2661.00 kg
Class-3	1875.00 kg
Class06-Divn.-1	60,00.00 Metres (Safety Fuse)
Class-6-Divn.-2	15,240.00 Metres (Deto-Fuse)
Class-6-Divn.-3	40,000 Nos. (Detonators)
MAGAZINE NO. 2	
LICENCE NO. (E-25 (14) - 145/ii /OR-213/EX)	
Class-2	2661.00 kg
Class-3	1875.00kg
Class-6-Divn.-1	40,000.00 Metres (Safety Fuse)
Class-6-Divn.-2	15,240.00 Metres (Deto-Fuse)
Class-6-Divn.-3	40,000 Nos. (Detonators) - Elect & Ordinary
MAGAZINE NO. 3	
LICENCE NO. (E-25 (14)-145/iii/OR-214/EX)	
Class-2	4136 kg
Class-6-Divn.-1	40,000.00 Meters (Safety Fuse)
Class-6-Divn.-2	15,240.00 Meters (Deto-Fuse)
Class-6-Divn.-3	40,000 Nos. (Detonators) [ED-15000+OD-25000]

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6. MINE DRAINAGE

a) Likely depth of water table

In the hill part of the lease none of the trial pits, adits or bore holes, reaching maximum depth of 106 m., struck anywhere between hill-top and foot hill, any water body. Though existence of perennial nalas, viz Jhikaria and Panposh flowing down the hill (in this lease) indicate presence somewhere of water pocket which feeds these nalas.

In northern sector of D' area and Panposh quarries occasional accumulation of water during monsoon is because of rain and not due to rise of ground water table. The quantity in D' area is about 60,000 m^3. Analysis is furnished below:

WATER QUALITY REPORT

LOCATION : D' area bottom quarry **Date of Sampling** : 13/04/09

Sl. No.	Parameter	Unit	Result
1	Temperature	°C	27.8° C
2	Colour	°C	Brownish
3	Odour	°C	Odourless
4	pH	°C	6.89
5	Conductivity	/cm	141.00
6	TDS	mg/l	70.50
7	TSS	mg/l	38.00
8	Chlorides	mg/l	B.D.L
9	Sulfates	mg/l	0.70
10	Hexavalent Chromium	mg/l	B.D.L
11	Total Iron	mg/l	

b) Evidence available from exploratory pits and bore holes confirm that all workings in ore bearing areas, viz B-C,D;E,F,G& D will remain above ground water table throughout the life of the mine.

c) No pumping will be required in any of the quarries ever. Marginal shortfall in production owing to occasional water logging of Pansposh and D area north quarries gets made-up from production in other quarries. Accumulated rain water in the above mentioned quarries gets dissipated quickly.

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7 STACKING OF MINERAL REJECTS & DISPOSAL OF WASTE

a) Nature and quantity of top soil

No top soil was encountered in any of the working areas B-C, Panposh, D, F and G'. Neither does it occur atop the virgin deposit of E' area.

Nature of overburden/waste rock

It is mostly laterite, but occasionally can be limonite, ochre, moorum, BHQ and shale phyllite. Quantity of generation given in the table at Anx. 8b.

Mineral rejects

Limonitic ocherous patches (sticky paste) - seemingly produced by action of leaching water on ore - encountered occasionally inside ore bodies can be called mineral rejects. Its occurrence is neither constant nor in every bench. Hence quantity of it can not be estimated and forecast. Nor is there regular generation.

b) Land chosen for disposal of waste : Justification

Over burden and waste rock will continue to be disposed of in dumps built at barren sites just out side pit limits of the ore deposits. Sites chosen are generally flat ground lest dumped material roll out. Proximity to ore body because of economics.

In B-C' and G' deposits, overburden/waste rock had been dumped within ore bearing areas in course of manual mining prior to 1984-85. In those days only hand mined lumps were taken out (transported) for sale. Hand mined fines, because of high alumina (being near surface material) and not properly screened (only had sorted) had no market. Hence it used to be left at the pit head.

After taking out the lumps, hand miners removed these fines upto a limited distance (150m) from their working point. In the said deposits such dumping thus often was within ore bearing zone.

As mentioned at para 4 (g) (ii) herein such waste dump in G'area will be shifted within this Mining Plan period.

Tailing pond for slime (mineral rejects) disposal is built similarly on a barren basin (trough like ground) away from the mine and also habitation) located 3.5 Km east of the thickeners.

c) Manner of disposal

Over burden and waste rock excavated from the mine face, when come across, is transported by dumpers to a barren site just outside the pit limit. The ground chosen is generally flat lest dumped materials roll down. Dumping is done layer upon layer keeping the central part a little lower than the peripheries with a view to prevent wash off in rain. Boulder walls are built round the feet of the dumps to arrest washed down material.

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In future, dumping will be by retreat dump method. The individual terrace heights will be restricted to 10m. Each terrace will have inward slope with catch drains at the inward side of the terrace. The catch drains of individual terraces will be connected to the garland drain outside the periphery of the dump. These catch drains will have half concrete open pipes followed by settling tanks to avoid wash-offs. Each terrain will also have a provision of berms at the outer end to reduce gully-formation due to rain water wash offs.

Tailings from the thickeners, is transported by gravity in a 350mm. dia pipe to the tailing pond.

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8. **USE OF MINERAL**

a). **End use of mineral**

All ores from BOM, both lumps and fines, are used by the Co.'s (SAIL) steel plants, dominantly Durgapur Steel Plant (DSP) and some times Bokaro Steel Plant, to make iron and steel.

b) Physical and chemical specifications stipulated by buyers (DSP).

Product	Physical(size)	Chemical (Assay)		
		Fe%	SiO_2%	Al_2O_3%
Lumps	(-30 + 6) mm	65.0	2.0 max.	2.0 max.
Fines	(-65 mm +100 mesh)	64.5	2.0 max.	2.0 max.

Total gangue in either product not to exceed 4.0%
Bokaro accepts the specification

c) **Details of blending, if any**

There is no grading, stacking of ores of different grades and, therefore, no exclusive blending operation.

R.O.M ore from different mine faces is dumped in the same hopper causing first round of mixing. Crushed and thereafter washed ores are stacked by mobile stackers continuously layer upon layer effecting further round of mixing, minimising quality fluctuation.

There had never been any blending with ore of Kiriburu mine vide **Anx. 14**

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9 OTHERS

a) SITE SERVICES

i) Workshops

Because of widely scattered sites of work, repair and maintenance facilities for mining machinery as well as the Ore Handling Plant have been put up at more than one place.

At G-area site of machine mining, a maintenance shed is provided. Besides, day-to-day repair of mining machinery, repairs of shovels, down-the-hole drills as well as of dumpers are carried out here. The shed has a tool room, lubricant room and an auto-elect room. An equipped maintenance van is also provided for work on machines like excavators and drills at mine faces. Some emergency spares like hoses, belts, bulbs etc., are kept in the tool room. Other spares, when necessary are brought from the main work-shop.

The main work-shop with following facilities is located at the Hill-top campus:

a) Engine & Sub-assembly room
b) Machine shop with lathes, drilling & milling machines, power saw, Hyd. Press, grinders etc.,
c) Auto Elect section
d) Welding and Smithy sections
e) Tyre repair shop
f) Tractor and Compressor room
g) Light vehicle repair shop
h) Heavy Vehicles repair shop
i) Tool room
j) Lubricant room
h) Washing Bay

For maintenance and repair of the fleet of dozers, pay loaders (both used on stockpiles and for wagon loading); motor graders, road roller etc., a repair and maintenance shed exists in the bottom workshop. It is equipped with tool room, lubricant room etc.

To cater some specific needs of the plant, small workshop is set up near the Valley Plant. It undertakes repair of idlers, conveyor drive units (e.g., gear box) brake units, sub-assemblies (e.g., screen drives, pumps), fabrication of liner plates, structural items, welding of crusher metals, liners etc.

There is a small electrical workshop located near the Valley Plant (vide Surface Plan No. Drg No. 2). It has facilities to repair small motors (upto 5HP), welding transformers, small switch-gears, contactors, relays, ACBs, MCCBs, OCBs and lighting installations. Besides testing of oil,

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that of insulators, relays is also carried out. Filtration of oil and small welding jobs are done.

Attached to the Civil Department exist the following facilities:

a) an working bench for carpenters,
b) bench-vice to hold pipes for cutting threads.

Power Supply

Power is supplied to the Bolani Ores Mines by Orissa Power Transmission Corporation Limited (OPTCL) from Joda grid sub-station by means of 132 KV tower link. It is received at Bolani's Main Receiving Sub-station (MRS) located inside the mining premises. It is then stepped down to 11KV and distributed to different locations of the mines.

Distribution

The 11 KV power received at different sub-station is further stepped down to 3.3KV & 415 Volt. The 3.3 KV Power is used to run HT motors in mines and Ore Processing Plant (OPP) and 415 volt power is used to run the LT motors.

Consumption

The present contract demand with NESCO is 5500 KVA. The average rate of consumption is 21 x 10^6 KWA/Month.

Future Programme

The power requirement after expansion and modification of existing facilities and installation of new beneficiation and Pellet Plant, Peak Power demand will be around 77.2 MVA.

Water Supply

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The System of supply has four sections:

=> Pumping from river Karo to Washing Plant Reservoir
=> Pumping from Jhikaria nala to Hill-top and F-area
=> Supply from Jhikaria nala under gravity to valley and loading plants, office areas, residential colony and Balagoda village.
=> Supply from Jhikaria nala under gravity to CISF barracks, Bolani & Balagoda villages, and Karo colony.

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Pumping to ROM Washing Plant

All water requirement except that for washing of ore, i.e., beneficiation, is drawn from Jhikaria nala @ 2360 m^3 /day. The water for washing @ 17150 m^3 /day is drawn from the Karo.

The report of hydrological study of Bolani and its surrounding area by Water & Power Consultancy Services (India) Ltd., New Delhi is given herewith **(Anx. 10)**

Sl. No	Purpose	Average demand m^3 / day	Peak demand m^3 /day
	MINING	NIL	NIL
1	Mine operation	NIL	NIL
2	Land reclamation	360	395
3	Dust suppression	20	25
4	Drinking	50	75
5	Green belt maintenance (including rehabilitation)	50	75
6	Beneficiation	2096	15120
7	Washing of dumpers etc	50	75
8	Fire service	15	20
	TOWNSHIP		
1	Green belt maintenance	25	40
2	Domestic	900	1000
3	Other supply to local villages, community functions etc.,	100	120
	Total	3,616	16,870

Pumping to Hill-top

Water from the Jhikaria Nala (vide Surface Plan) at a point (635m above MSL) (where it is emerging through a number of perennial springs) is collectd in a large 11m dia concrete tank (capacity about 2.5 lakh litres). A part of it is taken up to the Campus Storage tank (830m above MSL) capacity approx. 2 lakh litres) by a 100 HP/75KW pump through a 720m long 150mm dia MS pipe @ approx 140 litre/second. There are 2 nos. Of pumps, one working at a time. Total lift is about 230m. Daily drawl is approx. 2.0 lakh litres.

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From the campus tank, a part of the water flows down through a filtration plant (capacity : 5000 litres/hour) to an adjacent storage tank (capacity approx. 0.5 lakh litres) for drinking water. Supply from it goes to the work-shop, offices and canteen located in the Campus. Mobile Tankers also draw water from this tank for supply of drinking water to F & G areas (machine mining pit), Hill top plant and different transfer points. Daily consumption is about 20,000 litres.

From the aforesaid main Campus tank, water is sent through a 100 mm dia 1.7 km long MS pipe using a pair of 60HP/KW Pump (one working at a time), @ 24 litres/second and collected in a 90,000 litre capacity concrete tank at F-area. This water is used mainly for road watering (dust suppression) - done by water tankers and plant cooling.

Office & Store

The Time office (where all employees give attendance) is located in the valley, just at the entry point to the mines. The departments of Personnel & Accounts, the Vocational Training Centre are also located in the valley, near about the Time office. The plants and the work-shops have respective small offices attached to those.

The Central Stores is situated in the Hill-top Campus and keeps in stock spares for the Plant and mining machinery, electrical items, pipe fittings; tyres & tubes; lubricants (in a secluded room) stationaries, safety appliances, laboratory chemicals, different types of tools etc.

The purchase and stock accounts and the receipt sections of the Stores are located in the valley. The checking of items is also done there, besides disposal of scrap and surplus items. The cement Godowns and an open yard for steel and conveyer belting are also situated in the valley section.

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Fuel storage

Petrol (Petroleum class 'A') and diesel (Petroleum class 'B') are kept in stock in 3 nos. above ground steel tanks and one underground concrete tank, erected and built as per statutory specifications. These are situated in an enclosed area in the valley (vide Surface Plan) near the Time Office. The licensed capacity for petrol is 13.6 kilo litres, while that for diesel is 27.2 kilo litres. The station has pumps for issue to vehicles.

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First Aid Centres.

Requisite arrangement of First-aid has been made and is maintained at all work points as listed below and these points are shown on the Surface Plan.

Sl. no.	Location	First aid Box	Stretcher	Qualified First-aider	Remarks
1	F&G area (machine mining quarry)	provided	provided	Provided in shifts	There is also First-aid room
2	D-area & Panposh (Hand-mining quarries)	provided	provided	Provided in shifts	There is also First-aid room
3	Ore Processing Plant I) Hilltop F-area Ii) Valley Plant Iii)Loading plant(lump) Iv)Loading plant(Fines)	provided			
4	Workshop I) Mechanical Ii) Electrical Iii) Civil	provided			
5	Stores Central Valley	provided			

Fire Fighting Arrangement [Safety Measure]

Portable fire extinguishers (2kg to 4.5kg sizes) are kept in many locations for use in emergency. The following types are in use.

A) Soda-acid type (for dry fire)
B) Foam type (for dry & oil fire)
C) $C0_2$-type HS Dry dust under gas pressure
(for any kind of fire including elect fire)

Dry sand-filled buckets are also kept in many locations to deal with limited way.

The locations (vide surface Plan) of different types are listed - vide Page No. 28 & 29.

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Canteen

Because of scattered work points, a number of canteens have been provided. Tea and snacks are catered to different work-places like transfer points along conveyor route, washing plant etc., by mobile canteen.

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Type & Location of Fire Extinguishers of Bolani Ores Mines- 2008

Sl.No	Location	CO2	DCP	FOAM (Mechanical)	Total
1	G/Area	5	22	2	29
2	Crushing Plant	5	8	2	15
3	Washing Plant	4	7	2	13
4	Campus Garage	3	3	2	8
5	Campus Office	1	1	2	4
6	Campus Canteen	1	0	1	2
7	Reclaimer	1	2	0	3
8	MRS Panel Board	2	3	0	5
9	Valley Plant	0	0	2	2
10	Bottom Store	1	1	1	3
11	General Office	2	0	0	2
12	Campus Store	1	1	6	9
13	Electrical W/Shop	3	1	0	4
14	Central Time Office	0	0	2	2
15	CISF Camp	0	0	0	0
16	Lump L/d Plant	1	8	2	11
17	Fuel Pump	0	0	6	6
18	Magazine	0	1	3	4
19	Hospital	2	1	0	3
20	JNRC	0	0	0	0
21	Mount Club	0	0	0	0
22	Mecon Sub Station	1	0	0	1
23	CESS Sub Station	2	0	0	2
24	Colony Sub Station	2	1	0	3
25	Bottom Garage	0	2	3	5
26	Gas Godown	1	1	1	3
27	Intake Pump House	2	1	0	3
28	Fines L/d Plant	1	1	2	4
29	DAV School	0	0	0	0
30	Civil Office	1	0	1	2
31	Wireless Room	1	0	0	1
32	Fire Control Room	24	5	5	34
33	To Be Refilled	0	0	0	0
34	Empty Fire-Extingr..	5	6	5	16
33	TOTAL	72	76	50	198

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SUMMARY

Total requirement of fire-extinguishers = 198

CO2 TYPE FIRE EXTINGUISHERS = 72
DCP TYPE FIRE EXTINGUISHERS = 76
FOAM TYPE FIRE EXTINGUISHERS = 50

TOTAL FIRE EXTINGUISHERS = 198

Record of 100 nos. of Fire Sand Bucket of Bolani Ores Mines

Sl. No.	PLACE	QUANTITY
1	MAGAZINE	6
2	PETROL PUMP	16
3	BOTTOM GARAGE	2
4	LUMP LOADING PLANT	2
5	D - 0 (CONTROL ROOM)	2
6	PSP SUB-STATION	4
7	CAMPUS STORE	12
8	GAS GODOWN (BOECCS)	3
9	CBRS	3
10	CR. PLANT MCC SUB-STATION	4
11	LUMP WASHING PLANT SUB-STATION	4
12	BOTTOM GARAGE NEAR SLAP	2
13	FIRE ROOM (NEAR DOOR)	2
14	FIRE CONTROL ROOM	38
	TOTAL SAND BUCKETS	100

LICI COVER (NASA)

Sl. No.	Area	Location	K.G
1	G-AREA	MECH. STORE	3KG
2	CAMPUS STORE	ISSUE COUNTER	3KG
3	HILL TOP PLANT	CP-1	3KG
4	MVTC	NEAR CLASS ROOM	3KG
5	GENERAL OFFICE	PETROL TANK	3KG

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Rest Shelter

Rest shelters have been provided at following places (Vide Surface Plan)

1. Between F-area (machine mine quarry) & G-area
2. D-area (Contractual mining area)

The fully equipped group type VTC is located in the valley. The centre comprises of two nos. Class rooms, one work shed, one model room, a library and an office.

Besides usual implements of training, several audio-visual aids including VCP, TV, Digital camera are also kept. All types of training required under MVT Rules are imparted. Besides training courses, various skill development programmes are also conducted with invited faculties.

Chemical & Environmental Laboratories

The chemical laboratory is located at Hill top campus. This laboratory is mainly for analysis of ore samples.

A full fledged environment laboratory is also provided with monitoring and analysis facilities. Regular air, water and noise quality monitoring is being done as per the statutory requirement as well as operational needs. (Facilities of chemical and environmental laboratory will also be used for adjoining Manganese lease of 6.90 sq.miles lease also). The Chemical laboratory has been accorded recognition by the Government of Orissa.

Sample Shed

For preparation of samples (for chemical analysis) a sample shed is built near the Lump loading plant. It is equipped with a small crusher and a grinder.

Core shed

Part of diamond drill cores are retained systematically for future reference in a shed adjacent to the Mines Vocational Training Centre.

Planning, Project and Survey

Survey section is housed in the Mines office at the Hill top campus. Here is prepared and kept all statutory and other plans. Measurement and surveying records are also preserved here.

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Planning office located near the Laboratory prepares various geological and quality control plans besides electrical and civil drawings.

Project office located also in the valley, north of the VTC, deals with civil and structural construction matters and co-ordinate jobs under modernisation as well as AMR (Addition, Modification & Replacement) schemes.

Security

The mine originally had its own departmental staff for security jobs. Since 1983-84, this task is gradually assigned to CISF (Central Industrial Security Force). One Deputy Commandant stationed at Bolani, heads the Unit. His office is located in the valley inside the General Office area.

The remainder of departmental security staff is controlled by the Personnel Department.

Estate Office

To deal with disputes arising in respect of land acquired by Company and/or buildings, etc., constructed by the Company, one of the executives has been made (as per Government' Rules) the Estate Officer whose office is located adjacent to Personnel Department.

Employment potential

Potential figures will be furnished after the Technical Consultants work it out.
Existing figures are given below:

Highly skilled	=	309 (including 114 executives)
Skilled	=	396
Semi-skilled	=	91
Un-skilled	=	08
Statutory	=	165 (including 95 executives)

Lists of executives, highly skilled and skilled personnel stating their names, designation and qualification are at Anx. 8 c.

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10 BENEFICIATION

a) **Processing on site**

There are two plants for processing, one with washing facility for hill-top R.O.M and the other with dry crushing screening for foothill quarry produce.

The upper (hill-top) plant receives R.O.M in the hopper situated in F' area. It will be sized to -30mm by primary Gyratory, secondary cone and tertiary cone crushers and stacked.

Ore reclaimed from the said stack is fed to the Washing plant which has two circuits, one for B.O (Beneficiable ore) and the other for D.O (Direct ore).

D.O by-passed washing and is conveyed to the screening arrangement at the wagon loading plant. After screening lumps and fines go by respective conveyors to stock piles.

B.O is first scrubbed with water and then screened wet. Lumps go by conveyor to its stockpile. Before stacking it is screened once more.

The fines go to classifiers, then to dewaterisers and finally to its stockpile by conveyors (vide Drg No: 39). There will be addition of hydrocyclones, and with WHIMS/HGMS for further round of beneficiation.

The intermediate stockpile and the washing plant are located in B & C area.

There is also proposal for making pellets with beneficiated and previously dumped fines (vide Anx. 7).

R.OM ore from foothill quarries of D' area and Panposh after Primary crushing in pit, will be taken by conveyor for further crushing, screening and despatch to respective stockpiles.

b) **Disposal of tailings from processing plant**

Thickened slime from bottom of thickeners is taken to the Tailing Pond by a 350mm dia nearly 4 Km. long pipe line by gravity.

About 15% of B.O feed becomes slime yearly deposition of slime in the Tailing pond is about 0.25 Mm^3.

Holding capacity of the tailing pond, up to 477.5 m RL (at present) is 1.56 mm^3, giving a life of about 6 years. By raising the dam height to

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482.5m RL, life of the pond will be raised by another 9 years. The tailings have no toxic affect.

Tailings	Feed grade	Fe% 57.00% to 63.00% SiO_2% 1.50% to 3.50% Al_2O_3% 2.50% to 5.00%
	Feed Size	-1200 mm maximum
	Recovery %	-80% of feed
	Output grade	Lump - Fe% 62.02% to 63.50% SiO_2% 1.20% to 2.50% Al_2O_3% 2.00% to 2.50% Fines - Fe% 61.50% to 63.40% SiO_2% 2.00% to 2.80% Al_2O_3% 2.50% to 3.50%
Chemical Analysis of Tailings		Fe% 46.80% to 57.40% SiO_2% 4.90% to 7.40% Al_2O_3% 6.86% to 8.52%

c) **Schematic diagram of ore processing**

Drg. No. 43 is the schematic diagram of hill-top-cum-washing plant. Those of 600 tph plant for dry crushing screening and pellet plant are yet to be finalised.

d) **Quantity and type of chemicals (additives)**
No chemical is used in ore processing

e) **Quantity of additives stored**
There is no storage as no additive is used.

f) **Quantity (m3)of water required for mining and processing/day and its sources, extent of recycling.**

In the mine water required for dust suppression is 20m3 / day and for washing of machines (dumpers) is 50m3/day. This quantity along with other requirement is drawn from Jhikaria nala.

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Water for ore washing, about 2096 m³ /day, is drawn from Karo river. About 540m3 from thickener-classifier is recycled.

of tailings

Quantity of generation/due to enhanced production

1.4 to 1.5 Mtphy approximately - vide Table in para 4b)

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11.0 ENVIRONMENT MANAGEMENT PLAN

a) **Status of baseline information**

Existing land use pattern

Sl No	Purpose / Type of Use	Area put on use at the start of the plan as on April 2010 (in Ha)
1	Exploration	0.00
2	Mining	336.10
3	Storing of Top soil	0.00
4	Overburden Dump	10.93
5	Mineral Storage	4.65
6	Infrastructure (workshop, Plant, admin Building etc)	16.72
7	Effluent Treatment facility	1.20
8	Mineral Separation Plant	2.20
9	Tailing Pond	10.00
10	Roads & Conveyors	26.86
11	Railways	0.00
12	Green belt and prohibited zone	76.21
13	Township area	47.64
14	Others (Magazine)	1.00
15	Unbroken Land	787.94
	TOTAL AREA	1321.45 Ha

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Water Regime

The central phyllite-tuffceous shale band in between the upper and lower BHQ horizons in the hill, being impervious, seemingly held and stored the precipitation on the hill. This water found outlets through the faults running across the hill and forming the perennial easterly flowing nalas of Limtur, Balaguda (seasonal), Panposh, Jhikiaria and Chapua.

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It is, however, not known if aquifer condition existed any where. Regular mining (with attendant blasting) along Panposh nala for nearly four decades has not caused it any change in the course (flow path) or in quantum.

Although shale and phyllite were known to be occurring in the valley beneath the conglomaratic laterite cap, but no distinct water table or storage had so far been found. Drilling by Government agencies for tube wells struck a few pockets but all these dried up in no time indicating smallness of size.

Flora and Fauna

Flora : The dominant tree in the reserved forest was 'SAL' (Shorea Rebusta) with occasional Kendu, Asan, Dhor etc. The prominant species outside R/F was Kusum. There were also Mohua, Chatian etc.

Fauna : There was almost no habitation in the lease land. Most of the human population around was composed of Scheduled Tribes (Naiks, Kolhs, & Mundas) back-ward tribes (Mahantos) and Scheduled castes. Naiks and Mahantos used to confine themselves to cultivation. But Kols and Mundas did hunting as well.

In the reserved forest (hill region) besides elephants, there were Sambhars, barking deers, bears, monkeys, and various scavenging animals. Panthers were rare. Wild pigs were seen in the swampy areas. A variety of birds, like parrots, wag-tails, pigeons, pea fowls and jungle fowls could be seen.

Quality of air, water & noise

Both were reportedly unpolluted as there was no mining or industrial activity in the vicinity or in the upper catchments/10km. radius zone of this lease. Water in the hill nalas used to become muddy (influx of suspended solids) during heavy downpour, but clarity returned soon after the rains were over.

There was no noise. Only sound was of wind blowing through trees and leaves.

Climate condition

Generally dry, i.e., relatively less humid than Cuttack or Calcutta and a little extreme (semi-continental). The mornings and nights of January and December were bitterly cold (with occasional frosting), while the days and nights of May and first fortnight of June (till monsoon broke in) could be very hot. Rains brought down the temperature appreciably and the months of October-November and February-March, though cold were pleasant.

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No record of rainfall in Bolani is available for the period prior to sixties. According to the records of the nearby Gua Iron Mine (SAIL), the annual average was 152cms (varying between 102cm to 232cm) 80-90% of which occurred between mid-June and mid-October.

Human Settlements

Barring a couple of stray tribals of Bolani village, there was no human settlement in the Mining lease area before the activities to open Bolani Ores Mines commenced in 1957-58

Public Buildings, Places & Monuments

There were none.

Plan showing Sampling Station

Sampling for base line information was only for air near 'E' area, and for water near foot of Jhikaria water falls. These places are shown in Drg No. 36.

Does the area falls under notified area under Water Act, 1974

Yes, it does.

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B) Environmental Impact Assessment Statement

i) Land area

PROPOSED LAND USE PLAN FOR 5.10 SQ.MILES (1321.45 H) ML AREA

Purpose / Type of Use	Additional Requirement of land during Mining Plan period 2010-11 to 2014-2015 (In Ha)	Additional Requirement of land during Mining Plan period 2015-16to 2030-31
Exploration	220	0
Mining	37.16	307.88
Storing of Top soil	0.00	0.00
Overburden Dump	6.24	11.59
Mineral Storage	15.81	0.00
Infrastructure (workshop, Plant, admin Building etc)	35.00	35.11
Effluent Treatment facility	0.00	0.00
Mineral Seperation Plant	24.00	0.00
Tailing Pond	0.00	0.00
Roads & Conveyors	5.00	13.50
Railways	0.00	0.00
Green belt and prohibited zone	78.53	218.12
Township area	0.00	0.00
Others (Magzine)	0.00	0.00
TOTAL AREA	421.74	586.20

ii) Air quality

Because of continued practice of dust suppression, dust collection etc., quality will never be allowed to deteriorate by acquiring any content beyond permissible limit.

iii) Water Quality

None of the activities planned in the 5 years from 2010, or any time thereafter will pollute surface water or contaminate ground water.

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iv) Noise Level

Practice of use of ear plugs by workers posted at high noise level sites will continue. There will be no rise in noise level beyond prescribed limit any where else by any activity proposed.

v) Vibration levels (due to blasting)

Three studies of ground vibration due to blasting in machine mining, once in 1988 by Indian School of Mines, Dhanbad, second by CMRI, Dhanbad in 2004 and third by Central Mine Planning & Design Institute, Ranchi, in Feb,2008 (Anx. 9), found it to be well within prescribed limits. The pattern of blasting envisaged during the plan period and beyond will not cause any violation of these limits.

vi) Water regime

Drawl of water from the hill streams for use in mine, plant, canteen and colony, must have caused some depletion but even in seasons of drought this is not apparent. No adverse effect is apprehended in future either from the scheme of work envisaged.

The effluent from the washing plant and/or the thickeners will not be allowed to escape on surrounding ground and to pollute the surface or ground water. Further, as the beneficiation process will not use any chemicals whatsoever, chance of adverse effects on water regime will never be any in the event of any accidental discharge even.

vii) Socio-economic

The impact of opening up of Bolani has all along been beneficial to the community. It brought in, in its wake, well laid township with sewer, good arrangement of education, recreation facilities, health care, water supply and electricity to the houses, postal and banking services, telecommunication, extension of roads and long distance bus services etc. Native villagers in the nearby villages are getting job opportunities. With passage of time, these conditions will improve further.

viii) Historical monuments etc

There continues to be no public building or historical monument. Advent of people following different religions has led to putting up of places of worship viz., temples, mosque, gurudwara and church.

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C) Environment Management Plan

Different features of EMP are shown in the Environment Plan (Drg.No.-40)

Temporary storage & Utilisation of top soil

No top soil will be encountered in BOM in 5 years from 2010-11 or ever till life of the mine; hence no action for its storage and utilisation has been envisaged.

Proposal for reclamation/rehabilitatin of degraded land

Vide **Table A** on page 61

Use of worked out pit as reservoir

No pit will be exhausted for abandonment in the next 5 years. It may start from 2018, but there will be no scope of making any of them water reservoir.

Programme of afforestation for initial five years and for conceptual period

Details	year	Area proposed (in Hectare)	Quantity Proposed	Locations	Species
Afforestation in previous five years	**Upto Year 2010**	**148 Ha**	**370,000**	OB dumps & Barren areas	Sirish, Mahaneedm Neem, Karanj; Acacia
Afforestation for initial five years	2010-11	6.00 ha	15,000 nos	Backfilled areas, Mined out Benches, OB dumps and Barren areas	Sirish, Mahaneem, Neem, Karanj, Acacia
	2011-12	6.00 ha	15,000 nos		
	2012-13	6.00 ha	15,000 nos		
	2013-14	6.00 ha	15,000 nos		
	1014-15	6.00 ha	15,000 nos		
Afforestation for Conceptual period	2015-16 to 2034-35 / end of the mines	830 Ha	20,75,000	Backfilled areas, Mined out Benches, OB dumps and Barren areas	Sirish, Mahaneem, Neem, Karanj, Acacia

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Stabilisation & vegetation of dumps

Vide Table B on page 62

Control measures for air pollution

Dust suppression measures of spraying water on haul roads, use of dust collectors in drill machines, enclosing conveyor galleries and wet processing of r.o.m do the control.

Measures to control erosion/sedimentation of water courses

The pattern of mining carried out so far in Bolani, as well as to be done in future has not and will not cause any erosion or sedimentatin of any nala or river. Hence no control measure is thought of.

Treatment & disposal of water from the mine

Temporary accumulation of rain water in the foothill pits of D'area and Panposh gets dissipated in no time (within a few days). Therefore, no treatment action or measure for disposal has been contemplated.

Measures for minimising adverse efffects on water regime

Pattern of mining in Bolani does not affect in any way the water courses (nalas) and/or ground water level, as has been observed in almost five decades of continuous work. As the same pattern will continue in future, no control measure is thought of.

Protective measures for ground vibration/air blast caused by blasting.

Proper stemming, use of millisecond delay detonators and avoidance of collar priming minimise vibration. This is BOM's practice all along and will be continued.

Measures for protecting historical monuments and human settlements likely to be disturbed:

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There is no historical monument or public building in the lease area or nearby. Therefore, no protective action is required. No human settlement will be affected by BOM's mining in next 5 years or ever.

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Socio-Economic benefits

Progress of mining in Bolani in last 50 years has witnessed availability of health care (both OPD & Indoor), supply of good drinking water, development of means of communication like, metalled roads, long distance bus services, electrified railway line with Super Fast Express trains coming to Barbil, telephony indirect employment in driving and servicing of vehicles, truck and wagon loading, small business like shops etc. These benefits will continue and enlarge. List of community welfare jobs done attached **(Anx. 8d)**

D) Monitoring Schedule

Item	Location	Parameters	Frequency
Ambient Air Quality	Mines Ore Processing Plant Wagon Loading Area	RPM SPM $S0_2$ NOx	8-Hourly once a month
	Office Area Township Villages	RPM SPM SO_2 NOx	24-hour duration once a month
Water Quality	Near Check Dam Tailing Pond Seepage	pH Suspended solids Toxicity	Thrice in a month
	Karo river Downstream of Discharge of Tailing Pond overflow	pH Suspended Solids Toxicity	Thrice in a month
	Drinking Water supplied to Township	pH Suspended solids Toxicity	Once a month
	Ground Water (village wells)	pH Suspended solids Toxicity	Once in 6 months
Ambient Noise Quality	Work Zone (Mines, OPP & Wagon Loading area)	SPL L eq L min L max	5 to 10 minutes once a month
	Township	SPL L eq L min L max	5 to 10 minutes once a month

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P.M.C.P.

स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
STEEL AUTHORITY OF INDIA LIMITED
रॉ मेटेरियल्स डिवीज़न
RAW MATERIALS DIVISION

CERTIFICATE

THE PROGRESSIVE MINE CLOSURE PLAN OF 5.1 Sq. Mile LEASE OF BOLANI ORE MINES OVER AN AREA OF 1321.45 HECTARES WHICH HAS BEEN PREPARED BY RQP SRI DILIP KUMAR BOSE (RQP REGN. NO. RQP/CAL/098/88A), COMPLIES ALL STATUTORY RULES, REGULATIONS, ORDERS MADE BY THE CENTRAL OR STATE GOVERNMENT, STATUTORY ORGANIZATIONS, COURT ETC., WHICH HAVE BEEN TAKEN INTO CONSIDERATION AND WHEREVER ANY SPECIFIC PERMISSION IS REQUIRED, THE LESSEE WILL APPROACH THE CONCERNED AUTHORITIES. I, ALSO GIVE AN UNDERTAKING TO THE EFFECT THAT ALL MEASURES PROPOSED IN THIS CLOSURE PLAN WILL BE IMPLEMENTED IN A TIME BOUND MANNER AS PROPOSED.

Signature of the applicant (In full)

Name in block letters: GANATANTRA OJHA

Date: 08.04.2009
Place: N. Delhi

Address: DIRECTOR (PERSONNEL) & I/c RMD
AND
NOMINATED OWNER OF THE MINES
STEEL AUTHORITY OF INDIA LIMITED
ISPAT BHWAN, LODI ROAD,
NEW DELHI - 110003

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PROGRESSIVE MINE CLOSURE PLAN (PMCP)

As this closure plan is prepared simultaneously with the Mining Plan (MP) for the period 2010-11 to 2014-15, few information are common. In the PMCP instead of repeating those, reference is made to the preceding MP.

P.1 INTRODUCTION

Name of the lessee	-	Vide para 1 (a) of MP
Location of lease area	-	Vide para 2 (a) of MP
Extent of lease area	-	Vide para 2 (a) of MP
Type of lease area	-	Forest land - 1225.78 ha Non-forest land - 95.67 ha
Present land use pattern	-	Vide Para 11 (a) of MP
Method of Mining	-	Vide para 4 (a) of MP.
Mode of Ore Processing	-	Vide para 10 (a) of MP.

P.1.1 Reasons for closure

Exhaustion of ore when it happens. There is no possibility of closure of the mine during the 5 years period of this MP, nor in the 20-year period of renewed lease (being applied for) both commencing in April, 2010.

P.1.2 Statutory obligations

None so far.

P.1.3 Closure Plan preparation

Name & address of the applicant	-	Vide para 1 (a) of MP
Name & Address of the RQP	-	Vide para 1 (e) of MP
Name & Address of executing Agency	-	As there is no decision about closure of the mine, question of executing agency has not been thought of.

P.2 MINE DESCRIPTION

P.2.1 Geology - Vide para 3 (a) of MP

P.2.2 Reserves - Vide Para 3 (e) of MP

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P.2.3 Mining Method - Vide Para 4 (a) of MP

Mineral Beneficiation - Vide para 10 (a) of MP

P.3 REVIEW OF IMPLEMENTATION OF SCHEME OF MINING INCLUDING PMCP UPTO FINAL CLOSURE OF THE MINE

P.3.1 NAME OF THE MINE - Bolani Ores Mines

P.3.2 PARTICULARS OF THE APPROVAL OF THE MINING SCHEME

The Scheme of Mining (SOM) Dated Feb. 2007 (SOM 07) for the 5 - year period 2005-06 to 2009 -10, prepared under rule 12 of the MCDR, 1988, was approved by the Controller of Mines (CZ), IBM on 24.5.2007, vide his letter no.314(3)/2006- MCCM(CZ)/S.13, copy of which attached in the Anx. 1 .

P.3.3 DATE OF COMMENCEMENT OF MINING OPERATIONS -

11-04-1960

P.3.4 COMPLIANCE POSITION

(i) The letter of approval, mentioned at para 3.2, above did not impose any condition to be observed .

(ii) The Director of Mines Safety, Chaibasa, vide his letter NO.C.KE/notice u/Reg.108/4863, dated 15.12.1995,(Anx. 2) pointed out violation in respect bench height, as per MMR, 1961. As the rectification could not be completed yet, mining in the quarry is suspended. Rectification work is expected to be over by 2009.

(iii) The letter of Dy. Controller of Mines, IBM, Bhubaneswar NO. ORI/IRON/KJR/MCDR.60/BBS, dated 12.5.2008 pointing out violations as per Rules 13(1) and Rules 16(1) of the MCDR, 1988, is enclosed in Anx. 3 .

Compliance was intimated – vide letter no. GM/B-111, Dt: 01/07/08 (Anx. 4).

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P.3.4.1 **Exploration**

The SOM 07 proposed following core drilling : 750m in G-area (15 holes), 550m in F-area (22 holes) and 300m in D-area (6 holes) in 2008-09. M/s Mineral Exploration Corporation Ltd., (MECL) has been engaged to undertake the proposed drilling and the job will start in Nov. 2008 .

P.3.4.2 **Mine development : 2005-06 to 2007-08**

Mining (production of ROM) was carried out (and being continued) in 'D', 'F' and 'G' areas . Owing to non-rectification of violation, there was no mining in Panposh quarry.

P.3.4.2.1 Year wise & area wise planned & actual production of ROM is shown as under :

AREAWISE PLANNED & ACTUAL PRODUCTION 0F ROM

(Figs. In '000 t)

Years		'D' area	'F' area	'G' area	Total
2005 - 06	Plan	120	2093	1200	3413
	Actual	231.5	2093	1209	3533.5
	% deviation	+93	Nil	+0.75	+3.5
2006 - 07	Plan	601.5	2601	1850	5052.5
	Actual	158.2	1694	1637	3489.2
	% deviation	-74	-37	3.6	-31
2007 - 08	Plan	601.8	2600	1850	5051.8
	Actual	351	1686	2036	4073
	% deviation	-42	-36	+10	-20

Note:

> Actual production (over all) is 82 % of the production planned.
> Actual production in F- area is 75 % of production planned.
> Actual production in G- area is 99.7 % of production planned.

Reasons for deviations :

A) Inadequate availability of dumper & shovels
B) Prolonged break-down of the main crushing plant;
C) Only one shift operation in place of scheduled 2 shifts, of the 600 tph plant;
D) Accumulated backlog in OB removal;
E) Hold-up in progress of south side benches in F-area owing to non-receipt of permission for forest removal in time.

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P.3.4.2.2 Final (actual) production & quality

Product	Year	Quantity (in MT)	Quality (Avg)		
			Fe %	Sio2%	Al2o3%
Lump	2005-06	1.240	63.44	1.58	1.83
	2006-07	1.306	63.05	2.01	2.14
	2007-08	1.379	63.05	1.74	2.49
Fines	2005-06	2.125	63.09	1.98	2.19
	2006-07	2.283	62.96	2.34	2.35
	2007-08	2.461	62.24	2.39	3.08

P.3.4.2.3 Year wise & area wise planned & actual removal of waste rock is shown as under :

AREAWISE PLANNED & ACTUAL OB /WASTE REMOVAL

Figures. In '000tonnes

Years		'D' area	'F' area	'G' area	Total
2005-06	Plan	Nil	95	Nil	95
	Actual	0.68	368.7	170	539.4
2006- 07	Plan	6.0	93.2	Nil.	149.2
	Actual	Nil	414.3	238	652
2007– 08	Plan	8.8	150	Nil	180.8
	Actual	151.5	22.3	228	602.5

The quantum of waste rock removed in all the Quarries, 'D', 'F', and G' areas, during the last 3-years was far more than planned . This was due to unforeseen encounter of waste patches, which were not indicated by the neighbouring bore holes. Also, it was done by taking advantage of convenient availability of mining machinery, with a view of exposing ore, to aid, in turn, quick increase in production.

MEASURES PERTAINING TO PMCP

P.3.4.3 **Environmental management**

P.3.4.3.1 **Top Soil Preservation & Utilisation** :
No top soil was encountered during last 3 years .

P.3.4.3.2 **Land Reclamation & Rehabilitation** : SOM 07 envisaged partial backfilling of mined out pit in F- area . Mined out area of 3.0 ha has been backfilled in the southern portion of F–area . About 2.5 hectares of OB dump in F area , 4.5 hectares land in old tailing pond area have been rehabilitated by afforestation during last 3 years period .

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P.3.4.3.3 **Waste Dump Management** : As stated below, plantation has been undertaken on the OB/waste dumps . Action has been taken to erect the following retaining walls and they are already under construction

Year	Location	Size		
		Length (m)	Width(m)	Height (m)
2006-07	Old Fines Dump	600	1.5	1.0
2007-08	OB dump in D-area	600	1.5	1.0

P.3.4.3.4 **Afforestation** : The planned and actual level of afforestation is given as follows :

PLANNED & ACTUAL LEVEL OF AFFORESTATION

Year of plantation	Planned no. of plants	Actual no. of trees planted	Area in ha	Remarks
2005-2006	9000	9000	1.5	Waste dump in F-area and near fines dump
			2.0	Old Tailing Pond area
2006-2007	15000	15000	1.0	Waste Dump in F-area and near fines dump
			2.5	Old Tailing pond area
2007-2008	15000	Nil	The same is in tendering process	
Total	39,000	24,000	7.0	

Note : *Types of species planted* :
Mahaneem, Teak, Accacia, Gulmohar, Gamhar, Karanj etc.,

P.3.4.3.5 **Air Quality Management** : Dust suppression measures on haul road is regular. The existing dust suppression systems at hopper in F-area was maintained and operated regularly . A Dry Fog Dust Suppression System was installed in the new 600 TPH Crushing & Screening Plant .

P.3.4.3.6 **Environmental Monitoring** : Monitoring of qualities of air, water and level of noise was carried out regularly at different sites. Latest results thereof are given in Anx. 5. Most of the results are found to be within permissible limits.

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P.4 CLOSURE PLAN

P.4.1 Mined out land (Broken area)

Rehabilitation and reclamation (thro' afforestation) of the mined out areas in the quarries are being done continuously vide Table RR annexed. Drg No. 36 shows rehabilitated areas.

P.4.2 Water quality Management

Within the lease hold of BOM existing surface water sources are the perennial nalas descending from the hill. Starting from South they are, Chapua, Jhikaria, Pansposh, Balagoda and Limtur nalas. Of these water flow in Chapua, Balagoda and Limtur is only at lower levels (at the foothills); in Panposh, it appears at a little higher level near quarry. Only in Jhikaria, at much higher level (610.49 m ASL) and among all these in highest quantity.

All these nalas flow into the Karo river, which is flowing North just outside the lease boundary.

None of the mining and allied activities of BOM causes any erosion, chemical contamination, sedimentation or diversion of the courses of their channels. Latest study of water quality by the State Pollution Control Board, Orissa, found all contents within permissible limits (vide Anx. 5).

Occurrence of ground water as known only from a few dug wells and shallow tube wells in the neighbouring villages and the mine township, is insignificant. It is used only locally for domestic purposes. Its quality is found all right for human consumption. Annexure 5.

Mine drainage is never acidic as is evident from the analysis results of nala and river water. Current water requirement of BOM is given on Page ..

All water requirement except that for washing of ore, i.e., beneficiation, is drawn from Jhikaria nala @ 2360 m^3 /day. The water for washing @ 17150 m^3 /day is drawn from the Karo.

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TABLE RR

Year	PIT	Mined out area at the beginning 2010 (Ha)	Addition during the year (Ha)	TOTAL AREA (Ha)	Area reclaimed & rehabilated during the year (Ha)	Balance mined out area at the end (Ha)
2010-11	D- Area	16.20	0.65	16.85	0.00	16.85
2011-12		16.85	0.65	17.50	0.00	17.50
2012-13		17.50	1.00	18.50	0.00	18.50
2013-14		18.50	0.48	18.98	0.00	18.98
2014-15		18.98	0.48	19.46	1.33	18.13
2015-2030		18.13	0.00	18.13	18.13	0.00
2010-11	F-Area	53.10	3.20	56.30	3.10	53.20
2011-12		53.20	3.10	56.30	0.40	55.90
2012-13		55.90	0.00	55.90	0.40	55.50
2013-14		55.50	4.80	60.30	1.43	58.87
2014-15		58.57	4.80	63.37	1.40	61.97
2015-30		61.97	22.00	83.97	62.98	20.99
2010-11	G-Area	38.40	2.60	41.00	0.35	40.65
2011-12		40.65	2.80	43.45	0.35	43.10
2012-13		43.10	2.60	45.70	0.50	45.20
2013-14		45.20	2.00	47.20	0.90	46.30
2014-15		46.30	3.55	49.85	0.90	48.95
2015-30		48.95	15.00	63.95	47.96	15.99
2010-11	Panposh Quarry	22.50	2.80	25.30	0.00	25.30
2011-12		25.30	0.60	25.90	0.00	25.90
2012-13		25.90	0.20	26.10	0.00	26.10
2013-14		26.10	0.40	26.50	0.00	26.50
2014-15		26.50	0.00	26.50	0.00	26.50
2015-30		26.50	0.00	26.50	26.50	0.00

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DETAILS OF CHECK DAM

Year	Location	Name of Check dam	Particulars of construction	Size (Total L X B X H) (m)	Water quality monitoring
2010-11	Nallah originating from G-Mining area	CD-G-1 & CD-G-1-i	Earthen dry stone masonary with PCC spill-way system	L= 250 m H= 1.5 m Top width= 1.5m Bottom width=3m	Water monitoring will be done in Monsoon as it is a seasonal nallah.
	Nallah originating in Panposh dump area near Magazine on the upper side of the existing(Balagoda Nallah)	CD-B-1-i	Earthen / dry stone masonary with spill-way system	L= 100m H= 1.5 m Top width= 1.5m Bottom width=3m	-do-
2011-12	Nallah originating from Panposh Mining Area on the upper side of the existing check dam(near road side)	CD-P-1-i	Earthen / dry stone masonary with spill-way system	L= 110m H= 1.5 m Top width= 1.5m Bottom width=3m	-do-
	Nallah originating from F -Mining area	CD-F-1-i	Earthen dry stone masonary with PCC spill-way system	L= 100 m H= 1.5 m Top width= 1.5m Bottom width=3m	-do-
2012-13	Balagoda Nallah Near Magazine beyond the existing checkdam in lower side	CD-B-1-i	Earthen / dry stone masonary with spill-way system	L= 100m H= 1.5 m Top width= 1.5m Bottom width=3m	-do-
2013-14	Panposh Nallah Near road culvert beyond the existing check dam in lower side	CD-P-i	Earthen / dry stone masonary with spill-way system	L= 110m H= 1.5 m Top width= 1.5m Bottom width=3m	-do-
2014-15	Nallah Near Engg Cell office	CD-EC-3 –I	Earthen with spill-way system	L= 130m H= 1.5 m Top width= 1.5m Bottom width=3m	-do-

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Sl. No	Purpose	Average demand m^3 / day	Peak demand m^3 / day
	MINING	NIL	NIL
1	Mine operation	NIL	NIL
2	Land reclamation	360	395
3	Dust suppression	20	25
4	Drinking	50	75
5	Green belt maintenance (including rehabilit°.)	50	75
6	Beneficiation	2096	15120
7	Washing of dumpers etc	50	75
8	Fire service	15	20
	TOWNSHIP		
1	Green belt maintenance	25	40
2	Domestic	900	1000
3	Other supply to local villages, community functions etc.,	100	120
	Total	3,616	16,870

The report of hydrological study of Bolani and its surrounding area by Water & Power Consultancy Services (India) Ltd., New Delhi is given herewith **(Anx. 10)**. Water Balance chart for enhanced mining is under preparation and will be furnished when ready.

P.4.3 **Air Quality Management**

Monitoring of air quality in the mine as well as in the staff colony and nearby villages thro' the years has never revealed presence of any noxious gas due to mining or ore processing. There is only generation of dust and control measures thereof have kept it within the permissible limit. Results of quality monitoring is given in **Anx. 5.**

P.4.4 **Waste Management**

The overburden and dominant waste rock in BOM is high aluminous laterite and limonite. It occurs mostly as capping on iron ore. Limonite and silica veins or BHQ ' horses' are encountered occasionally inside ore bodies. These are treated as discard (waste rock). Total quantity of overburden plus all types of waste is never more than 10% (actually far less) of ore reserve.

All overburden and most of near surface waste material is excavated during bench preparation, transported and dumped at sites outside the pit limits.

Trees are planted on these dumps, specially on the slopes for stabilization. To arrest wash-off during rains garland drains are dug at the feet of these dumps. Inside the drains are dug a number of catch pits. After monsoon these drains

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and catch pits are cleaned for use again. With the excavated materials, bunds are built atop drains. This protective measure will continue throughout the life of the mine. When dumping ceases entire dump will be afforested. In the accompanied Table year-wise dump-wise rehabilitation to be done and retaining walls to be constructed are given in Table in following pages.

A comprehensive programme is stated in the Biological Reclamation Plan (Anx.11)

No toxic or hazardous material has been found to be present in overburden or waste rock of BOM.

P.4.5 **Top Soil Management**

No top soil occurs on any of the ore bodies in Bolani.

P.4.6 **Tailing dam management**

Protection of tailing ponds require on one hand sturdy construction of the embankments, and on the other, precaution in respect of on rush of water during heavy rain. From the civil structural design of the Dam [Drg No. 40] safety in construction and arrangements for disposal of storm water can be seen to be adequate.

The analysis of water from effluent streams and seepage from tailing pond did not find any parameter/item failing standards prescribed in the Environment (Protection) Act, 1988

Utilization of silt from the pond will be for raising height of the embankment (to enhance capacity & thus life of pond).

The clear water overflow from the dam will contain nominal quantity of suspended solids well within permissible limits.

The effluent (found on analysis) does not contain anything toxic to contaminate ground water.

When filled up the pond will be rehabilitated through afforestation.

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Table No.

Details of dumps during Scheme Period (2010-11 to 2014-15 & Conceptual Stage)

2Dump, No.	Year	Nature of Dump i.e. OB, Reject etc	Area at the beginning of the year (Ha)	Additional Area During the Year (Ha)	Area to be Rehabilitated during the year (Ha)/ conceptual stage	Balance area at the end of the Year (Ha)	Remarks
D/2 F area	2010-11	Reject	Nil	Nil	Nil	Nil	Backfilling only, No New OB dump is envisaged
	2011-12	Reject	Nil	Nil	Nil	Nil	
	2012-13	Reject	Nil	Nil	Nil	Nil	
	2013-14	Reject	Nil	Nil	Nil	Nil	
	2014-15	Reject	Nil	Nil	Nil	Nil	
	Conceptual Period	**N A**	**Nil**	**Nil**	**Nil**	**Nil**	
D/3 Panposh	2010-11 to 2014-15	Reject	0.75	Nil	0.75	Nil	
	Conceptual Period	**N A**	**Nil**	**Nil**	**Nil**	**Nil**	
D/4 Panposh	2010-11	OB	0.75	0.5	Nil	1.25	
	2011-12	OB	1.25	0.3	Nil	1.55	
	2012-13	OB	1.55	Nil	Nil	1.55	
	2013-14	OB	1.55	Nil	Nil	1.55	
	2014-15	OB	1.55	0.17	Nil	1.72	
	Conceptual Period	**OB**	**1.72**	**Nil**	**1.72**	**Nil**	
D/5 G area	2010-11 to 2014-15	OB/Reject	3.25	Nil	Nil	3.25	Backfilling only, No New OB dump is envisaged
	Conceptual Period	**3.25**	**Nil**	**Nil**	**3.25**	**Nil**	
D/6 D-area	2010-11 to 2014-15	Reject	1.37	Nil	Nil	1.37	
	Conceptual Period	**1.37**	**Nil**	**Nil**	**1.37**	**Nil**	
D/7 D-area	2010-11 to 2014-15	OB	0.32	Nil	Nil	0.32	
	Conceptual Period	**0.32**	**Nil**	**Nil**	**0.32**	**Nil**	
D/9 D-area	2010-11	Reject	0.52	0.8	Nil	1.32	
	2011-12	Reject	1.32	0.8	Nil	2.12	
	2012-13	Reject	2.12	0.8	Nil	2.92	
	2013-14	Reject	2.92	0.8	Nil	3.72	
	2014-15	Reject	3.72	0.8	Nil	4.92	
	Conceptual Period	**OB/Reject**	**4.92**	**Nil**	**4.92**	**Nil**	

CONSTRUCTION OF RETAINING WALL

Year	Location	Name / Ref no of Retaining Wall	Particulars of construction	Size (LXBXH) (m)
2010-11	G-area OB dump (Extension of proposed wall which is under construction)	RW-G1-i	Stone masonary with batter with French holes	L= 100m H= 1.5 m Top width= 1.5m Bottom width=2.5m
2011-12	D-area OB dump (Extension of existing wall)	RW-D1-i	Stone masonary with batter with French holes	L= 150m H= 1.5 m Top width= 1.5m Bottom width=2.5m
2012-13	Loading Plant Stockpile (New)	RW-LSP1	Stone masonary with batter with French holes	L= 300m H= 1.5 m Top width= 1.5m Bottom width=2.5m
2013-14	(i)Panposh Dump (Extension of existing wall) (ii) Panposh Dump (New)	RW-P1-i RW-P2	Stone masonary with batter with French holes	L= 50m H= 1.5 m Top width= 1.5m Bottom width=2.5m L= 100m H= 1.5 m Top width= 1.5m Bottom width=2.5m
2014-15	F-area OB dump (Repair & Extension of existing walls)	RW-F1	Stone masonary with batter with French holes	L= 200 m H= 1.5 m Top width= 1.5m Bottom width=3m

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P.4.7 **Infrastructure**

The then (at the time of closure) standing infrastructural facilities like roads, power line, water supply arrangement, built within the lease hold will be left *'as is where is'* basis as those will have use for the community that stays back viz., native villagers and also the Govt. Departments/agencies who will arrange maintenance and security of the said facilities.

P.4.8 **Disposal of mining machinery**

The machines in the ore processing plants including the conveyer systems upon dismantling will be shifted to other places of operation of the owners, i.e., SAIL. And, mobile mining machines most likely will be taken to other working mines of SAIL for further use.

P.4.9 **Safety & Security**

Besides afforestation of the mining benches and the waste dumps, exploratory pits and adits (if any left out) as well as the plant hopper in F area will be filled up. Then all the excavated areas will be fenced off and notice boards informing danger of trespass and advising caution necessary will be put up.

The lessee may negotiate with local village Panchayat to take over charge of supervision and maintenance of the said safety measures. Barring these fences and notice boards the lessee will not have any installation calling for security provision.

P.4.10 **Disaster management & risk assessment**

After closure of the mine fear of disaster will be from land slide at times of heavy rain. But as natural drainage is never disturbed, benches and waste dumps in the mine, dumps of unsold fines in the valley are afforested, and whatever few mining benches left bare will be in solid hard rock without too many fissures-fractures, chance of slide will not be there.

As the bottom of the Panposh pit will be above Panposh nala flowing beside, accumulated rain water, when any, will drain out fast and there will not remain any fear of drowning – though notice prohibiting entry will also be displayed.

With measures described above being preparatory for mine closure no serious risk is anticipated.

P.4.11 **Care & Maintenance during temporary discontinuance**

Mining areas will be fenced off to prevent undesirable entry of public. Security guards will be posted at strategic points to oversee plant, machines as well as mining areas. Depending on period of discontinuance, arrangement for skeletal maintenance will be made.

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TIME SCHEDULE (tentative) FOR FINAL CLOSURE

	JOB / SECTOR	ACTION	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16	Month 17	Month 18
1	MINED OUT LAND	REHABILITATION							M	O	N	I	T	O	R	I	N	G		
2	WATER SUPPLY SYSTEM (ORE WASHING)	REMOVAL, DISMANTLING OF PUMPS, PIPELINES ETC																		
3	DUST SUPPRESSION ARRANGEMENT	DISMANTLING																		
4	WASTE DUMPS	REHABILITATION THROUGH AFFORESTATION																		
5	TOP SOIL	NO ACTION																		
6	TAILING DAM	AFFORESTATION								M	O	N	I	T	O	R	I	N	G	
7	INFRASTRUCTURE	DISMANTLING																		
8	PLANT AND MACHINERY	DISMANTLING & REMOVAL																		
9	SAFETY & SECURITY	ERECTION OF FENCING & GUARDING							G	U	A	R	D	I	N	G				

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P.5 ECONOMIC REPERCUSSIONS

P.5.1 Status of local residents employed

As no possibility of closure of the mine is foreseen in next 20-years even, this aspect has not been studied.

P.5.2 Compensation to be given

It will be as per statutory regulations prevailing at the time of closure.

P.5.3 Satellite occupation

No thought has been given to this matter as no closure is imminent. However, because of association with the mining and allied activities, people particularly the local tribal ones, will be more skillful than hitherto and thereby will have gainful occupation of various types.

P.5.4 Continued engagement of employees

When closure of Bolani mine takes place, other units including mines of SAIL are expected to be running and shall offer scope of transfer to Bolani employees.

P.5.5 Envisaged repercussions

As the closure will be at least 20-years hence, the exact repercussion can not be realistically visualized.

P.6 TIME SCHEDULING FOR ABANDONMENT

Work on mine closure is to commence after all ore is extracted and processed. The time period for abandonment shown graphically in next page (page - 63) is divided into two broad parts. The first will be for actions like dismantling, shifting out etc., while the second part is for monitoring to ensure that steps taken are effective. Total period is expected to be 18-months.

P.7 ABANDONMENT COST

Though the mine is not to be closed down in near future, a broad estimate of the costs of actions required for implementing various measures including some maintenance and monitoring is given in the Tables A, B, C & D in the following pages.

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A. Reclamation and Rehabilitation Proposal of Mined out Land

Details	Year	Area Proposed (In Hectare (Ha))	Quantity Proposed	Remarks
Backfilling	2010-11	1.30	4.02 Million m^3	
	2011-12	1.30	4.06 Million m^3	
	2012-13	1.30	4.36 Million m^3	
	2013-14	1.55	4.03 Million m^3	
	2014-15	1.58	4.07 Million m^3	
	2015-16 to 2034-35	**30.00**	3.00 Million m^3	
Afforestation on backfilled area	2010-11	3.10	8000 nos	Tentative Expenditure is given in terms of present cost of materials, wage rate etc.
	2011-12	1.30	5000 nos	
	2012-13	1.30	5000 nos	
	2013-14	1.30	5000 nos	
	2014-15	1.55	5000 nos	
	2015-16 to 2034-35	**31.58**	80,000 nos	
Afforestation On mined out benches	2010-11	NIL	NIL	Tentative Expenditure is given in terms of present cost of materials, wage rate etc.
	2011-12	NIL	NIL	
	2012-13	NIL	NIL	
	2013-14	2.33	5500 Nos	
	2014-15	2.03	5500 Nos	
	2015-16 to 2034-35	**380.00**	9,50,000 nos	
Converting to reservoir	2010-11	NIL		Tentative Expenditure is given in terms of present cost of materials, wage rate etc.
	2011-12	NIL		
	2012-13	NIL		
	2013-14	NIL		
	2014-15	NIL		
	2015-16 to 2034-35	**10.00**		
Picnic Spot	2010-11	NIL		Tentative Expenditure is given in terms of present cost of materials, wage rate etc.
	2011-12	NIL		
	2012-13	NIL		
	2013-14	NIL		
	2014-15	NIL		
	2015-16 to 2034-35	**5.00 Ha**		

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B. Stabilization and Rehabilitation of dumps (With Lease)

Details	Year	Area Proposed (In Hectare (Ha))	Quantity Proposed	Expenditure	Remarks
Terracing	2010-11	0.10	Quantity is not applicable as the terraces will be made on the existing OB dumps	Rs 25000	Tentative Expenditure is given in terms of present cost of materials, wage rate etc.
	2011-12	0.10		Rs 25000	
	2012-13	0.10		Rs 25000	
	2013-14	0.10		Rs 25000	
	2014-15	0.10		Rs 25000	
	2015-16 to 2034-35	1.00		Rs 2,50,000	
Pitching	2010-11	0.12	Quantity is not applicable as the pitching will be made on the existing OB dumps	Rs 2,00,000	-do-
	2011-12	0.12		Rs 2,00,000	
	2012-13	0.09		Rs 1,75,000	
	2013-14	0.09		Rs 1,75,000	
	2014-15	0.09		Rs 1,75,000	
	2015-16 to 2034-35	1.00		Rs 15,00,000	
Parapet wall / Toe wall/ Retaining wall	2010-11	-	100 m	Rs 4,00,000	-do-
	2011-12	-	150 m	Rs 5,00,000	
	2012-13	-	300 m	Rs 10,00,000	
	2013-14	-	150 m	Rs 5,00,000	
	2014-15	-	200 m	Rs 5,50,000	
	2015-16 to 2034-35	-	500 m	Rs 20,00,000	
Construction of check dams	2010-11	-	350 m	Rs 3,50,000	-do-
	2011-12	-	210 m	Rs 2,10,000	
	2012-13	-	100 m	Rs 100,000	
	2013-14	-	110 m	Rs 1,10,000	
	2014-15	-	130 m	Rs 1,30,000	
	2015-16 to 2034-35	-	800 m	Rs 8,00,000	
Settling Ponds, Garland Drains	2010-11	-	100 m	Rs 50,000	-do-
	2011-12	-	150 m	Rs 75,000	
	2012-13	-	300 m	Rs 150,000	
	2013-14	0.01	150 m	Rs 75,000	
	2014-15	0.01	200 m	Rs 1,00,000	
	2015-16 to 2034-35	0.02	500 m	Rs 2,50,000	
Afforestation on dumps	2010-11	2.00	5000 nos	Rs 2,50,000	-do-
	2011-12	2.00	5000 nos	Rs 2,50,000	
	2012-13	2.00	5000 nos	Rs 2,50,000	
	2013-14	2.00	5000 nos	Rs 2,50,000	
	2014-15	2.00	5000 nos	Rs 2,50,000	
	2015-16 to 2034-35	30.00	75,000 nos	Rs 37,50,000	

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C. Rehabilitation of barren area within Lease

Details	Year	Area Proposed (In Hectare (Ha))	Quantity Proposed	Remarks
Afforestation	2010-11	1 .00 ha	2000 nos	Tentative Expenditure is given in terms of present cost of materials, wage rate etc.
	2011-12	2 .00 ha	5000 nos	
	2012-13	2 .00 ha	5000 nos	
	2013-14	2 .00 ha	5000 nos	
	2014-15	2 .00 ha	5000 nos	
	2015-16 to 2034-35	40 .00 ha	1,00,000 nos	
Vegetative fencing	2010-11		400 m	-do-
	2011-12		600 m	
	2012-13		600 m	
	2013-14		600 m	
	2014-15		600 m	
	2015-16 to 2034-35		2500 m	

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(D) Environmental Monitoring (Core Zone & Buffer Zone)

Details	Year	No of Sampling stations proposed	No of 24 hour/ representative Samples proposed/ year	Expenditure	Remarks
Ambient Air Quality	2010-11	6 nos	24	Rs 200,000	
	2011-12	6 nos	24	Rs 2,00,000	
	2012-13	6 nos	24	Rs 2,00,000	
	2013-14	6 nos	24	Rs 2,00,000	
	2014-15	6 nos	24	Rs 2,00,000	
	2015-16 to 2034-35	**6 nos**	**480**	**Rs 40,00,000**	
Water quality	2010-11	4 nos	16	Rs 50,000	
	2011-12	4 nos	16	Rs 50,000	
	2012-13	4 nos	16	Rs 50,000	
	2013-14	4 nos	16	Rs 50,000	
	2014-15	4 nos	16	Rs 50,000	
	2015-16 to 2034-35	**4 nos**	**320**	**Rs 8,00,000**	
Noise Level Survey	2010-11	4 nos	16	Rs 25,000	
	2011-12	4 nos	16	Rs 25,000	
	2012-13	4 nos	16	Rs 25,000	
	2013-14	4 nos	16	Rs 25,000	
	2014-15	4 nos	16	Rs 25,000	
	2015-16 to 2034-35	**4 nos**	**320**	**Rs 5,00,000**	

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a) **Dismantling/demolition/removal of infrastructure**

As the salvage value of things dismantled will be more than the actions of dismantling etc., this cost is not counted.

b) **Shifting of machinery & equipment**

As all these will be re-used in other units/mines of SAIL, cost in this respect has also not been considered.

c) **Site Safety**

The cost of fencing all the mined out areas has been estimated at Rs. 5.0 lakh in the SOM approved in May, 2007. The estimate is realistic and is retained.

d) **Protective measures**

These are mainly check dams, garland drains and settling tanks – safeguards concerning waste dumps. Cost estimates are stated in detail in the SOM approved in May, 2007. That estimate, in aggregate, at Rs. 1.833 lakhs is retained.

e) **The total cost of abandonment**

As Bank Guarantee, in this respect has already been provided for a sum of Rs. 65,20,750/- **(vide Anx. 12)**, additional Bank Guarantee for the balance sum of Rs. (1,11,50,250 - 65,20,750)= Rs. 46,29,500/- (Rupees forty-six lakh twenty-nine thousand five hundred only) will be provided upon approval of the computation by IBM.

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P.8 FINANCIAL ASSURANCE

TABLE : BREAK-UP OF AREAS IN THE MINING LEASE FOR CALCULATION OF FINANCIAL ASSURANCE [Drg. No. 38]

Sl. No.	Head	Area put on use at start of Plan (Ha)	Additional requirement during Mining Plan period (Ha)	Total (Ha)	Area Considered as fully Reclaimed and Rehabilitated (Ha)	Net area considered for calculation (Ha)
1	AREA UNDER MINING	277.64	37.16	314.80	11.39	303.41
2	STORAGE FOR TOP SOIL	0.00	0.00	0.00	0.00	0.00
3	OVERBURDEN/DUMP	25.93	0.50	26.43	16.96	9.47
4	MINERAL STORAGE	4.65	15.00	19.65	0.00	19.65
5	INFRASTRUCTURE (WORKSHOP, ADMN. BLDG ETC)	16.72	35.50	52.22	0.00	52.22
6	ROADS	26.86	5.00	31.86	0.00	31.86
7	RAILWAYS	0.00	0.00	0.00	0.00	0.00
8	GREEN BELT & PROHIBITED ZONE	76.21	78.53	154.74	154.74	0.00
9	TAILING POND	10.00	0.00	10.00	10.00	0.00
10	EFFLUENT TREATMENT PLANT	1.20	0.00	1.20	0.00	1.20
11	EXPLORATION	0.00	220.00	220.00	220.00	0.00
12	MINERAL SEPARATION PLANT	2.20	24.00	26.20	0.00	26.20
13	TOWNSHIP AREA	47.64	0.00	47.64	47.64	00.00
14	OTHERS (MAGAZINE)	1.00	1.00	2.00	0.00	2.00
15	GRAND TOTAL	490.05	416.69	906.74	460.73	446.01

Computed in the prescribed manner the net area for which Financial Assurance (F.A) is to be provided now as required by Rule 23F of the MCDR, 1988, is 446.01 Ha (Table at P.8, is given above) . The F.A @ Rs. 25,000/hectare, works out to Rs. 1,11,50,250/- (Rupees one crore eleven lakh fifty thousand two hundred fifty only).

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13/11/X

खान नियंत्रक (मध्यांचल)
Controller of Mines (Central Zone)
भारतीय खान ब्यूरो
Indian Bureau of Mines

Dilip Kumar Basu Bose
Registra

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P.9 **CERTIFICATES**

The necessary certificates are enclosed.

P.10 **RELEVANT PLANS & SECTIONS**

The necessary plans & sections have been referred to at the appropriate places and are enclosed with this document.

Photographs showing working of different areas of mine, back-filling in F area, rehabilitated waste dump in F area, recent afforestation in F area O.B. Dump, plantation over Panposh OB dump, retaining wall around OB dump, rehabilitated waste dump in D area, Biological reclamation of old tailing pond have been put in the enclosed compact disc.

The CD also contains a video film showing mine working, rehabilitation works, peripheral development works etc., The order for a satellite image of the area surrounding 5.10 sq. Miles lease hold of BOM has been placed with National Remote Sensing Agency, Govt. of India, Hyderabad. It will be submitted no sooner received.

Dilip Kumar Basu Bose

Regn. No. 832/A