

## **SCHEME OF MINING OF JINDAL CHROMITE MINE OVER AN AREA OF 89.00 HECTARES IN JAJPUR DISTRICT, ORISSA.**

### **INTRODUCTION**

The mining lease over 89.00 hectares was granted to M/s Jindal Strips Ltd. & executed on 04.01.2002 for a period of 20 years. Subsequently the M.L was transferred in favour of M/s Jindal Stainless Limited w.e.f 01.04.2002.

The name of the Company Jindal Stainless limited was changed to JSL limited on 23.09.2008. It was then changed from JSL limited to JSL Stainless limited on 06.08.2010. Finally the name of the company was again changed from JSL Stainless limited to Jindal Stainless limited on 07.12.2011. Copies of certificate of Incorporation regarding changes of the name of the company from the Registrar of Companies, National capital Territory of Delhi & Haryana are enclosed vide Annexure – 8.

#### **Particulars of earlier approval :**

1. Mining plan under Rule 22 MCR,1960 for the period 2002-2003 to 2006-07 was approved by IBM, Nagpur vide letter no. 314(3)/99-MCCM(C)MP-7 dated 29.12.2000. The commencement of mining operation by the lessee was on 28.01.02
2. Modification of mining plan under rule 10 MCDR-1988 for the period 2004-05 to 2005-06 was approved by IBM, Nagpur vide letter no. 314(3)/2004-MCCM(C)/MP-8, dated 28.01.2005.
3. Scheme of mining with PMCP under Rule 12 of MCDR-1988 for the period 2007-08 to 2011-12 was approved by IBM, Nagpur vide letter no. 314(3)/2007-MCCM(CZ)S-11, dated 14.06.2007.
4. Modification of approved scheme of mining for the last three years (2009-10, 2010-11 and 2011-12) of the scheme period was approved by IBM, Nagpur vide 314(3)/2009-MCCM(CZ)/MP-38 dtd. 24.06.2010.

The modified proposal for the balance three years of approved scheme period was projected by taking into account enhancement of production from Q-2 (band-VI) along with installation of proposed COB with capacity of 24,000 MT/year to upgrade the sub-grade and tailings of existing COB plant as per flow chart designed by IMMT.

## **PART-I**

### **CHAPTER – I**

#### **1.0 REVIEW OF SCHEME OF MINING :**

##### **1.1 Name of the mine**

Jindal Chromite Mines, Kaliapani village, P.S. Tomka, District: Jajpur (Odisha): Area: 89.00 Hectares.

##### **1.2 Particulars of approval of Scheme of Mining**

The last scheme of mining with PMCP was approved by IBM for the period (2007-2008 to 2011-2012) and subsequently modification of approved scheme of mining for the period 2009-10, 2010-11 and 2011-12 was also approved by IBM.

##### **1.3 Date of commencement of mining operations**

The mining operation in the area has been started by the Lessee since 28.01.2002.

##### **1.4(a) Deficiencies, if any, that existed in the approved Mining Plan**

No major deficiencies existed in the approved Scheme of Mining and modifications to the approved Scheme of Mining.

##### **1.4(b) Review of approved scheme of mining (2007-08 to 2011-12) for the 1<sup>st</sup> two years scheme period (2007 – 08 to 2008 – 09) and last three years (2009-10 to 2011-12) of modifications approved scheme period.**

###### **(i) Exploration**

Year	Commitment		Achievement
	Boreholes	Location	
2007-08	PBH-4,5,6	Band- I	Boreholes could not be drilled due to non availability of outside agency for such low-scale metrage drilling.
2008-09	PBH-7,8	Band- II	
2009-10	No proposal	---	---
2010-11	PBH- 7,8	Band- I	Boreholes could not be drilled due to non availability of outside agency for such low-scale metrage drilling.
	PBH- 1	Band- II	
2011-12	PBH- 1	Band- II	The lessee has drilled 4 nos. of boreholes (BH- I, IA, 2 & 2A) in Band-I and 2 nos. boreholes (BH-3, BH-4) in Band-II (Ref. Annexure - 6).
	PBH- 2,3	Band- I	

**(ii) Year wise Mine Development**

Year	Commitment		Achievement
	Name of Quarry with Band	FRL in (m)	
1 <sup>st</sup> 2007-08	Q <sub>1</sub> (Band I & II)	88	Achieved
	Q <sub>2</sub> (Band VI)	254	
2 <sup>nd</sup> 2008-09	Q <sub>1</sub> (Band I & II)	76	Achieved
	Q <sub>2</sub> (Band VI)	164	Achieved upto 165m FRL
3 <sup>rd</sup> 2009-10	Q <sub>1</sub> (Band I & II)	64	Upto 65m FRL
	Q <sub>2</sub> (Band VI)	158	Development was held up due to recession
4 <sup>th</sup> 2010-11	Q <sub>1</sub> (Band I & II)	57	Not achieved due to want of environmental clearance for the approved capacity
	Q <sub>2</sub> (Band VI)	152	
5 <sup>th</sup> 2011-12	Q <sub>1</sub> (Band I & II)	57	
	Q <sub>2</sub> (Band VI)	146	

**(iii) Exploitation :**

**Commitment : (As per Scheme of the Mining)**

Year	ROM (+)			Total (MT)
	+44 Cr <sub>2</sub> O <sub>3</sub>	30 to 44 Cr <sub>2</sub> O <sub>3</sub>	10 to 30% Cr <sub>2</sub> O <sub>3</sub>	
<b>From Q-1</b>				
1 <sup>st</sup> 2007 – 08	76800	78975	26325	182100
2 <sup>nd</sup> 2008 – 09	56850	62437	20813	140100
3 <sup>rd</sup> 2009 - 10	47850	54225	18075	120150
4 <sup>th</sup> 2010 - 11	42600	73012	24338	139950
5 <sup>th</sup> 2011 - 12	--	105525	35175	140700
<b>From Q-2</b>				
1 <sup>st</sup> 2007 – 08	Nil	Nil	Nil	Nil
2 <sup>nd</sup> 2008 – 09	19,950	11,419	3806	35,175
3 <sup>rd</sup> 2009 - 10	40062	23608	7870	71540
4 <sup>th</sup> 2010 - 11	41787	24625	8208	74620
5 <sup>th</sup> 2011 - 12	42336	24948	8316	75600

**Compliance :**

**Yearwise production achieved is as follows :**

Year	ROM (+)			Total (MT)
	+44 Cr <sub>2</sub> O <sub>3</sub> (MT)	30 to 44 Cr <sub>2</sub> O <sub>3</sub> (MT)	10 to 30% Cr <sub>2</sub> O <sub>3</sub> (MT)	
<b>From Q-1 (Band-I &amp; II)</b>				
1 <sup>st</sup> 2007 – 08	38,916	27,140	53,378	1,19,434
2 <sup>nd</sup> 2008 – 09	19,022	38,126	22,245	79,394*
3 <sup>rd</sup> 2009 – 10	21835		19020	40855
4 <sup>th</sup> 2010 – 11	51000		6000	57000*
5 <sup>th</sup> 2011 – 12 (upto Sept. 11)	13000		6500	19500*
<b>From Q-2 (Band-VI)</b>				
1 <sup>st</sup> 2007 – 08	Nil	755	---	755**
2 <sup>nd</sup> 2008 – 09	200		200	400
3 <sup>rd</sup> 2009 – 10	10000		11500	21500
4 <sup>th</sup> 2010 – 11	12000		5000	17000
5 <sup>th</sup> 2011 – 12 (upto Sept. 11)	5000		7500	12500

Year	Total production achieved (MT)			Generation of OB (m3)	Stripping ratio (Ore:OB) MT/cum
	Q <sub>1</sub>	Q <sub>2</sub>	Total		
2007-08	119434	755	120189	702200	1:5.84
2008-09	79394	400	79794	425000	1:5.32
2009-10	40855	21500	62355	117797	1:1.89
2010-11	57000	17000	74000	1142282	1:15.43
2011-12 (upto Sept'11)	19500	12500	32000	436947	1:13.65
<b>Total</b>			<b>368338</b>	<b>2824226</b>	<b>1:7.66</b>

**Reason for deviation**

\* Not achieved due to want of environmental clearance for approved capacity during the year.

\*\* Not achieved due to presence of cliffs, non-finalization of contractors.

**(iv) Dumping of Waste Materials :**

Year	Target	Achievement	Disposal of waste (m3)	
	OB (m3)	OB (m3)	Road making and maintenance	Dump-1
2007-08	2169800	702200	Nil	702200
2008-09	1668000	425000	425000	Nil
2009-10	1916140	117797	35340	82457
2010-11	1418540	1142282	342685	799597
2011-12	1427770	436947 (upto Sept. 11)	131084	305863
		<b>2824226</b>	<b>934109</b>	<b>1890117</b>

Total area covered by Dump-1 (between Quarry-1 and Quarry-2) is 8.82 hectares with RL of 150m. The waste materials have been dumped in three terraces of 25m, 25m and 15m with top RL at 215m.

**V. Afforestation**

Year	Target	Achievement				
	No. of species	Area of plantation (hects)	Number of species	Location	Name of the species	% of survival
2007 – 08	2000	1.8	3500	Slope of Dump-2 near tailing pond	Acacia, Bada Chakunda, Krishnachuda, Teak & Mango etc.	80%
2008 – 09	2000	0.3	500	- do -	- do -	70%
2009 – 10	2000	1.25	2000	Near magazine	- do -	60%
2010 – 11	2000	1.25	2000	Near ANFO shed	- do -	60%
2011– 12	2000	1.25	2000		- do -	60%
<b>Total</b>	<b>10,000</b>	<b>5.85</b>	<b>10,000</b>			

**(vi) Environmental Measures :  
(Quality of Air / Noise / Dust )**

**Commitment :**

Air/Dust

Proper maintenance of road surface by spraying of water periodically and plantation were proposed to minimize air pollution. Quarterly monitoring of air quality for parameters like SPM, NO<sub>x</sub>, Co, SO<sub>2</sub> etc were also envisaged.

Noise

Use of muffle blasting, provision of delay detonators, plantation scheme were proposed to reduce the noise level. Further noise monitoring at the selected station were proposed.

**Compliance :**

All such proposals and measures have been followed by the lessee during the Five years of scheme period. Environmental monitoring during the 5<sup>th</sup> year of 2011-12 is enclosed (Annexure - 4).

**1.4(c) Review of the Compliance position of Conditions & Stipulation imposed.**

The last scheme of mining for 2007-08 to 2011-12 was approved with certain general conditions. The major condition / stipulation imposed and its compliance is furnished below :

**Environmental Monitoring :**

Environmental monitoring of ambient air quality, dust fall rate, water quality, soil sample analysis and noise level measurements at various stations established in core zone & buffer zone as per the requirement of

environmental guide lines and keeping in view of IBM circulars, should be carried out every year by the Environmental Monitoring cell established by the company 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.

**Compliance :**

The lessee has entrusted the job of regular monitoring to M/s Geomin Consultants. The data so generated have been properly maintained by the lessee.

**1.4(d) Violation indicated by IBM & DGMS and their Compliance.**

The contraventions observed by IBM & DGMS and it's necessary compliance position given by the lessee are enclosed (Ref. Annexure - 1).

**1.5 Socio-economics activities undertaken in & around the area.**

The various socio-economic activities undertaken during last five years of scheme period and the amount spent under various heads are indicated as follows :

<b>Year</b>	<b>Periphery Development work executed</b>	<b>Rupees</b>
2007 – 2008	Dug one no. of Tube well in village Kankadpal & Bambilo	Rs. 1,80,000.00
	Contributed for foot ball tournament, Cricket tournament and different Puja.	Rs. 50,000.00
	Donated to Indian Red Cross Society, Dist. Branch, Jajpur.	Rs. 25,000.00
	Donated to Utkal Balashram, a home for orphanage.	Rs. 5,000.00
	Contributed to the Collector, Jajpur for repairing of Tamka-Mangalpur Road.	Rs. 27,54,000.00

2008 – 2009	Contributed for foot ball tournament, Cricket tournament and different Puja.	Rs. 50,000.00
	Donated to Indian Red Cross Society, Dist. Branch, Jajpur.	Rs. 5,000.00
	Contributed for plantation at Sukinda	Rs. 15,000.00
	Contributed for foot ball tournament, Cricket tournament and different Puja.	Rs. 75,000.00
	Conducted sports in nearby village (Chirgunia)	Rs. 40,000.00
2009 – 2010	Plantation programme at Sourika High School, Village Chirgunia.	Rs. 30,000.00
	Dug tow nos. Tube well at Village Haripur, & Kharadih of Sukinda block at Cost Rs. 1,00,000/- per tube well.	Rs. 2,00,000.00
	Contribution towards Zilla Mahotsub	Rs. 75,000.00
	Contributed towards Sukinda Ratha Yatra	Rs. 21,000.00
2010 – 2011	Electrification of Chandimata Primary School building Kaliapani with supplying fan and lights.	Rs. 50,000.00
	Dug two no. of bore well at Nua-Dihi High School and Kaliapani Rama basti for drinking water supply.	Rs. 3,00,000.00
	Contribution towards Zilla Mahostab	Rs. 1,70,000.00
	Contributed for foot ball tournament, Cricket tournament and different Puja.	Rs. 75,000.00
2011 - 2012	Contributed for foot ball tournament, Cricket tournament and different Puja.	Rs. 75,000.00
	Contributed for conducting annual sports at Chirgunia village.	Rs. 40,000.00
	Proposed to contribute for road making of remaining 5.2 Km. Tamaka – Mangalpur Road as per decision of district administration.	Rs. 52,00,000.00
	Proposal for Drinking water supply provision to local villages of two bore well.	Rs. 3,00,000.00
	Proposed to construct one club house with all accessories.	Rs. 5,00,000.00
	Proposal for Zilla Mahostab	Rs. 2,00,000.00



**PART-II**

**CHAPTER – II**

**2.0 PROPOSAL UNDER SCHEME OF MINING FOR THE NEXT FIVE YEAR:**

**2.1 Name and Address of the Applicant.**

M/s Jindal Stainless Limited – A Public Limited Company.

The list of Board of Directors is enclosed vide Annexure-10

<b>Registered Office :</b>	<b>Corporate Office</b>	<b>Mine site Office</b>
O.P. Jindal Marg, Hisar-125005, Haryana, India, Tel. No. 222471-83 (01662)	Jindal centre, 12, Bhikaiji Cama Place, New Delhi-110066 Tel-(011)26188345-70 Fax-(011)26161271	Jindal Chromite Mine Village Kaliapani Dist : Jajpur, Odisha PIN : 755 047 Tel : 06726 – 268315, 268449

Nominated Owner

Mr, Subash Singh Viridi

Executive Director and

Chief Operating Officer

Jindal Stainless limited

Kalinga Nagar Industrial Complex

Dist – Jajpur-755026

Odisha

A copy of Board resolution regarding Nominated Owner is enclosed vide annexure-11.

**2.2 The last approved scheme of mining was for the period of 2007-08 to 2011-12, subsequently.**

The modification of approved scheme was prepared for the balance period (3 year) in Q-2 (Band-VI) and installation of another COB in addition to existing one. The present scheme for the period 2012-13 to 2016-17 is being prepared as per statute by M/s Geomin Consultant (P) Ltd.

**2.3 Minerals to be mined :**

Chrome ore

**2.4 Area & date of expiry of lease**

M.L area - 89.00 hecets

Date of expiry - 03.01.2022

**2.5 Date of expiry of five year period for which approved on last occasion.**

The validity of approved scheme (2007-08 to 2011-12) is upto 31.03.2012. The present scheme of mining is being prepared as per the statute for the next five year i.e. 2012-13 to 2016-17.

### CHAPTER – III

#### 3.0 RESERVES

#### 3.1 Category wise (Proved, Probable & Possible) reserves estimated in the earlier scheme of mining with grades.

Reserves as per approved modification of scheme of mining as on 31.03.2009.

Band No.	Geological (million tonnes)			Resources (mt) (332)	Mineable (million tonnes)	Grade Cr <sub>2</sub> O <sub>3</sub> %
	Proved (111)	Probable (122)	Total (111 + 122)			
I	0.579	0.564	1.143	1.241	0.134	+44%
	0.509	0.477	0.986	1.049	0.146	30 to 44%
	0.187	0.159	0.346	0.350	0.049	10 to 30%
II	0.653	0.480	1.133	0.576	0.238	20 to 32%
VI	0.447	0.319	0.766	0.319	0.190	30 to 44%
	0.336	0.241	0.577	0.241	0.143	10 to 30%
<b>Total :</b>	<b>2.711</b>	<b>2.240</b>	<b>4.951</b>	<b>3.776</b>	<b>0.900</b>	

#### 3.1.1 Mineable reserve after depletion

The mineable reserve after depletion during 2009-10 upto Sept'2011(2011-12) has been calculated and presented as follows :

(million tone)

Band No.	Quarry No.	As per approved modification of scheme of mining		Depleting of reserves		Net reserve as on 1.10.11	
		Acceptable grade (+40 Cr <sub>2</sub> O <sub>3</sub> )	Beneficial grade (+10 to -40%) Cr <sub>2</sub> O <sub>3</sub>	Acceptable grade (+40 Cr <sub>2</sub> O <sub>3</sub> )	Beneficial grade (+10 to -40%) Cr <sub>2</sub> O <sub>3</sub>	Acceptable (+40 Cr <sub>2</sub> O <sub>3</sub> )	Beneficial grade (+10 to -40%) Cr <sub>2</sub> O <sub>3</sub>
I & II	Q-1	0.135	0.433	0.085	0.031	0.049	0.402
VI	Q-2	0.190	0.142	0.027	0.024	0.163	0.118
<b>Sub Total</b>		<b>0.325</b>	<b>0.575</b>	<b>0.112</b>	<b>0.055</b>	<b>0.213</b>	<b>0.520</b>
<b>Grand Total</b>			<b>0.900</b>		<b>0.167</b>		<b>0.733</b>

**3.2 Additional reserve established category wise (with basis & parameters considered).**

During the last scheme period exploration through six number of boreholes carried out by the lessee for Band-I and Band-II, which were found to be negative (Ref. Annexure – 6).

**3.3 Category wise updated reserves with grade (indicate end use grade with analysis) as well as marginal grades:**

The geological & mineable reserve as projected in the approved scheme of mining has been further updated by taking into account six boreholes drilled in the Band – I & Band – II and the existing quarry position at Q – 1 & Q – 2.

The details of geological & mineable reserve have been indicated in table 3.1 & 3.2.

**Summary of Geological & Mineable Reserves**

**Geological Reserve (MT)**

	<b>Band I</b>	<b>Band VI</b>	<b>Total</b>
Proved	5,59,260	16,42,200	22,01,460
Probable	8,49,000	10,51,750	19,00,750
<b>Sub-Total</b>	<b>14,08,260</b>	<b>26,93,950</b>	<b>41,02,210</b>
Resource	18,67,800	10,51,750	29,19,550
<b>Grand Total</b>	<b>32,76,060</b>	<b>37,45,700</b>	<b>70,21,760</b>

**Mineable Reserve (MT)**

<b>Band I</b>	<b>Band VI</b>	<b>Total</b>
50,400	7,52,850	8,03,250

The gap between geological reserves & mineable reserve is due to following factors.

- The geological proved and probable reserves have been estimated upto floor mRL 50 & 0 respectively for Band-I and Band-II.
- For Band-VI, the geological proved & probable reserves have been estimated upto floor mRL 100 and 50 respectively.
- As per bore-hole data there has been no intersection of ore for Band - II.

- However the mineable reserves have been computed upto 57 mRL for Band-I & II and incase of Band-VI, it is computed upto 120 mRL leaving 7.5m peripheral barrier along lease boundary on both sides and keeping the ultimate pit slope angle at 30° as per the opencast mining method.

The boreholes given on Band-II did not expose any chromite mineralization. Hence no reserve for this band was calculated as it disappears at depth Similarly based on the borehole data, the reserve for Band-I has been reduced. However the reserve for Band-VI has been increased which was calculated afresh based on the correct width of the band as well as existing borehole data. Suitable L-sections have been prepared and enclosed.

### 3.4.1 UNFC Codification

Classification	Code	Quantity (in mt)	Grade
(1)	(2)	(3)	(4)
<b>Total Mineral Resources (A+B)</b>		7.021	Cut off at 10% Cr <sub>2</sub> O <sub>3</sub>
<b>A. Mineral Reserve</b>			
(1) Proved Mineral Reserve	111	0.803	
(2) Probable Mineral Reserve	122	---	
<b>B. Remaining Resources</b>			
(1) Feasibility Mineral Resource	211	1.398	
(2) Prefeasibility Mineral Resource	222	---	
(3) Measured Mineral Resource	331	---	
(4) Indicated Mineral Resource	332	1.901	
(5) Inferred Mineral Resource	333	2.919	
(6) Reconnaissance Mineral Resource	334	----	

### 3.4.2 Justification of UNFC Classification

#### UNFC Code-111

**E1-** The said mine is a profit making mine with good amount of production of chromite ore since 2002.

Approved scheme of mining of Jindal Chromite Mine already exists.

This mine is a systematic mine and serves as a captive mine for Lessee's ferroalloys plant installed at Kothavalsa.

- F1-** The M.L area is already exposed with Band-I, Band-II & Band-VI through bore holes drilled by the Lessee which revealed the extension of chromite ore upto the depth below existing quarry floor. The mining activities within this mine is cost effective & feasible in all aspect (Ref. Annexure-17).

From environmental point of view, EIA & EMP report has already been approved by MOEF which includes study of socio economic impact, waste disposal / reclamation & detailed land use data. Rehabilitation & resettlement proposal has not been included in the EIA / EMP report as the project is not affecting any persons within the lease area. Further owing to enhancement of production from Q-2 (Band-VI) and installation of another COBP with capacity of 24,000 MT/year the EIA & EMP is under process.

Mining scheme has already been approved by IBM, which includes recovery factor, man power requirement, equipments etc.

Details of infrastructure & services, construction activities is already within the M.L area.

- G1-** Detailed geological mapping has already been carried out on a scale of 1:2000.

Detailed topographical-cum-geological map including all surface geological features, extent of deposit, location of bore holes, dip & strike is already done in the said mine.

Bore holes are already drilled by the lessee within the M.L area for both Band-I, Band-II & Band-VI and the existence ore bodies have been proved.

The mineable reserves have also been computed by taking into account of peripheral barrier (7.5m) along lease boundary and keeping the ultimate slope angle at 30° as per the opencast mining for chromite.

**UNFC Code (211)**

- E2-** It is potentially economic, but not mineable due to slope and safety zone.
- F1-** Feasibility conducted & report appended, it is not mineable due to constraints discussed under E2.
- G1-** It is proved under detailed exploration but not mineable due to factors as stated in E2 and F1.

**UNFC Code (332)**

- E3-** Intrinsically economic based on geological study. General idea about forest/non-forest is available.
- F3-** Geological studies are undertaken with topographical setting and nature of land.
- G2-** Depth Extension on the basis of exploration carried out in adjoining lease and GSI work in past upto 0mRL.

**UNFC Code (333)**

- E3-** Intrinsically economic based on geological study. General idea about forest/non-forest is available.
- F3-** Geological studies are undertaken with topographical setting and nature of land.
- G3-** Depth Extension on the basis of exploration carried out adjoining lease and GSI work in past upto 0mRL .

**3.5 Future Exploration Proposal:**

The explorations carried out by the lessee during last three years of scheme period around Band I & II are found to be negative. However taking into account of the prospect of underground mining in future, the following inclined boreholes have been proposed in Band-I and Band-VI at 50 m interval.

Year	No. of BH	Meterages	Location
2 <sup>nd</sup> (2013-14)	2 (80 <sup>0</sup> Incl)	400 (-100 mRL)	Band I
3 <sup>rd</sup> (2014-15)	2 (80 <sup>0</sup> Incl)	400(-110 mRL)	Band I
4 <sup>th</sup> (2015-16)	3(45 <sup>0</sup> Incl)	600 (20,40,42 mRL)	Band VI

**Table – 3.1**

**MINERAL RESOURCES (BAND – I)**

**MEASURED MINERAL RESOURCES (331)**

Section	Floor RL (m)	Sectional area (m2)	Length of influence (m)	Volume of ore (cu.m)	Tonnage factor	Ore +10% to -40% Cr <sub>2</sub> O <sub>3</sub> (MT)	+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	Total (MT)
AB	50	1488	90	133920	3	140616	261144	401760
CD		525	100	52500		55125	102375	157500
EF		---	---	---		---	---	---
<b>G-Total</b>						<b>195741</b>	<b>363519</b>	<b>559260</b>

**INDICATED MINERAL RESOURCES (332)**

Section	Floor RL (m)	Sectional area (m2)	Length of influence (m)	Volume of ore (cu.m)	Tonnage factor	Ore +10% to -40% Cr <sub>2</sub> O <sub>3</sub> (MT)	+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	Total (MT)
AB	0	1200	90	108000	3	113400	210600	324000
CD		1750	100	175000		183750	341250	525000
<b>G-Total</b>						<b>297150</b>	<b>551850</b>	<b>849000</b>

**INFERRED MINERAL RESOURCES (333)**

Section	Floor RL (m)	Sectional area (m2)	Length of influence (m)	Volume of ore (cu.m)	Tonnage factor	Ore +10% to -40% Cr <sub>2</sub> O <sub>3</sub> (MT)	+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	Total (MT)
AB	-110	2640	90	237600	3	249480	463320	712800
CD		3850	100	385000		404250	750750	1155000
<b>G-Total</b>						<b>653730</b>	<b>1214070</b>	<b>1867800</b>



**GEOLOGICAL RESERVE (BAND – VI)**

**MEASURED MINERAL RESOURCES (331)**

Section	Floor RL (m)	Sectional area (m <sup>2</sup> )	Length of influence (m)	Volume of ore (cu.m)	Tonnage factor	Ore +10% to -40% Cr <sub>2</sub> O <sub>3</sub> (MT)	+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	Total (MT)
AB	100	1560	90	140400	3.5	235872	255528	491400
CD		1520	100	152000		255360	276640	532000
EF		1360	130	176800		297027	321776	618800
<b>G-Total</b>						<b>788256</b>	<b>853944</b>	<b>1642200</b>

**INDICATED MINERAL RESOURCES (332)**

Section	Floor RL (m)	Sectional area (m <sup>2</sup> )	Length of influence (m)	Volume of ore (cu.m)	Tonnage factor	Ore +10% to -40% Cr <sub>2</sub> O <sub>3</sub> (MT)	+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	Total (MT)
AB	50	1000	90	90000	3.5	151200	163800	315000
CD		1000	100	100000		168000	182000	350000
EF		850	130	110500		185640	201110	386750
<b>G-Total</b>						<b>504840</b>	<b>546910</b>	<b>1051750</b>

**INFERRED MINERAL RESOURCES (333)**

Section	Floor RL (m)	Sectional area (m <sup>2</sup> )	Length of influence (m)	Volume of ore (cu.m)	Tonnage factor	Ore +10% to -40% Cr <sub>2</sub> O <sub>3</sub> (MT)	+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	Total (MT)
AB	0	1000	90	90000	3.5	151200	163800	315000
CD		1000	100	100000		168000	182000	350000
EF		850	130	110500		185640	201110	386750
<b>G-Total</b>						<b>504840</b>	<b>546910</b>	<b>1051750</b>

**Table – 3.2**

**MINEABLE RESERVE**

**Friable (Band – I)**

**PROVED (111)**

Section	Floor RL (m)	Sectional area (m2)	Length of influence (m)	Volume of ore (cu.m)	Tonnage factor	Ore +10% to -40% Cr <sub>2</sub> O <sub>3</sub> (MT)	+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	Total (MT)
CD	57	280	60	16800	3	17640	32760	50400

**LUMPY (BAND – VI)**

**PROVED (111)**

Section	Floor RL (m)	Sectional area (m2)	Length of influence (m)	Volume of ore (cu.m)	Tonnage factor	Ore +10% to -40% Cr <sub>2</sub> O <sub>3</sub> (MT)	+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	Total (MT)
AB	140	720	90	64800	3.5	108864	117936	226800
CD	122	840	100	84000		141120	152880	294000
EF	134	510	130	66300		111384	120666	232050
<b>G-Total</b>						<b>361368</b>	<b>391482</b>	<b>752850</b>

**FEASIBILITY MINERAL RESOURCES (211)**

*(in tonnes)*

Band I	Band VI	TOTAL
508860	889350	1398210

## CHAPTER – IV

### 4.0 CONCEPTUAL MINING PLAN

For quarry-I (Band-I & II), the floor R.L (57 mRL) and for Quarry-II (Band-VI) the floor R.L (122 mRL) will remain same with respect to the approved scheme of mining.

As per the present estimation, the mineable reserves by opencast mining methods in the area are as follows:

Band No.	Quarry No.	Acceptable Grade +40% Cr <sub>2</sub> O <sub>3</sub> (MT)	Beneficial Grade Actual grade to be +10% to -40% Cr <sub>2</sub> O <sub>3</sub> (MT)	Total
I	Q-1	32760	17640	50400
VI	Q-2	391482	361368	752850
<b>Total</b>		<b>424242</b>	<b>379008</b>	<b>803250</b>

#### **Production from Q1 (Band-I)**

Proposed (2012-13) = 41040 MT  
(Projected for 1<sup>st</sup> year only)

The balance reserve available  
beyond approved scheme period = 50400 - 41040  
will be mined in the sixth year = 9360 MT  
along with Q - 2

#### **Production from Q2 (Band-VI) as per Present Scheme**

Proposed (2012 – 2017) = 451374 MT

The balance reserve available  
beyond approved scheme period = 752850 - 451374  
will sustain for another three = 301476 MT  
year @100,000 MT per year

Hence as suggested in the approved scheme of mining cooperative mining with BAL and TISCO with due permission of DGMS, has to worked out and technology for underground mining of both friable & lumpy bands has to be developed for further continuance of mining operation.

#### 4.1 Final slope angle at the close of mine.

Based on CMRI recommendation regarding overall and final pit slope angle in Quarry-1 (friable) for 38° and 38°/44° for lumpy ore band in Quarry-2, attempts are now being made to get the permission from the statutory authorities to keep the ultimate pit slope as mentioned above. This would definitely increase the quantum of mineable reserves and extend the life of the mine by few more years.

#### 4.2 Ultimate pit limit boundaries

The ultimate pit limit boundaries are projected in plate no. VIII. The ultimate size of the quarry – 1 will be 710m x 305m and of quarry – 2 will be 720m x 305m. The top and bottom RL of the quarry – 1 will be 154m and 57m while that for quarry – 2 will be 280m & 122m respectively.

#### 4.3 Ultimate capacity of dump

Waste projected from Q <sub>1</sub> (2012-13)	= 3,65,445 m <sup>3</sup>
Waste projected from Q-2 (2012-17)	= 39,70,780m <sup>3</sup>
Quantity total of waste in scheme period from Q <sub>1</sub> & Q <sub>2</sub>	= 365445 + 3970780 = 43,36,225 m <sup>3</sup>
Conceptual waste (m <sup>3</sup> ) for next three year by taking stripping ratio 1:8.94	= 2682,000 m <sup>3</sup>
Total waste (m <sup>3</sup> )	= 70,18,225 m <sup>3</sup>
Applying swell factor at 1.2	= 84,21,870 m <sup>3</sup>

There are two existing waste dumps viz Dump-1 between Quarry-1 and Quarry-2 and Dump-2 located in NW part of the lease area. Dump-1 is spread over an area of 8.82 hectares having 3 terraces of 25m, 25m and 15m with a total height of 65m. Bottom RL is 150m and top RL is 215m. The angle of dump slope is 34°. The area of dump-2 is 17.08 hectares with two terraces of 25m each. The bottom RL is 125m and top RL is 175m with dump slope angle of 34°.

It is proposed to backfill the southern side of Quarry-1 in retreating manner after one year i.e. after 2012-13 where the quarriable ore is mined. The area to be covered is around 8.24 hectares from 70m RL to 150m RL.

Dump-1 and proposed backfilling area of Quarry-1 are adjacent to each other (Ref. Plate-VIIA). It is estimated that around 200,000cum of waste shall be backfilled which will come to the floor level of Dump-1 i.e 150m RL. Then dumping of waste will go upto 250m RL with four terraces of 25m each and slope angle at 28°. This will accommodate another 3200000 m<sup>3</sup> of waste materials.

The detail calculation of quantity to be backfilled/dumped is given below.

Terrace	Dimensions in (m) (l x w x h)	R.L (m)	Quantity (m <sup>3</sup> )	Remarks
1	150 x 90 x 20	70 – 90	2,70,000	Backfilling
2	140 x 180 x 20	90 – 110	5,04,000	Backfilling
3	130 x 230 x 20	110 – 130	5,98,000	Backfilling
4	140 x 240 x 20	130 - 150	6,72,000	Backfilling
	<b>Sub Total</b>		<b>20,44,000</b>	
5	150 x 250 x 25	150 – 175	9,37,500	Dumping in Dump-1
6	160 x 240 x 25	175 – 200	9,60,000	- do -
7	160 x 200 x 25 70 x 120 x 10	200 – 225 215 – 225	8,00,000 84,000	- do -
9	140 x 130 x 25	225 - 250	4,55,000	- do -
	<b>Sub Total</b>		<b>32,36,500</b>	
	<b>Grand Total</b>		<b>52,80,500</b>	

#### 4.3.1 Utilization of waste

<u>Total waste (m<sup>3</sup>)</u>	<u>Pattern of utilization</u>	<u>Waste to be utilized (m<sup>3</sup>)</u>
84,21,870	30% haul road maintenance	25,21,161
	Back filling of part quarry – 1 with extension of Dump-1	43,75,047
	To waste dump (Dump – II)	15,25,662

#### 4.4 Reclamation and landuse planning & afforestation.

Owing to constraints for the area for dumping, it has been proposed to dump the waste material over band – II in southern side of Quarry-1 keeping a very safe distance from Band I which will run for another one year with the limitation of open-cast mining. The ore band II beyond the present 78m RL can't also be further mined, as ore above the current threshold value (10% Cr<sub>2</sub>O<sub>3</sub>) has not been intersected in the boreholes and also with the provision of opencast mining (Ref Plate-VIII).

Afforestation will be taken up in the already planted area keeping in view of the survival rate. It is proposed to take up plantation on the matured dumps, haulage road, office sites and colony etc.

#### 4.5 Land use at the conceptual period

##### 4.5.1 Landuse at the time of mine closure.

The land use at the conceptual period is presented here for ready reference.

Landuse	In conceptual period (Hectares)		
	Non-forest	Forest	Total
Area under mining / quarrying	21.650	22.280	43.930
Storage of top soil	0.100	0.000	0.100
Waste dump	25.900	0.000	25.900
Mineral storage	7.160	0.000	7.160
Infrastructure with magazine	1.560	0.000	1.560
Roads	2.669	0.000	2.669
Effluent treatment plant	0.100	0.000	0.100
Mineral separation plant (COBP)	2.17	0.000	2.17
<b>Sub-total</b>	<b>61.309</b>	<b>22.280</b>	<b>83.589</b>
Safety zone	3.600	1.440	5.040
Others (undisturbed)		0.371	
<b>Total</b>		<b>89.000</b>	

## CHAPTER – V

### 5.0 MINING

#### 5.1 Brief description Mining Operation.

- Method of Mining is fully mechanized (FM).
- Working of ore Band I & II are named as Q-1 and working ore band VI is termed as Q-2.
- The ore and overburden is extracted by using HEM machinery. Deep hole drilling and blasting is conducted followed by excavation and loading of ores by high capacity shovels and excavators.
- Hydraulic shovels are used for loading of blasted materials.

#### 5.2 Proposed Mining in quarry-1 During the Scheme Period (2012-13)

##### 5.2.1(a) Mine working during 2012-13 (First year)

R.L of working	-	154 – 57m
AV. height of the bench	-	6m
Slope of the individual bench	-	70 <sup>0</sup>
AV. Slope of the quarry	-	30 <sup>0</sup>
Individual bench floor width	-	10m
Width of the floor	-	45m
Section considered	-	CD
Run of mine (ROM) in MT	-	41040
+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	-	26676
-40% Cr <sub>2</sub> O <sub>3</sub> (MT)	-	14364
Overburden (m <sup>3</sup> )	-	365445
Ore : OB (Ton : Cum)	-	1:8.9

### 5.2.1(b) Mine working during 2012-13 (1<sup>st</sup> Year for Q-2 of Band-VI)

RL of working	284 to 158mRL
Average height of the bench	6m
Slope of the individual bench	70 <sup>0</sup>
Average slope of the quarry	30 <sup>0</sup>
Individual bench floor width	10m
Width of the floor	40
RL of the floor	158 mRL
Section considered for excavation	AB, CD & EF
Number of benches proposed	21
Run of mine (ROM) in MT	56,679
+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	29473
-40% Cr <sub>2</sub> O <sub>3</sub> (MT)	27206
Overburden (m <sup>3</sup> )	905940
Ore : Overburden (MT : m <sup>3</sup> )	1: 15.98

\* From 2<sup>nd</sup> year on wards the mining has been proposed for Q-2 only.

### 5.2.2 Mine working during 2013-14 (2<sup>nd</sup> Year for Q-2, Band-VI)

RL of working	296 to 152mRL
Average height of the bench	6m
Slope of the individual bench	70 <sup>0</sup>
Average slope of the quarry	30 <sup>0</sup>
Individual bench floor width	10m
Width of the floor	45
RL of the floor	152 mRL
Section considered for excavation	AB, CD & EF
Number of benches proposed	24
Run of mine (ROM) in MT	98070
+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	50996
-40% Cr <sub>2</sub> O <sub>3</sub> (MT)	47074
Overburden (m <sup>3</sup> )	655020
Ore : Overburden (MT : m <sup>3</sup> )	1:6.67

### 5.2.3 Mine working during 2014-15 (3<sup>rd</sup> Year for Q-2, Band-VI)

RL of working	296 to 146mRL
Average height of the bench	6m
Slope of the individual bench	70 <sup>0</sup>
Average slope of the quarry	30 <sup>0</sup>
Individual bench floor width	10m
Width of the floor	50
RL of the floor	146 mRL
Section considered for excavation	AB, CD & EF
Number of benches proposed	25
Run of mine (ROM) in MT	98175
+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	51051
-40% Cr <sub>2</sub> O <sub>3</sub> (MT)	47124
Overburden (m <sup>3</sup> )	6.96,820
Ore : Overburden (MT : m <sup>3</sup> )	1:7.09



#### 5.2.4 Mine working during 2015-16 (4<sup>th</sup> Year for Q-2, Band-VI)

RL of working	296 to 146mRL
Average height of the bench	6m
Slope of the individual bench	70 <sup>0</sup>
Average slope of the quarry	30 <sup>0</sup>
Individual bench floor width	10m
Width of the floor	45
RL of the floor	140 mRL
Section considered for excavation	AB, CD & EF
Number of benches proposed	26
Run of mine (ROM) in MT	98700
+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	51324
-40% Cr <sub>2</sub> O <sub>3</sub> (MT)	47376
Overburden (m <sup>3</sup> )	821100
Ore : Overburden (MT : m <sup>3</sup> )	1:8.31

#### 5.2.5 Mine working during 2016-17 (5<sup>th</sup> Year for Q-2, Band-VI)

RL of working	284 to 131mRL
Average height of the bench	6m
Slope of the individual bench	70 <sup>0</sup>
Average slope of the quarry	30 <sup>0</sup>
Individual bench floor width	10m
Width of the floor	50
RL of the floor	131 mRL
Section considered for excavation	AB, CD & EF
Number of benches proposed	26
Run of mine (ROM) in MT	99750
+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	51870
-40% Cr <sub>2</sub> O <sub>3</sub> (MT)	47880
Overburden (m <sup>3</sup> )	8,91,900
Ore : Overburden (MT/m <sup>3</sup> )	1:8.94

#### 5.3 Abstract (Quarry-1) - Band-I.

Products	2012-13 (1 <sup>st</sup> year)
OB (Cu.m)	365445
+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	26676
-40 % Cr <sub>2</sub> O <sub>3</sub> (MT)	14364
Ore (MT) : OB (Cu.m)	1:8.9

### Abstract (Quarry-2) - Band-VI

Products	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>
	2012-13	2013-14	2014-15	2015-16	2016-17
OB (Cu.m)	905940	655020	696820	821100	891900
+40% Cr <sub>2</sub> O <sub>3</sub> (MT)	29473	50996	51051	51324	51870
-40 % Cr <sub>2</sub> O <sub>3</sub> (MT)	27206	47074	47124	47376	47880
Ore (MT) : OB (Cu.m)	1:15.98	1:6.67	1:7.09	1:8.31	1:8.94

## 5.4 Extent of Mechanization

### 5.4.1 Present deployment of machinery:

Sl. No.	Equipment	Numbers
1.	Excavator	3
2.	Wagon drill	2
3.	Dumper	17
4.	Water pump	4
5.	Air compressor	2
6.	Dozer	2
7.	Water tanker	3
8.	Jeep	3
9.	Grader	1

The detail existing machineries with no. capacity, make etc. is enclosed (Ref. Annexure-20)

### 5.4.2 Requirement of machinery in scheme period

#### 5.4.2.1 Dozing

One bulldozer of 275 HP shall be utilized for construction, leveling and compaction of haul road and waste dump. The same shall be continued in the scheme period.

### 5.4.2.2 Drilling

<b>Specification of wagon drill</b>		
Diameter of wagon drill	:	100 mm
Air consumption	:	7.5 CuM/min
Pressure supplied up to	:	10.5 kg f/sq.cm.
<b>Drilling parameters</b>		
Dia. Of blast hole (D)	:	100 mm
Height of the bench	:	6 m
Additional drilling required (sub grade)	:	1 m
Length of the hole (H)	:	7 m
Burden (B)	:	3 m
Spacing (S)	:	3.5 m
Volume of earth to be broken/loosen per hole		$B \times S \times H = 3 \times 3.5 \times 7 = 73.5 \text{ CuM}$
<b>Meterage of drilling per drill (wagon drill) for primary blasting in ore zone</b>		
Total volume of material to be excavated (Max : in a year of scheme period)	:	4,47,825 m <sup>2</sup> (Q – 1) 9,34,440 m <sup>3</sup> (Q – 2)
Max. requirement of drilling for only 30% of the total volume of quarry – 1 and 70% of quarry – 2	:	1,34,347 (Q – 1) 6,54,108 (Q – 2)
Number of holes to be drilled	:	$7,88,455 \div 73.5 = 10727$ numbers.
Number of holes to be drilled per day of 300 days in a year	:	$10727 \div 300 = 35.75$ or 36 numbers
Total meterage of drilling per day (length of blast hole = 7m)	:	$36 \times 7 = 252$
<b>Requirement of drills</b>		
Speed of the wagon drill	:	6 m / hr
Effective drilling hr/two shifts (8 hrs shift of which effective working hrs = 6hrs / shift)	:	12hrs
Meterage of drilling to be effected / day	:	$6 \times 12 = 72 \text{ m}$
Number of drills required	:	$252 \div 72 = 3.5$ or 4 numbers
Keeping a wagon drill as stand by to overcome breakdown	:	1 numbers
Total requirement of wagon drills	:	$4 + 1 = 5$ numbers

### 5.4.2.3 Requirement of air compressors

Number of wagon drills will be in operation	:	5 numbers
Dia of each wagon drill	:	100 mm
One 100 mm dia wagon drill requires compressed air	:	7.5 CuM / min
So, 5 wagon drills shall require air compressor of	:	37.5 CuM / min
Compressor unit required	:	5 numbers

#### 5.4.2.4 Excavators required to be deployed in the scheme period

<b>Specification of excavators</b>		
Bucket capacity (C)	:	2.1 Cum
Bucket fill factor (F)	:	0.9
Time cycle pass at 90 <sup>0</sup> swing (T)	:	32 sec
Swell factor (S)	:	0.8
Production efficiency factor (e)	:	0.7
Job management factor (f)	:	0.9
<b>Time scheduling</b>		
Working days per year	:	300 days
Number of working shifts per day	:	2 shifts
Working hours per shift	:	8hrs
Effective working hours per shift	:	6 hrs
Effective working hours per tow shift	:	12 hrs
Seconds in hour	:	3600 sec
Output/2.1 CuM shovel/annum	:	$[C \times F \times S \times e \times f \times 3600 \times 12 \times 300] - T = [2.1 \times 0.9 \times 0.8 \times 0.7 \times 0.9 \times 3600 \times 12 \times 300] \div 32 = 385786.8$ or 385787 CuM in 2 shifts.
<b>Number of excavators required</b>		
Maximum excavation in a year of scheme period	:	1382265 CuM
Total excavation by one 2.1 CuM shovel per annum	:	385787 CuM
Requirement of shovel	:	$1382265 \div 385787 = 3.58$ or 4 numbers

#### 5.4.2.5 Transportation

Overburden shall be generated during the proposed period of mining scheme for ore production. Calculation of Tippers for transportation of ore and overburden to their respective sites are based on 1.5 km hauling distance from either of the quarries within the leasehold area.

### Loading time

Capacity of the Tipper (25 tonnes)	=	9 CuM loose materials
Rate of production of 2.1 CuM shovel per day	=	$385787 \text{ CuM} \div 300 = 1285.95$ or 1286 CuM
Number of passes required for one tipper attached to 2.1 cu.m shovel	=	Tipper capacity $\div [C \times F \times S] = 9 \div [2.1 \times 0.9 \times 0.8] = 5.95$ or 6 passes
Hauling time for waste dump yard and ore stack yard	=	Average haul length to be covered by the loaded Tipper (1.5 km) $\div$ Average speed of Tipper (15 kmph) = 6 min
Return time	=	Average speed of Tipper (empty) to be covered by empty Tipper (1.5 km) $\div$ Average speed of Tipper (25 kmph) = 3.6 or 4 min
Tipper cycle time (waste dump yard and ore stack yard) = Loading time + hauling time + unloading time + return time + spotting time and waiting time	=	$6 + 6 + 2 + 4 + 3 = 21$
Working time per Tipper per day	=	12 hrs
Number of trips per Tipper per day	=	$(12 \times 60) \div 21 = 34.28$ or 34
Volume per day per Tipper	=	$34 \times 9 = 306 \text{ CuM}$
Tipper requirement (attached to 2.1 CuM shovel)	=	$1286 \div 306 = 4.20$ or 4
4 (four) 2.1 CuM shovels shall require	=	$4 \times 4 = 16$ numbers of 25 tonne Tippers
Keeping 2 stand by 25 tonne Tipper to overcome break down	=	$16 + 2 = 18$ numbers

### 5.4.3 List of machinery proposed in scheme period

Sl. No.	Equipment	Number required
1	Excavator	1
23	Wagon Drill	3
3	Dumber	1
4	Water pump	4
5	Air compressor	3
6	Dozer	2
7	Water tanker	1
8	Jeep	1

**Table - 5.1**  
**OVERBURDEN REMOVAL SCHEDULE**  
Quarry – 1 (Band – 1)

Year	Bench Floor Level (m)	Section Referred	Cross Sectional area (m <sup>2</sup> )	Average Length of influence (m)	Volume of overburden (m <sup>3</sup> )
1 <sup>st</sup>	137	CD	40	140	5,600
	131	CD	225	140	31500
	125	CD	210	140	29400
	119	CD	198	140	27720
	113	CD	162	140	22680
	107	CD	180	140	25200
	101	CD	180	140	25200
	95	CD	216	140	30240
	89	CD	162	140	22680
	83	CD	174	140	23800
	77	CD	162	140	22680
	71	CD	150	140	21000
	65	CD	180	140	25200
	57	CD	48	140	6720
	57 (Ramp)	CD	1527.5	30	45825
<b>G-Total</b>					<b>365,445</b>

**OVERBURDEN REMOVAL SCHEDULE (Q-2, Band-VI)**

Year	Bench Level (mRL)	Section Considered	C/S area (m <sup>2</sup> )	Av. Length of influence (m)	Volume of OB (m <sup>3</sup> )
1 <sup>st</sup>	284	EF	36	90	3240
	278	EF	60	90	5400
	272	EF	72	90	6480
	266	EF	120	90	10800
	260	EF	150	90	13500
	260	CD	42	100	4200
	254	EF	90	90	8100
	254	CD	60	100	6000
	248	EF	102	90	9180
	248	CD	114	100	11400
	242	EF	150	90	13500
	242	CD	120	100	12000
	236	EF	132	90	11880
	236	CD	144	100	14400
	230	EF	102	90	9180
	230	CD	180	100	18000
	230	AB	48	90	4320
	224	EF	144	90	12960
	224	CD	180	100	18000
	224	AB	78	90	7020
	218	EF	180	90	16200
	218	CD	210	100	21000
	218	AB	108	100	10800
	212	EF	240	90	21600
	212	CD	90	100	9000
	212	AB	206	90	18540
	206	EF	216	90	19440
	206	CD	264	100	26400
	206	AB	120	90	10800
	200	EF	240	90	21600
	200	CD	300	100	30000
	200	AB	138	90	12420
	194	EF	240	90	21600
	194	CD	300	100	30000
	194	AB	150	90	13500
	188	EF	300	90	27000
	188	CD	330	100	33000
	188	AB	180	90	16200
	182	EF	100	90	9000
	182	CD	342	100	34200
	182	AB	240	90	21600
	176	EF	240	90	21600
176	CD	342	100	34200	
176	AB	252	90	22680	
170	EF	450	90	40500	
170	CD	378	100	37800	
170	AB	270	90	24300	
164	EF	390	90	35100	
164	CD	360	100	36000	
158	EF	150	90	13500	
158	CD	168	100	16800	
	<b>Grand Total</b>				<b>905940</b>

Year	Bench Level (mRL)	Section Considered	C/S area (m <sup>2</sup> )	Av. Length of influence (m)	Volume of OB (m <sup>3</sup> )
2 <sup>nd</sup>	296	EF	60	90	5400
	290	EF	60	90	5400
	284	EF	60	90	5400
	278	EF	60	90	5400
	272	EF	60	90	5400
	272	CD	84	100	8400
	266	EF	60	90	5400
	266	CD	60	100	6000
	260	EF	60	90	5400
	260	CD	60	100	6000
	254	EF	60	90	5400
	254	CD	60	100	6000
	248	EF	60	90	5400
	248	CD	60	100	6000
	242	EF	60	90	5400
	242	CD	60	100	6000
	236	EF	60	90	5400
	236	AB	40	90	3600
	236	CD	60	100	6000
	230	EF	60	90	5400
	230	CD	60	100	6000
	230	AB	60	90	5400
	224	EF	60	90	5400
	224	CD	60	100	6000
	224	AB	60	90	5400
	218	EF	60	90	5400
	218	CD	60	100	6000
	218	AB	60	90	5400
	212	EF	60	90	5400
	212	CD	60	100	6000
	212	AB	60	90	5400
	206	EF	60	90	5400
	206	CD	60	100	6000
	206	AB	60	90	5400
	200	EF	60	90	5400
	200	CD	60	100	6000
	200	AB	60	90	5400
	194	EF	60	90	5400
	194	CD	60	100	6000
	194	AB	60	90	5400
	188	EF	60	90	5400
	188	CD	60	100	6000
	188	AB	60	90	5400
	182	EF	60	90	5400
	182	CD	60	100	6000
	182	AB	60	90	5400
	176	EF	720	90	64800
	176	CD	60	100	6000
176	AB	60	90	5400	
170	EF	720	90	64800	
170	CD	60	100	6000	
170	AB	60	90	5400	
164	EF	720	90	64800	
164	CD	60	100	6000	
164	AB	360	90	32400	
158	EF	158	90	14220	
158	CD	120	100	12000	
158	AB	300	90	27000	
152	EF	720	90	64800	
152	CD	120	100	12000	
152	AB	108	100	10800	
<b>Grand Total</b>					<b>6,55,020</b>



Year	Bench Level (mRL)	Section Considered	C/S area (m <sup>2</sup> )	Av. Length of influence (m)	Volume of OB (m <sup>3</sup> )
3 <sup>rd</sup>	296	EF	60	90	5400
	290	EF	60	90	5400
	284	EF	60	90	5400
	278	EF	60	90	5400
	272	EF	60	90	5400
	272	CD	34	100	3400
	266	EF	60	90	5400
	266	CD	60	100	6000
	260	EF	60	90	5400
	260	CD	60	100	6000
	254	EF	60	90	5400
	254	CD	60	100	6000
	248	EF	60	90	5400
	248	CD	60	100	6000
	242	EF	60	90	5400
	242	CD	60	100	6000
	236	EF	60	90	5400
	236	AB	40	90	3600
	236	CD	60	100	6000
	230	EF	60	90	5400
	230	CD	60	100	6000
	230	AB	60	90	5400
	224	EF	60	90	5400
	224	CD	60	100	6000
	224	AB	60	90	5400
	218	EF	60	90	5400
	218	CD	60	100	6000
	218	AB	60	90	5400
	212	EF	60	90	5400
	212	CD	60	100	6000
	212	AB	60	90	5400
	206	EF	60	90	5400
	206	CD	60	100	6000
	206	AB	60	90	5400
	200	EF	60	90	5400
	200	CD	60	100	6000
	200	AB	60	90	5400
	194	EF	60	90	5400
	194	CD	60	100	6000
	194	AB	60	90	5400
	188	EF	60	90	5400
	188	CD	60	100	6000
	188	AB	60	90	5400
	182	EF	60	90	5400
	182	CD	60	100	6000
	182	AB	60	90	5400
176	EF	720	90	5400	
176	CD	60	100	6000	
176	AB	60	90	5400	
170	EF	720	90	64800	
170	CD	60	100	6000	
170	AB	60	90	5400	
164	EF	720	90	64800	
164	CD	60	100	6000	
164	AB	60	90	5400	
158	EF	720	90	64800	
158	CD	120	100	12000	
158	AB	60	90	5400	
152	EF	720	90	64800	
152	CD	120	100	12000	
152	AB	228	90	20520	
146	EF	150	90	13500	
146	CD	120	100	12000	
146	AB	96	100	9600	
<b>Grand Total</b>					696820

Year	Bench Level (mRL)	Section Considered	C/S area (m <sup>2</sup> )	Av. Length of influence (m)	Volume of OB (m <sup>3</sup> )
4 <sup>th</sup>	296	EF	60	90	5400
	290	EF	60	90	5400
	284	EF	60	90	5400
	278	EF	60	90	5400
	272	EF	60	90	5400
	272	CD	90	100	9000
	266	EF	60	90	5400
	266	CD	60	100	6000
	260	EF	60	90	5400
	260	CD	60	100	6000
	254	EF	60	90	5400
	254	CD	60	100	6000
	248	EF	60	90	5400
	248	CD	60	100	6000
	242	EF	60	90	5400
	242	CD	60	100	6000
	236	EF	60	90	5400
	236	AB	60	90	5400
	236	CD	60	100	6000
	230	EF	60	90	5400
	230	CD	60	100	6000
	230	AB	60	90	5400
	224	EF	60	90	5400
	224	CD	60	100	6000
	224	AB	60	90	5400
	218	EF	60	90	5400
	218	CD	60	100	6000
	218	AB	60	90	5400
	212	EF	60	90	5400
	212	CD	60	100	6000
	212	AB	60	90	5400
	206	EF	60	90	5400
	206	CD	60	100	6000
	206	AB	60	90	5400
	200	EF	60	90	5400
	200	CD	60	100	6000
	200	AB	60	90	5400
	194	EF	60	90	5400
	194	CD	60	100	6000
	194	AB	60	90	5400
	188	EF	60	90	5400
	188	CD	60	100	6000
	188	AB	60	90	5400
	206	EF	60	90	5400
	206	CD	60	100	6000
	206	AB	60	90	5400
	200	EF	60	90	5400
	200	CD	60	100	6000
	200	AB	60	90	5400
	194	EF	60	90	5400
194	CD	60	100	6000	
194	AB	60	90	5400	
188	EF	60	90	5400	
188	CD	60	100	6000	
188	AB	60	90	5400	
182	EF	60	90	5400	
182	CD	60	100	6000	
182	AB	60	90	5400	
176	EF	720	90	64800	
176	CD	60	100	6000	
176	AB	60	90	5400	
170	EF	720	90	64800	
170	CD	60	100	6000	
170	AB	60	90	5400	
164	EF	720	90	64800	
164	CD	60	100	6000	
164	AB	60	90	5400	
158	EF	720	90	64800	
158	CD	120	100	12000	
158	AB	60	90	5400	
152	EF	720	90	64800	
152	CD	120	100	12000	
152	AB	60	90	5400	
146	EF	720	90	64800	
146	CD	120	100	12000	
146	AB	150	90	13500	
140	EF	720	90	64800	
140	CD	120	100	12000	
<b>Grand Total</b>					<b>821100</b>

Year	Bench Level (mRL)	Section Considered	C/S area (m2)	Av. Length of influence (m)	Volume of OB (m3)
5 <sup>th</sup>	284	EF	50	90	5400
	278	EF	60	90	5400
	272	EF	60	90	5400
	272	CD	90	100	9000
	266	EF	60	90	5400
	266	CD	60	100	6000
	260	EF	60	90	5400
	260	CD	60	100	6000
	254	EF	60	90	5400
	254	CD	60	100	6000
	248	EF	60	90	5400
	248	CD	60	100	6000
	242	EF	60	90	5400
	242	CD	60	100	6000
	236	EF	60	90	5400
	236	AB	60	90	5400
	236	CD	60	100	6000
	230	EF	60	90	5400
	230	CD	60	100	6000
	230	AB	60	90	5400
	224	EF	60	90	5400
	224	CD	60	100	6000
	224	AB	60	90	5400
	218	EF	60	90	5400
	218	CD	60	100	6000
	218	AB	60	90	5400
	212	EF	60	90	5400
	212	CD	60	100	6000
	212	AB	60	90	5400
	206	EF	60	90	5400
	206	CD	60	100	6000
	206	AB	60	90	5400
	200	EF	60	90	5400
	200	CD	60	100	6000
	200	AB	60	90	5400
	194	EF	60	90	5400
	194	CD	60	100	6000
	194	AB	60	90	5400
	188	EF	60	90	5400
	188	CD	60	100	6000
	188	AB	60	90	5400
	182	EF	60	90	5400
	182	CD	60	100	6000
	182	AB	60	90	5400
	176	EF	720	90	64800
	176	CD	60	100	6000
	176	AB	60	90	5400
	170	EF	720	90	64800
	170	CD	60	100	6000
	170	AB	60	90	5400
164	EF	720	90	64800	
164	CD	60	100	6000	
164	AB	60	90	5400	
158	EF	720	90	64800	
158	CD	120	100	12000	
158	AB	60	90	5400	
152	EF	720	90	64800	
152	CD	120	100	12000	
152	AB	60	90	5400	
146	EF	720	90	64800	
146	CD	120	100	12000	
146	AB	150	90	13500	
140	EF	720	90	64800	
140	CD	120	100	12000	
134	EF	720	90	64800	
134	CD	120	100	12000	
131	CD	60	80	4800	
<b>Grand Total</b>					891900

**Table – 5.2**

**YEARWISE PRODUCTION SCHEDULE**

Year/Quarry		Bench Floor RL (m)	Section considered	Sectional area (m <sup>2</sup> )	Length of influence (m)	Volume of ore (All grades) (m <sup>2</sup> )	Quantity of ore (at 3.5t/m <sup>3</sup> )* (3.0 t/m <sup>3</sup> )
1 <sup>st</sup>	(2012- 13) Quarry - 1	57	GH	304	45	13680	41,040
1 <sup>st</sup>	(2012- 13) Quarry - 2	158	CD	102	97	9894	34,629
		158	EF	90	70	6300	22,050
<b>Total</b>							<b>97,719</b>
2 <sup>nd</sup>	(2013-14) Quarry - 2	152	CD	120	100	12000	42,000
		152	EF	90	98	8820	30,870
		152	AB	120	60	7200	25,200
<b>Total</b>							<b>98,070</b>
3 <sup>rd</sup>	(2014-15) Quarry - 2	146	AB	120	70	8400	29,400
		146	CD	120	100	12000	42,000
		146	EF	102	75	7650	26,775
<b>Total</b>							<b>98,175</b>
4 <sup>th</sup>	(2015-16) Quarry - 2	140	AB	120	70	8400	29,400
		140	CD	120	100	12000	42,000
		140	EF	120	65	7800	27,300
<b>Total</b>							<b>98,700</b>
5 <sup>th</sup>	(2016-17) Quarry - 2	134	AB	120	40	4800	16,800
		134	CD	120	100	12000	42,000
		131	CD	60	75	4500	15,750
		134	EF	120	60	7200	25,200
<b>Total</b>							<b>99,750</b>

\* Tonnage conversion factor for Band I – 3.0 and 3.5 for Band – VI.

## CHAPTER – VI

### 6.0 HANDLING OF WASTE / SUB-GRADE MATERIAL

The waste materials which are being generated in the working Quarry-1 and Quarry-2 mainly comprises of lateritic soil, sandy soil with quartzite and chromiferous laterite which is limited. Below the top layer, huge amount of limonite and serpentine is being excavated and removed as wall rocks in Quarry-1 while weathered serpentinite and quartzite will be removed as overburden in Quarry-2.

#### 6.1 Rate of yearly generation of wastes and proposal of waste for next Five Years (2012-12 to 2016-17).

The rate of yearly generation of waste and overburden to be excavated in the next five year scheme period from Q-1 and Q-2 are given below:

Year	Overburden from Q-1 (m3)	Overburden from Q-2 (m3)	Total (m3)
1 <sup>st</sup> 2012-13	365445	905940	1271385
2 <sup>nd</sup> 2013-14	---	655020	655020
3 <sup>rd</sup> 2014-15	---	696820	696820
4 <sup>th</sup> 2015-16	---	821100	821100
5 <sup>th</sup> 2016-17	---	891900	891900
<b>Total :</b>	<b>365445</b>	<b>3970780</b>	<b>4336225</b>

**6.1.1** There are two existing waste dumps viz Dump-1 between Quarry-1 and Quarry-2 and Dump-2 located in NW part of the lease area. Dump-1 is spread and over an area of 8.82 hectares having 3 terraces of 25m, 25m and 15m with a total height of 65m. Bottom RL is 150m and top RL is 215m. The angle of dump slope is 34°. The area of dump-2 is 17.08 hectares with two terraces of 25m each. The bottom RL is 125m and top RL is 175m with dump slope angle of 34°.

It is proposed to backfill the southern side of Quarry-1 in retreating manner after one year i.e. is after 2012-13 where the quarriable ore is mined. The area to be covered is around 8.24 hectares from 70m RL to 150m RL. The waste materials to be generated during the next five years of scheme period will be dumped in dump-2, for back filling in mined out area Q-1 and for road maintenance. The waste material to be generated during 1<sup>st</sup> year will be dumped in Dump-2 in two terraces i.e 125mRL to 150mRL and 150mRL to 175mRL.

**The pattern of utilization of overburden are as follows :**

Total OB generation (insitu)	-	4336225 m <sup>3</sup>
Broken volume	-	5203470 m <sup>3</sup>
Maintenance (haul road)	-	1561041 m <sup>3</sup>
Backfilling in part of Q-1 (Ref. Plate VII)	-	2116767 m <sup>3</sup>
Balance waste for dumping (Dump - 2)	-	1525662 m <sup>3</sup>

The protective measures have been discussed in para 9.3.3.

**6.2 Rate of yearly generation of sub-grade ore with reference to threshold value and proposal for its stacking :**

The ore having +40 Cr<sub>2</sub>O<sub>3</sub> is considered as acceptable grade and the ore having -40 Cr<sub>2</sub>O<sub>3</sub> upto 10% Cr<sub>2</sub>O<sub>3</sub> is clubbed under beneficiable grade. Hence there will be as such no generation of sub-grade. This beneficiable ore will be subsequently upgraded in the existing and proposed COBP in the M.L area.

The accumulated quantity of ore (+10% -40% Cr<sub>2</sub>O<sub>3</sub>) of 133477.27MT and tailing of COB (17% to 18% Cr<sub>2</sub>O<sub>3</sub>) of 275781MT is presently stacked in the M.L area.

## CHAPTER -7

### 7.0 USE OF MINERALS

#### 7.1 Changes proposed in the use of mineral if any, with reason

The ore produced from the mines are of two categories based on their physical properties. The ore produced from Quarry-1 are friable in nature and ferruginous. The ore produced from Quarry-2 are lumpy, hard and siliceous. The chemical analysis is given in Annexure-15.

The chrome ore produced from the mine is being consumed by the ferro chrome plants of the lessee at Kothavalasa of Andhra Pradesh, Hissar of Haryana and its sister company M/s Jindal Steel & Power Ltd's plant at Raigarh (Chhattishgarh). Since these plants require high grade ore having around 46% – 48%  $\text{Cr}_2\text{O}_3$ , the acceptable ore (+40%  $\text{Cr}_2\text{O}_3$ ) after proper blending is sent to these plants while the beneficiable grade ore (-40%  $\text{Cr}_2\text{O}_3$ ) is stacked separately. A chrome ore beneficiation plant (COBP) is in existence within the leasehold area which is designed to process 10-12 tonnes of beneficiable grade ore (having 30-35%  $\text{Cr}_2\text{O}_3$ ) per hour i.e 6800 tonnes per month to produce around 2600 tonnes of concentrate at around 38% yield of mineral.

**7.2 Changes in the specifications, if any imposed by the user industries :**

The ore is being mined for captive purpose only.

**7.3 Efforts made for utilization of the beneficiable grade mineral including fines**

Further modification was being carried out in the existing COB as per the proposal given in the scheme of mining & also in the mineral beneficiation. The existing COB after modification

Feed grade	:	30 to 32% Cr <sub>2</sub> O <sub>3</sub>
Feed rate	:	13 tph
Concentrate Grade	:	48 – 49%
Yield	:	41%
Production capacity	:	3500 MT



## CHAPTER - 8

### 8.0 MINERAL BENEFICATION:

#### 8.1 Results of Beneficiation Investigations.

Mining operations of Jindal Chromite Mines started in the year 2002. It was observed that the production of low grade ore i.e 30 – 34% Cr<sub>2</sub>O<sub>3</sub> was very high.

In order to make the ore usable for ferrochrome plant consumption, it was decided to install one 10 tph throughput plant for beneficiation by enriching the ore to 47 – 48% Cr<sub>2</sub>O<sub>3</sub> having Cr : Fe 1.8 to 2.0. Accordingly one plant was constructed and commissioned during February 2003. Therefore it was decided to increase the capacity of the plant to 15-16 tph. This modification was done during the year 2004 and the concentrate production capacity was enhanced from 30,000 tones to 40000 tone per annum.

Later on due to non-availability of the above grade feed, 28% Cr<sub>2</sub>O<sub>3</sub> ore was fed to the COB plant resulting low recovery of the product with comparatively lower quality. To overcome the problem IMMT (RRL) Bhubaneswar was requested to study the problem and find out a solution. With the recommendation of RRL the plant production was optimized at 41% yield, production of concentrate having 46 – 47% Cr<sub>2</sub>O<sub>3</sub> and plant production capacity was maintained at 36000 tonnes per annum.

#### 8.2 Beneficiation tests on sub-grade minerals/tailings.

In the meantime the quality of low grade ore in the mine was further deteriorated and the Cr<sub>2</sub>O<sub>3</sub> analyzed 16 -18% which could not be processed in the plant. It was as good as the tailing quality. To over come

this problem IMMT (RRL) Bhubaneswar was approached to conduct a feasibility test for recovering the Chrome values from the sub-grade ore as well as the tailings and encouraging results were obtained. Immediately IMMT, Bhubaneswar was entrusted to prepare DPR for setting up an additional facility for recovering the chrome values.

IMMT suggested for some modification in the beneficiation plant to add one new circuit for processing the sub-grade ore with a facility for froth flotation. The proposal was for a feed capacity of 20 tph, for both the materials i.e sub-grade ore and the tailings. But both the materials shall be processed separately in the same plant. The plant shall be operated in all the three shifts and is expected to process 1,28,000 tonnes per annum and can produce 25600 tonnes of chrome ore concentrate having 46 – 47% Cr<sub>2</sub>O<sub>3</sub> with Cr : Fe 1.8.

Keeping the above up-gradation into account for both sub-grade & tailing the lessee has proposed to install another COBP with a capacity 24,000 MT/year adjacent to existing one.

### **Details of COBP**

The detail flow sheet of COB Plant for sub-grade & tailing is indicated in annexure-2. The gist of COBP for sub-grade & tailing are given below :

In this plant the sub-grade & tailing will be fed separately with the following data.

Feed grade	:	Having Cr <sub>2</sub> O <sub>3</sub> 18-19%
Feed rate	:	20 tph
Concentrate Production	:	4 tph (Approx.)
Concentrate Grade	:	46 – 47% Cr <sub>2</sub> O <sub>3</sub>
Yield	:	20%

When tailing will be processed it will be divided in two Ckt. i.e. tabling and flotation ckt. From flotation ckt the production will be around 1.2 tph and from tabling the production will be around 2.8 tph with a total production of 4 tph. The data will be as follows :

Feed grade	:	Tailing having $\text{Cr}_2\text{O}_3$ 17-18%
Feed rate	:	20 tph
Concentrate Production	:	4 tph
Concentrate Grade	:	46 – 47%

After processing of low grade ore 52% of the material is recovered and balance 48% (below 10%  $\text{Cr}_2\text{O}_3$ ) will be dumped in the earmarked area in Dump-2.

The process flow sheet with material balance chart indicating the grade of tailing prepared by IMMT is enclosed (Ref. Annexure-2).

#### **Details of tailing pond and its protective measures.**

The existing COBP-1 tailing pond (105M x 15M x 3.2M) will hold approximately 12000 MT of tailing where as the monthly tailing generation is 4500MT. The proposed two tailing ponds of size 75M x 23M x 3.2M and 75M x 20M x 3.2M having tailing holding capacity 11000 MT and 10000MT respectively against monthly tailing generation 8000MT in proposed COBP-II. Since both the tailing ponds will be alternatively used, each being used for one month and cleaned in the following month, tailing holding capacity will be adequate. The sides of the tailing pond have been raised by 0.50m by putting embankment on all sides so that no rain water can come in. It is planned to raise the embankment by another 0.50m so as to get a free board of 1m.

## CHAPTER – 9

### 9.0 ENVIRONMENTAL MANAGEMENT PLAN

For safe and secure management of prevailing environment condition of M.L area, quarterly monitoring of air, water, noise and treatment of effluent mine water have been carried out on regular basis. The environment monitoring data of last quarter is enclosed vide annexure-4 with location details. The location of air, water, noise monitoring stations are indicated in Environment management plan (Plate-VII) and key plan (Plate-V).

The monitoring schedule with frequency of monitoring are given below.

Environmental Domain	Parameter	Frequency
Air	SPM, RPM, So <sub>2</sub> and NoX	Quarterly twice (continuously for 48 hours) in 4 locations.
Water	As per CPCB Guide line	2 samples from ground water 2 from surface water source in a quarter.
Noise	Level	24 hours in a quarter in 4 locations.

The different parameters of air, noise and water quality are within permissible limits.

### 9.1 Top-soil storage Preservation & Utilisation.

#### 9.1.1 Proposal as per Approved Scheme of Mining.

No topsoil will be generated during the scheme period. However there was a proposal for stacking of topsoil for future use, in case any negligible quantity of topsoil is found will be stacked separately and will be utilized for plantation purpose as and when required.

#### 9.1.2 Position At The End of 5 Years of Scheme of Mining.

During the mining scheme period, negligible amount of top-soil was generated & same has been utilized for afforestation.

### **9.1.3 Proposal For The Next 5 Year Scheme period.**

During the balance scheme of mining period, mining will be done mostly depth wise. Southern side of the quarry-2 & northern side of Q-1 does not have any fertile soil cover.

## **9.2 Land reclamation & rehabilitation**

### **9.2.1 Proposal as per Approved Scheme of Mining**

The ore deposits are not going to be exhausted. Though opencast mining may not continue beyond certain depth, the technology for under ground mining has to be developed and then the proposal for reclamation and rehabilitation can be worked out based on the technology of under ground mining. Upper four benches of north side will be rehabilitated by digging pits, spreading soil and planting suitable trees all through during the close part of opencast mining i.e after 4<sup>th</sup> year of scheme period. Similarly lower benches shall be planted all along in subsequent years.

### **9.2.2 Position At The End of 5 Years of Scheme of Mining.**

As the ore deposits are not exhausted, the question of land reclamation and rehabilitation does not arise.

### **9.2.3 Proposal For The Next 5 Year Scheme period.**

Proposal for reclamation & rehabilitation as listed in para 9.2.1 will be implemented keeping in view the technology for underground mining. Further owing to the constraints of dumping site, it has been proposed to backfill part of Q-1 over band-II, in footwall side of Q-1 (as there is no ore available for opencast mining) with the waste generated during the scheme of mining for the next five year. (Ref. Para 6.1.1 and Plate no. VII-A)

### **9.3 Waste Dump Management.**

#### **9.3.1 Proposal As Per Approved Scheme of Mining.**

The dumping of waste materials have been proposed on the earmarked dumping grounds i.e. Dump-1 between quarry-1 & 2 and dump-2 on the NW corner of the lease near COB plant. The boulder wall with garland drain and check dam will be maintained during the next five year scheme period. Plantation along the inactive dump slopes will be continued for stabilization of the dump slopes. The haul road towards south western side of the lease boundary as well as the existing waste dump on north side shall be stabilized during next years through plantation along the slopes below 100 mRL.

#### **9.3.2 Position At The End of 5 Years Scheme of Mining.**

Volume of waste generated from the lease area during last five years was utilized for haul road maintenance (30%) and balance waste materials had been dumped over the earmarked dumping ground i.e dump-1 (for Q-2) which is now fully stabilized.

#### **9.3.3 Proposal for the Next 5 Years Scheme Period.**

Likely generation of waste during ensuing five (5) years will be of the order of 43,36,225 m<sup>3</sup>. The total broken waste will be 52,03,470m<sup>3</sup>. Out of the two dumps Dump-1 (between Q-1 and Q-2) has been already stabilized. Out of the 52,03,470m<sup>3</sup> overburden, 15,25,662m<sup>3</sup> will be dumped on the existing dump in NW side (dump-2) near COB plant, 15,61,041m<sup>3</sup> and 21,16,767m<sup>3</sup> will be used for road making and backfilling in the part of Q-1 respectively. The following protection measures are proposed for the dumps for safeguarding the environment :

- Regular compaction of active dumped top spaces for controlling erosion during rain & wind.
- Overall slope angle will be maintained at 28° with the horizontal.
- Development of terraces along the dump slopes to control erosion and slope failure.
- Erection of check dam and development of garland drain & settling tank along the periphery of the dump toe for controlling the wash-offs.
- Garland drain will be developed around the waste dump which will be connected to settling tank to treat the hexavalent chromium, if available, by pumping to ETP.

#### **9.4 Afforestation Programme with Precautions Proposed for Survival and Protection of Plantation.**

##### **9.4.1 Proposal As Per Approved Scheme of Mining.**

A total of 10,000 nos. of trees were proposed to be planted in the lease area at the rate of 2000 trees per annum.

##### **9.4.2 Position At The End of 5 Years of Scheme of Mining**

An area of 5.85 hectares have been planted by 10,000 nos saplings on the waste dump slope / terraces and haul roads.

##### **9.4.3 Proposal For The Next 5 Year Scheme Period.**

A plantation schedule comprising of 9600 no. of saplings have been proposed to be planted over an area of 6.0 hectares during the next scheme period. The saplings under plantation will be of local varieties.

## **9.5 Quality of Air .**

### **9.5.1 Proposal As Per Approved Mining Scheme.**

Proper maintenance of road surface by spraying of water periodically and plantation were proposed to minimize air pollution. Quarterly monitoring of air quality for parameters like SPM, NO<sub>x</sub>, CO, SO<sub>2</sub> etc. was also envisaged.

### **9.5.2 Position at the End of 5 Years of Scheme of Mining.**

Quarterly monitoring of air quality for parameters like SPM, NO<sub>x</sub>, CO, SO<sub>2</sub> etc is being carried out. The monitoring data is enclosed vide Annexure – 4.

### **9.5.3 Proposal For The Next 5 Year Scheme Period.**

Air, water and noise monitoring is proposed to be continued once in a season. The top surface of the haul road is proposed to be wetted by water spraying. Plantation schedule has already been given (Ref. Para – 9.4.3).

## **9.6 Quality & make of water including surface and ground water .**

### **9.6.1 Proposal As Per Approved Scheme of Mining.**

Surface run off around the mine in the rainy season is allowed to divert to natural drainage system by constructing garland drains. The entire surface run off of the mine, stack yard, and other parts of the lease is diverted to a settling tank through garland drains and this water is pumped to the existing ETP for treatment for keeping the hexavalent chromium within permissible limit. Flow of loose sediments from the waste dump would be restricted by constructing a check dam.



### **9.6.2 Position At The End of 5 Years of Scheme of Mining.**

As per the proposals, the garland drains have been made and the entire surface run off as well as mine water is diverted to the settling tank from where the water is pumped to the ETP for treatment. Part of the pumped out water is used in the COB plant. The water after proper treatment is being utilized for sprinkling on the road, plantation etc inside the lease area. As per the data submitted to IBM for the month of Dec'11, the input and out put quantity for hexavalent. Chromium from the mine water is as follows :

- Mine drainage water from pit – 0.245Mg/Ltr (Cr6+)
- Out let water of ETP – 0.035Mg/Ltr (Cr6+)

### **9.6.3 Proposal For The Next 5 Year Scheme Period.**

Garland drain with settling tanks have been developed around the waste dump to control the wash offs which may pollute the surface water. However, monitoring & analysis of surface as well as ground water will be done once in a season which is practiced at present.

## **9.7 Noise level and Vibration**

### **9.7.1 Proposal as Per Approved Scheme of Mining.**

To reduce the noise level in the M.L area, use of muffle blasting to reduce the fly rock, provision of delay detonators and plantation schemes were proposed which would help to keep the noise level within permissible limit of 90 DB. Six monitoring stations were proposed to be set up and quarterly monitoring of noise level in the ML area was proposed.

### **9.7.2 Position at the end of 5 Years of Scheme of Mining.**

All these preventive measures are being taken up regularly. Noise level monitoring in the area has been carried out and the results have shown the noise level within permissible limit (Ref. Annexure – 4).

### **9.7.3 Proposal For The Next 5 Years Scheme Period.**

These entire proposals will continue during the next five years of scheme period. The lessee has taken initiative for carrying out vibration study during ensuing scheme period. An undertaking to this effect is enclosed (Ref. Annexure-20).

## **9.8 Treatment of Mine water and Effluent/Toxic substance before Discharge**

### **9.8.1 Proposal as Per Approved Scheme of Mining.**

Since the mine discharge water contains hexavalent chromium, this water is not allowed to flow outside the lease and is diverted through garland drains to a settling tank. The water from this settling tank is then pumped to the existing ETP for treatment for keeping the Cr<sup>6+</sup> within permissible limit.

### **9.8.2 Position at the end of 5 Years of Scheme of Mining.**

Garland drains as proposed have been constructed to divert the water to the settling tank and then to the ETP for treatment of its hexavalent chromium. The treated water is then used for sprinkling on the road, plantation etc.

### **9.8.3 Proposal For The Next 5 Year Scheme Period.**

The same proposals as was being done will be continued during the next five year of scheme period.

**Table – 9.1**

**PLANTATION SCHEDULE  
(Around Dump Slope)**

<b>Year</b>	<b>Area to be planted (hects)</b>	<b>No. of Saplings</b>	<b>Type of Saplings</b>
1 <sup>st</sup> (2012-13)	1.20	1920	Accacia, Bada Chakunda, Krishnachuda & Teak etc.
2 <sup>nd</sup> (2013-14)	1.20	1920	- do -
3 <sup>rd</sup> (2014-15)	1.20	1920	- do -
4 <sup>th</sup> (2015-16)	1.20	1920	- do -
5 <sup>th</sup> (2016-17)	1.20	1920	- do -
<b>Total :-</b>	<b>6.0</b>	<b>9600</b>	

## CHAPTER – 10

### 10.0 ANY OTHER INFORMATION

- Jindal chromite mines of M/s Jindal Stainless Limited started mining operation since the year 2002.
- There are three chromite ore bands namely Band-I, Band-II & Band-VI.
- Working on Band-I, II is termed as quarry-1 and working on Band-VI is termed as Q-2.
- Band-I & II display a friable nature while Band-VI is of lumpy variety.
- Technology for underground mining of both friable and lumpy bands are to be developed . for this purpose six boreholes have been proposed in both friable (Band-I) and lumpy (Band-VI) to under the ore body behavior at depth.
- The lessee is also keen for mining of pyroxenite and quartzite exposed in the M.L area and necessary statutory approval for inclusion of the same are being initiated. The copy of the letter regarding the inclusion of the above to the State Govt. is enclosed (Ref. Annexure-7). Once inclusion for the above is obtained from the concerned authorities the reserve / resource vis-à-vis production planning will be submitted for approval under rule 10 of MCDR 1988.

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### **CERTIFICATE - I**

Certified that the provisions of Mineral Conservation & Development Rules, 1988 have been observed in Scheme of Mining on Jindal Chromite Mine over an area of 89.00 hectares in Jajpur district, Odisha and whatever specific permission are required the applicant will approach the Indian Bureau of Mines (IBM).

Certified that the informations furnished in Scheme of Mining are correct to the best of our knowledge.

#### **Key Persons :**

M/s. Geomin Consultants (P) Ltd.  
Geological & Mining Consultants.  
267, Kharavela Nagar,  
Bhubaneswar - 751001.  
Regn. No. RQP/CAL/167/92-B.



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

314(3)/2011-MCCM(CZ)/ MS-58

Nagpur, the 2<sup>nd</sup> May, 2012

To,  
M/s Jindal Stainless Ltd.,  
Jindal Chromite Mine,  
Village Kaliapni, District Jajpur,  
Odisha -755047.

Subject:- Approval of Scheme of Mining alongwith Progressive Mine Closure Plan in respect of Jindal Chromite ore mining lease of M/s Jindal Stainless Ltd, over an area of 89 ha in Jajpur district of Odisha State submitted under Rule 12 of MCDR, 1988.

Ref:- 1) Your letter No. JSL/Mines/IBM:2012/011 dated 30/01/2012..  
2) This office letter of even number dated 09/04/2012.  
3) Your RQP's letter No. GM(G)/IBM/698/12 dated 24/04/2012.

Sir,

In exercise of the powers conferred by sub rule (4) of Rule 12 of Mineral Conservation and Development Rules 1988 I hereby **approve** the Scheme of Mining including Progressive Mine Closure Plan of Jindal Chromite ore mine of M/s Jindal Stainless Ltd., over an area of 89 ha in Jajpur district of Odisha State submitted under Rule 12 of MCDR, 1988. This approval is subject to the following conditions: -

- i) This Scheme of Mining 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 Scheme of mining 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 further clarified that this approval of Scheme of mining 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) The provisions of Mines Act, 1952 and Rules and Regulations made there under including submission of notice of opening, appointment of Manager and other statutory officials as required by the Mines Act, 1952 shall be complied with.
- v) The execution of Scheme of Mining shall be subjected to vacations of prohibitory orders/notices, if any.
- vi) The Scheme of mining is approved without prejudice to any other order or direction from the court of competent jurisdiction.
- vii) The approval of mining operations and associated activities is restricted to the mining lease area only and also within the diverted area by the competent authorities of forest department till the requisite permission is granted by such authorities in additional areas as proposed in the document. 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.

- viii) If anything is found to be concealed as required by the Mines Act in the content of the Scheme of Mining and the proposals for rectification has not been made, the approval shall be deemed to have been withdrawn with immediate effect.
- ix) 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.
- x) The approval of Scheme of mining is subject to the compliance of CCOM's Circular No. 2/2010 regarding Geo-referenced cadastral map within 6 months from the date of approval failing which the approval of the document shall be deemed to have been withdrawn with immediate effect.
- xi) Yearly report as required under rule 23E (2) of MCDR, '88 setting forth the extent of protection and rehabilitation works carried out as envisaged in the approved progressive mine closure plan and if there is any deviations, reasons thereof shall be submitted before 1<sup>st</sup> July of every year to the Regional Office, IBM, Bhubaneswar.
- xii) 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 scheme of mining is, therefore, issued without prejudice to and is subject to the said directions of the Supreme Court as applicable.
- xiii) A copy of Environment Impact Assessment-Environment Management Plan (EIA-EMP) as approved by MOEF (Ministry of Environment & Forest) shall be submitted to IBM immediately after approval by MOEF.
- xiv) 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 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.
- xv) This approval is restricted in respect of proposal given in the document for the period 2012-13 to 2016-17 with validity upto 31/03/2017.
- xvi) The financial assurance submitted by you for Rs 18,64,250/- (Eighteen lakh sixty-four thousand two hundred fifty only) is valid upto scheme period and next financial assurance shall be submitted on or before 31/03/2017.
- xvii) The next Scheme of Mining will be due for submission on 01/12/2016.

Encl :- One copy of approved  
Scheme of Mining

Yours faithfully,

  
(Ranjan Sahai)

Controller of Mines (CZ)

Copy for information to :-

- 1) The Director of Mines Safety, Directorate General of Mines Safety, Bhubaneswar Region, 136/A, Sahid Nagar, Bhubaneswar alongwith one copy of approved scheme of mining.
- 2) The Director of Mining, Directorate of Mining & Geology, Government of Odisha, Head of the Department Building, New Capital, Bhubaneswar 751 001 Odisha alongwith one copy of approved scheme of mining.
- 3) M/s Geomin Consultants (P) Ltd., RQP, 267, Kharvela Nagar, Bhubaneshwar – 751001.

(Ranjan Sahai)  
Controller of Mines (CZ)