Phone Nos. (0674) 2744430/ 2742463
Fax No. (0674) 2744430
E- mail rcombbsr@sancharnet.in/
ibmbbsr@yahoo.com

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES
OFFICE OF THE REGIONAL CONTROLLER OF MINES

Mahani Complex, 2nd Floor
308, District Centre; Chandrasekharpur
Bhubaneswar – 751 016

No. BBS/Jaj/Cr/MP-280

Date: 27.7.2006

To

Shree Ashok Kumar Mishra
Managing Director, IFCAL
Agent, Talangi Chromite Mines
For M/s IDC of Orissa Ltd
At & P.O: Jajpur Road,
Dist: Jajpur, PIN: 755 020
Orissa

Sub: Mining Plan of **Tailangi Chromite Deposit** (including Progressive Mine Closure Plan) of M/s IDC of Orissa Ltd., over an area of **155.537 ha**, in Jajpur district of Orissa, submitted under rule 22 (4) of MCR, 1960

Ref. (1) Your RQP's letter No. HKS/IBM/IDC/MP-03/06 dated 05.04.2006, received in this office on 18.04.2006..
(2) This office letter of even number dated 21.06.2006.
(3) Your DGM I/C (Mines) letter No. IFCAL/TCM/1945 dated 29.06.2006..
(4) This office letter of even number dated 06.07.2006.
(5) Your DGM I/C (Mines) letter No. IFCAL/TCM-2109 dated 06.07.2006, received in this office on 10.07.2006.

Sir,

In exercise of the power conferred by the 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 28.04.1987, I hereby **APPROVE** the aforesaid Mining Plan. This approval is subject to the following conditions:

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

(ii) The Mining Plan is approved without prejudice to any order or direction from any court of competent jurisdiction.

02. It is also clarified that the approval of your aforesaid Mining Plan does not in any way imply the approval of the Government in terms of any other provision of Mines & Minerals (Development & Regulation) Act, 1957, or the rules framed thereunder and any other law.

03. The details of grant of the lease by the State Government, whenever such an order is passed, may be intimated to the Regional Controller of Mines, Indian Bureau of Mines, Bhubaneswar.

04. 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 the Mining Plan is, therefore, issued without prejudice to and is subject to the said directions of the Supreme Court as applicable in your case

contd.....2

05. A copy of EIA-EMP (Environment Impact Assessment-Environment Management Plan) approved by MOEF (Ministry of Environment & Forests) shall be submitted to IBM within 30 days of approval of MOEF.

06. You shall submit an yearly report before 1st July every year setting forth the extent of protective and rehabilitative measures carried out as envisaged in the approved Progressive Mine Closure Plan and if there is any deviation, reasons there of, after opening of the mine.

07. Further, this approval of Mining Plan is subject to the following conditions:

(i) Provisions of the Mines Act, 1952 and Rule & Regulations made thereunder including submission of notice of opening, appointment of manager and other statutory officials as required by the Mines Act, 1952, shall be complied with.

(ii) The execution of Mining Plan shall be subjected to vacation of prohibitory orders/ notices, if any.

(iii) If anything is found to be concealed as required by the Mines Act in the contents of the Mining Plan and the proposal for rectification has not been made, the approval shall be deemed to have been withdrawn with immediate effect.

Yours faithfully.

27/7/16

(M. K. PRASHER)
Regional Controller of Mines (NR)

Encls. Two copies of approved Mining Plan.

प्रतिलिपि निम्न को सादर सूचनार्थ अग्रेषित/Copy forwarded for kind information to:

1. श्री एच.के. साहु,आर.क्यू.पी. द्वारा इगमा कन्सलटांट (प्रा.) लिमिटेड, एम-55, ग्राउण्ड फ्लोर, बरमुण्डा हाउसिंग बोर्ड कालोनी, बरमुण्डा, भुवनेश्वर- 751 003.

   Shri H. K. Sahoo, RQP, C/o IGMA Consultants (P) Ltd, M-55,Ground Floor, Baramunda Housing Board Colony, Baramunda, Bhubaneswar- 751 003.

2. डाइरेक्टर ऑफ माइन्स, डाइरेक्टोरेट ऑफ माइन्स, उडीसा सरकार, हेड्स ऑफ डिपार्टमेंट बिल्डिंग, न्यू कैपीटल, भुवनेश्वर- 751 001.

   Director of Mines, Directorate of Mines, Government of Orissa, Heads of Department Building, New Capital, Bhubaneswar–751 001. **The Directorate may please ensure that the financial assurance of Rs 8,81,525/- (Rupees eight lakhs eighty one thousand five hundred twenty five only) is submitted by the applicant to the Regional Controller of Mines, Indian Bureau of Mines, Bhubaneswar, before executing the mining lease deed as per Rule 23 (F) of MCDR, 1988.**

3. डाइरेक्टर ऑफ माइन्स सेफ्टी, डाइरेक्टोरेट जनरल ऑफ माइन्स सेफ्टी, भुवनेश्वर क्षेत्र, प्लाट न. एल-1, नयापल्ली, पोस्ट- आर आर एल कैम्पस, भुवनेश्वर-751 013. को अनुमोदित माइनिंग प्लान की एक प्रति के साथ.

   Director of Mines Safety, Directorate General of Mines Safety, **Bhubaneswar Region,** Plot No. L-1, Nayapalli, P.O. RRL Campus, Bhubaneswar- 751 013, **along with one copy of approved mining plan.**

4. खान नियंत्रक (मध्यांचल), भारतीय खान ब्यूरो, नागपुर– 440 001, को अनुमोदित माइनिंग प्लान की एक प्रति के साथ, रजिस्टर्ड पार्सल द्वारा.

   Controller of Mines (CZ), Indian Bureau of Mines, Nagpur – 440 001, **along with one copy of approved mining plan by REGISTERED PARCEL**

(एम. के. प्रशर / M. K. PRASHER)
क्षेत्रीय खान नियंत्रक / Regional Controller of Mines (NR)

MINING PLAN

भारत सरकार
खान ब्यूरो, पूर्व
INDIAN BUREAU OF MINES, BHUBANESWAR
GOVT. OF INDIA

(WITH PROGRESSIVE MINE CLOSURE PLAN)

अनुमादित
APPROVED

ON

TAILANGI CHROMITE MINE OVER AN AREA OF 155.537 HECTARES IN JAJPUR DISTRICT, ORISSA.

पत्र संख्या द्वारा
VIDE LETTER No. BBS/Jaj/Cr/MP-280

SUBMITTED UNDER RULE 22 MCR 1960
at 27.7.2006

THE INDUSTRIAL DEVELOPMENT CORPORATION OF ORISSA LTD.

27/7/06
क्षेत्रीय खान नियंत्रक (ना.क्षे)
Regional Controller of Mines (NR)
भारतीय खान ब्यूरो
Indian Bureau of Mines
नागपुर/Nagpur

By,

Mr.H.K. Sahoo

RQP/CAL/257/97-A

IGMA Consultant (P) Ltd.

S-26, BDA Market complex

Nilakantha Nagar, Nayapalli

Bhubaneswar

Gram : CHROME

ISO 9001 : 2000
APPROVED BY IRQS
IRQS
A DEPARTMENT OF INDIAN REGISTER OF SHIPPING
ACCREDITED BY THE DUTCH COUNCIL FOR ACCREDITATION

Phone :(06726) 220212 / 220494 / 220508 / 2203707
220516 / 220317 / 220517
Fax : (06726) 220664 / 220318
E Mail - fcp@sify.com

IDCOL FERRO CHROME & ALLOYS LIMITED

(A WHOLLY OWNED SUBSIDIARY OF IDCOL)
A GOVT. OF ORISSA UNDERTAKING
REGD. OFFICE : FERROCHROME PROJECT - 755020
JAJPUR ROAD , DIST. JAJPUR (ORISSA) INDIA

OUR REF :

DATE : 10.01.06

CONSENT LETTER

The Mining Plan with progressive mine closure plan in respect of Talangi Chromite Mine of M/s IDC of Orissa Ltd. over an area of 155.537 hectares in Village Talangi in district Jajpur, State- Orissa has been prepared by Mr.H.K.Sahoo, Regd. No.RQP/CAL/257/97– A. I request the Regional Controller of Mines, IBM, Bhubaneswar, to make further correspondence regarding modification of the report with the said recognized person on his following address.

Mr.H.K.Sahoo,
RQP/CAL/257/97-A
C/O IGMA Consultants (P) Ltd.
M-55, Ground Floor
Barmunda Housing Board Colony,Barmunda
Bhubaneswar – 751003
Ph .0674 – 5527104

We hereby undertake that all the modifications so made in the mining plan by the recognized person be deemed to have been made with our knowledge and consent and shall be acceptable to us and binding on us in all respects.

Ashok Kumar Mishra

Signature of the Applicant in full

Full name in Block letters (ASHOK KUMAR MISHRA)
Managing Director, IFCAL,
Agent , Talangi Chromite Mines,
For IDC of Orissa Ltd.
Jajpur Road, Dist: Jajpur

CERTIFICATE

MINING PLAN ON CHROMITE MINE OVER AN AREA OF 155.537 HECTARES OF THE INDUSTRIAL DEVELOPMENT CORPORATION OF ORISSA LTD. IN JAJPUR DISTRICT, ORISSA.

Certified that the provision of Mineral Concession Rule, 1960 has been observed in Mining Plan and wherever specific permissions are required the applicant/mine owner will approach the Indian Bureau of Mines (IBM)

Certified that the information furnished in the mining plan are correct to the best of my knowledge.

Place:-
Date:-

Mr.H.K. Sahoo
RQP/CAL/257/97-A

CERTIFICATE –II

MINING PLAN ON CHROMITE MINE OVER AN AREA OF 155.537 HECTARES OF THE INDUSTRIAL DEVELOPMENT CORPORATION OF ORISSA LTD. IN JAJPUR DISTRICT, ORISSA.

Certified that the provision of Mines Act 1952 and Rules and Regulations made there under have been observed in Mining plan and wherever specific permissions are required the applicant/mine owner will approach the Director General of Mines Safety (DGMS), Dhanbad.

Certified that the information furnished in the mining plan are correct to the best of my knowledge.

Place:-
Date:-

HKSahoo

Mr.H.K. Sahoo
RQP/CAL/257/97-A

CONTENTS

Mr. H. K. SAHOO
ROP/CAL/257/97-A

LIST OF PLATES

Sl.no.	Plan No.	Plates Description	Scale
1.	Plate I	Lease plan	16"=1mile
2.	Plate II	Surface Plan	1:2000
3.	Plate III	Geological plan	1:2000
4.	Plate III(a)-III(d)	Geological sections	1:500
5.	Plate IV	Development plan of Block A & Section.	1:500
	Plate IV(a)	Development plan of Block B	1:500
	Plate IV(b)	Development section of Block B	1:500
6.	Plate V	Key plan	1:50,000
7.	Plate VI	Environment Plan	1:5000
8.	Plate VII	Environment management plan	1:2000
9.	Plate VIII	Conceptual Plan	1:2000
10.	Plate VIII(a)-(d)	Conceptual Section	1:500
11.	Plate IX	Financial Assurance Area Plan	1:2000

Mr. H. K. SAHOO
TROPICAL/257/97-A

LIST OF TABLES

Mr. H. K. SAHOO
TROPICAL125/197-A

LIST OF ANNEXURE

Mr. H. K. SAHOO

INTRODUCTION

M/s. Industrial Development Corporation of Orissa Limited established its Ferrochrome Plant at Jajpur Road during 1969. This is the first Ferrochrome Plant in the country manufacturing Ferrochrome. The present licensed capacity of the plant is 10,000 tones of low carbon Ferrochrome per annum with facility to manufacture high carbon Ferrochrome and Silico chrome. M/s. Industrial Development Corporation of Orissa Limited has proposal to enhance its capacity from 10,000 tones to 25,000 tones of low carbon Ferrochrome. Recently the central Govt. have issued license to manufacture 15,000 tones of High Carbon Ferrochrome. The present requirement of the chrome ore is 30,000 tones hard lumpy/intermediate variety to produce 10,000 tone low carbon ferrochrome. When the capacity is enhanced, the requirement of the chrome ore will be of the order of 75,000 to 80,000 tones (both lump and fines taken together). In addition to this, there is a proposal to put up a briquetting plant to utilize the fines which will be ultimately used for high carbon Ferrochrome. For this purpose necessary pilot plant study work has been started and an effective economical method has been developed for briquetting the chrome ore fines.

When the Industrial Development Corporation's Ferrochrome plant was established way back in 1969, it was decided that Orissa Mining Corporation would mine and supply the high-grade chrome ore to IDCOL. There was restriction on the supply of lumpy chrome ore by Orissa Mining Corporation to the outside parties including IDCOL's competitors. Over the last 20 years there has been a sea change in the situation. For Orissa Mining Corporation the sale of chrome ore both in the domestic and international markets has been a major business proposition. Also Ferrochrome/Charge chrome plants have come up in private sector within the state of Orissa and Orissa Mining Corporation supplies all these plants with chrome ore, besides their captive min. It is anomalous that while all other plants namely charge chrome plant of Ferro Alloys Corporation / Indian Metal & Ferro Alloys and Charge chrome of Orissa Mining Corporation. Alloys have their own captive mines, the oldest of the plants, under public sectors, namely the ferrochrome Plant of IDC of Orissa Limited has no such mine for its captive use. All these other manufactures apart from using chrome ore from their captive mine are also procuring good quality of chrome ore from Orissa Mining Corporation Limited often at the expenses of IDC of Orissa Ltd. It has been noticed that manufactures like IMFA, FACOR are having competitive advantage over IDCOL in the chrome ore transaction.

H.K.Sahoo

Mr. H. K. SAHOO

Orissa Mining Corporation have failed to maintain constant supply of required quantity and quality of chrome ore, for which ferrochrome plant of M/s. IDCOL has been suffering to a great extent. Without a captive source, ferrochrome plant is not in a position to compete in the domestic and international market after purchasing the chrome ore at a high cost as demand by Orissa Mining Corporation Ltd.

There is a huge difference between the cost of production (PMV) pits mouth value and price charged by Orissa Mining Corporation. So far no mining lease has been executed in favour of Industrial Development Corporation of Orissa Limited even if this Corporation is 100% owned by the state Government.

With this background, IDCOL has filed a M.L application on 27.04.88 for an area of 236.740 hectares in and around Tailanga village in Sukinda valley which was held earlier by Orissa Mining Corporation. This area comes within the reserved block for exploitation by public sector undertaking as per the Gazette VMG-42/77 Notification 7699 dt,. 3.8.77. Since Orissa Mining Corporation did not renew the lease, the Industrial Development Corporation a public sector undertaking has applied for the same area on 27.04.88 as mentioned earlier. The State Government have granted prospecting license over this area to the Industrial Development Corporation of Orissa Ltd. Vide its proceedings No. III(C) MG. 1/90,2907/MG BBSR-Dated 24.03.90.

Subsequently M/s Industrial Development Corporation of Orissa Ltd. file the M.L application over 585 Acres or 236.74 hectares in village Tailangi for chromite. The Department of Steel & Mines Govt. of Orissa has intended to grant the mining lease in favour of M/s IDC of Orissa ltd over 236.74 hectares in village Tailangi for chromite vide letter no. III(G) SM-70/2000-9528/SM, Bhubaneswar of dated 21.8.2000. It has been conveyed also to M/s IDC of Orissa Ltd that the area comes to 221.22 hectares instead of 236.74 hectares by Department of Steel and Mines Govt. of Orissa vide letter no 9757/SM/III(G) SM 72/2000 of dated 26.8.2000. The mining lease has been granted infavour of M/s.IDC of Orissa Ltd. for 20 years over an area of 221.22 hectares in four block such as 65.683 hectares and other three blocks comprise of 155.537 hectares by Department of Steel and Mines vide letter no. 9761/SM, Bhubaneswar III(G) SM-70-2000 of dated 26.8.2000. The present mining plan with progressive mine closure plan is prepared over 155.537 hectares under rule 22-MCR 1960. This mine is proposed to be worked as category-A(OTFM) mine.

Mr. H. K. SAHOO
RQP/CAL/257/97.

1.0 GENERAL

a. Name of the applicant with complete address

The Industrial Development Corporation of Orissa Ltd.
(A Government of Orissa Undertaking)
Post Box No. 78
Bhubaneswar 751001
Ph: 252120
Plant Address: Idcol Ferro Chrome & Alloys Limited.
Ferrochrome Project, At/P.o-Jajpur Road, Dist: Jajpur
Phone: (06726)-220212 /220494/ 220524 (Fax)

अनुमोदित
APPROVED

b. Status of the applicant : It is a 100% owned state Government Company.

c. Mineral/ Minerals which the applicant intends to mine : Chromite.

d. Period for which mining lease is granted. Renewal/ proposed to be applied. : 20 years.

e. Name, address and reg. No. of the RQP who prepared the mining plan. :

H.K. Sahoo
RQP/CAL/257/97-A
IGMA Consultants (P) Ltd.
S-26, BDA Market complex
Nilakantha Nagar, Nayapalli
Bhubaneswar .
Ph. No.-0674-5527104(O)

27/7/06
क्षेत्रीय खान नियंत्रक (ना.क्षे.)
Regional Controller of Mines (NR)
भारतीय खान ब्यूरो
Indian Bureau of Mines
नागपुर / Nagpur

HKSahoo
Mr. H. K. SAHOO
RQP/CAL/257/97-A

f. Name and address of the prospecting Agencies

1. Directorate of Mining & Geology
   Orissa, Bhubaneswar
2. Geological Survey of India,
   Orissa Circle, Bhubaneswar
3. The Industrial Development Corporation of Orissa limited,
   Bhubaneswar.

g. Reference no. and date of the consent letter from state Govt.

The Department of Steel and Mines Govt. of Orissa has granted the mining lease in favour of M/s IDC Orissa Ltd. for 20 years vide letter no. 9761/SM/III(G) 70/2000, Bhubaneswar of dated 26.8.2000. The Xerox copy of the said letter is enclosed as annexure-1. The Department of Steel and Mines Govt. of Orissa has instructed the applicant to obtain the necessary clearance over 155.537 hectares. In respect of this the mining plan has been prepared and submitted under rule 22 of MCR,1960 for necessary approval.

Mr. H. K. SAHOO
RQPICAL/25/197-A

2.0 LOCATION AND ACCESSIBILITY.

a) Details of area (with location of map)

District and State	:	Jajpur, Orissa
Taluka / Subdivision	:	Sukinda
Village	:	Ostapal, Tailangi & Balipara.
Plot No.	:	As per land schedule Ref: Annexure-2
Lease area (hects)	:	155.537
Whether the area is recorded to be in forest	:	The part of the area is recorded as forest land. The total area comprises of 137.516 hectares of forest land and 18.021 hectares of non-forest land. The land schedule and boundary description of the area is appended as annexure-2 and 3 respectively.
Ownership / Occupancy	:	As per Land Schedule.
Existence of public road / railway line, Near by and approximate distance	:	The Tomka-Kalarangi road mines at a .distance of 0.5 km andThe Daitari & paradeep express Highway is at a distance of 16 KM from the lease.
Toposheet No. with latitude and longitude	:	73G/16, Latitude: 21°03'05" to 21°04'02" N Longtitude: 85°48'04" to 85° 50' 00"E

b) General location and vicinity map : The Tailangi lease area over an area of 155.537 hect. is located in the Tahasil of Sukinda in Jajpur district and forms a part of the survey of India Toposheet No. 73G/16.

The area is well communicated by a motorable road from Tomka to Tailangi, consisting partly of pucca and partly by morum road covering a total distance of about 16kms. This road meets the Daitari-Paradeep Express High Way at Tomka. The map showing the area and location of village is enclosed in Key plan as Plate No.V.

Mr. H. K. SAHOO
RQPICAL/25/197...

3.0 GEOLOGY

3.0. Geology & Reserve

The Tailangi chromite deposit is extended on the northern side of the Damsala and forms a part of the sukinda ultramafic belt. The deposit is bounded by latitude 21° 3' 5" to 21° 4' 2" and longitude 85° 48' 4" to 85° 50' 00" in survey of India Toposheet no. 73G/16. the deposit is located at the eastern part of the Sukinda valley bounded by Daitari Hill range comprising of older quartzite in north and by Mahagiri hill range comprising of younger quartzite in south.

The lithological formation encountered are soil, laterite, Talc and limonitic rocks, and quartzite with association of chromite. The chromite ore body of the Tailngi area forms the Northern limb of the synclinally folded sukinda ultramarfic complex. The chromite beds are sharply dipping and consists of alternate bands of weathered pyroxinite and chromite. The general strike of the litho units is N 75° W to S 75° East. The mineral assemblage and associated formation dip at roughly 60° towards south west. The ore bodies are lens shaped and often intersected in the bore holes is medium to fine grained brown to yellowish brown in colour and friable in nature. Limonitic and Talcose gangues are often observed in the ore body. Preliminary exploration has been carried out by the Directorate of Mining & Geology (Govt. of Orissa) by giving few trenches and pits. Subsequently the Geological Survey of India have carried out detail prospecting of the area by drilling 26 bore holes along with the associated survey work.

The main objective of developing this deposit is to meet the raw material requirement of our captive ferrochrome plant of M/s. IDC Orissa Ltd located at Jajpur Road. The estimated reserve of chromite of all grades stands at 2.33 million tones, considered up to a depth of 80 meters. The reserve carried out so far in this area.

3a.(i) Physiography

The granted mining lease area forms a part of sukinda ultramafic valley bounded by Daitari hill range in North of 807 mtr. Height and in the south by the Mahagiri hill range of 697 mrts. Height from the mean sea level. The physiography of the area covered under the mining lease is a gently undulating country with sparsely situated small mounds. The highest contour within the mining lease area is 210.14 mtrs. And the lowest contour is 148.49 mtrs. The highest

altitude point (HAP) and lowest altitude point (LAP) have been marked in surface plan plate No. II.

The northern boundary of the lease lies at the base of the Daitari hill range whereas the Dasmala Nallah forms the southern boundary of the mining lease.

The drainage system of the area is controlled by the Damsala nallah which flows at the southern boundary of the mining lease area. The area around Tailangi exhibit bushy growths and occasional big sal and mahua trees. The climate is moderate to temperate in nature. The average rain fall of the area is about 1880 mm.

The Tomka Kalarangi road runs at a distance of about 0.5kms from the mining lease area, which is lying towards north of the road. The area under refernce is connected to tomka Kalarangi road by a fair weather Jeepable road. The damsala nallah and its tributary to Tailangi nallah forms the prominent water course in the area.

The Tailangi and Balipara Basti with temporary huntments are situated within the mining lease area in North western and North eastern part of the lease hold area respectively, The lease area comprise of 137.516 hectares of forest land and 18.021 hectares of non-forest anabadi Govt. The plan showing the contours for the area covering around 500mtrs of the mining lease has been shown in environment plan plate-VI.

3a.(ii).Geology

The Tailangi chromte deposit forms a part of Sukinda ultramafic complex. The associated formations are limontic rocks, cherts, talc and quartzitic rock. The parent rock is dunite, which is altered into serpentine, limonitised and silicified.

The stratigraphic succession of the area is as follows:

Soil and laterite.

Weathered ultramafic consists of talc &

Limonite with cherty materials,

Chromite with limonite partings at places

Weathered ultramafic composed of serpentine ,

Talc and dunite

Older quartzities.

Mr. H. K. SAHOO

This forms a segment of the northern limb of the synclinally folded sukinda ultramafic complex. A number of mineable ore bodies are found in the area. The ore bodies are more or less parallel to each other and often exhibits pinching and swelling character. The ore bodies are narrow, elongated and steeply dipping. The amount of dip varies from 50° to 80°. The average dip is about 60° towards south west. In some of the bore hole sections the relict olivines are observed which grades into pure olivinite at depth. Thus it indicates that the parent rock is dunite which alterted into serpentine. The wall rock mostly exhibits dunite suite of rocks consisting of serpentine, Dunite, Talc, Limonite and cherts as evident from the bore hole sections. Mostly the wall rock is monomineralic olivinites which occasionally altered to limonite. The general trend of the deposit is N 75° W to S 75° E, with local variation in the strike at places. The bore holes logs indicates that the ore bodies, more or less conforms to the attitude of the associated rocks.

Detailed geo chemical sampling established an ore bearing zone on the surface with demarcation of lateritic ultramafic bodies showing chrome nodules. Detailed drilling was confined to such zone. The Geological Survey of India have given a number of inclined bore holes at an angle of 45° The ore bodies have been computed and projected from the bore hole logs.

(ii) All the five ore bodies have now been shown in the geological plan plate no.III.

(iii) The locations of pits and trenches have also been shown in the map Mentioned above.

3b. Details of Exploration

The following exploration work has been carried out in the area-

1. Physiography and infrastructure study.
2. Contouring (6.54 Sq.mt)
3. Geological mapping (2.5 Sq.mt)
4. Pitting & Trenching (36 pits and 11 trenches)
5. Drilling 26 bore holes
6. Ground water study.

Mr. H. K. SAHOO
RQP/CAL/257/97

As described earlier, the physiogrphy and the infrastructure of the area has been studied in details with a view to asses the quantum of development work required to work out in a systematic and scientific manner with necessary improvement of the adjoining areas.

After studying the physiography of the terrain the contouring of the area has been done at an interval of 5 meters.

By geo-chemical anomaly study 5 isolated chromite bands have been identified in Tailangi area. Besides this the datas collected by photographical survey has been taken into consideration while preparing the geological map. The geological map (plate-III) has been prepared in 1:2000 scale in which the litho units, chromite ore bodies and other geological features have been recorded, compiling the datas collected from surface geological survey, geo chemical anomaly survey , 11 trenches and 36 pits have been excavated. Out of this , 4 trenches and 7 pits have been excavated in the area proposed for mining in first five year in the lease area of 65.683 hectares. The pits are located at 50mtrs interval covering a total length of about 350 mtrs. (on chromite ore body No.1) other pits are excavated at selected locations to confirm the findings of geo-chemical anomaly survey and photogeological survey. In this process 5 discontinuous ore bands have been recognized in this area.

26 bore holes have been drilled by Geological Survey of India, the cores of all the 26 bore holes have been analyzed. Out of these 16 bore holes, 16 bore holes fall within this granted mining lease area (155.537 hectares), and balance 10 bore holes fall within other M.L block (65.683 hectares). The datas of effective bore holes available from these 16 bore holes is found to be sufficient for preparing the mining plan for the first five years, with an annual target production of 84,000 tones of chromite. The datas of these 16 bore holes have been considered while preparing the mining plan for first five years.The details litho chemical logs containing the collar level bore hole angle, total depth and the thickness and grade of each litho unit are given in annexure –4.

Mr. H. K. SAHOO
ROPICAL/257197-A

The ground water of this area has been studied from the existing dug well. The ground water level from 3 to 10mtrs. Besides this the surface flow water of Tailangi and Damsala Nallah has been studied to assess its quantity and quality of flow.

The geological reserve of the area has been assessed separately for the 6 ore bodies taking into consideration the excavation and bore hole datas. The bore hole no. GJ 30 and 34 drilled by Geological Survey of India cuts across the regional ore band No.V. The other 24 bore holes have been drilled for regional ore band no. V & VI. The total meterage of these 26 bore holes comes to 2482.2 mtrs the interval between GJ 30 & 34 is 200 mtrs. By which these two bore holes have successfully proved the dimension of a part of the ore band No.V The other bore holes namely BH, GJ 30,33,34,35,36,37,39,40,41,42,45,48,49,51 & 52 have indicated the existence of regional ore band No.V & VI. Out of these bore holes only 16 number of bore holes have been dug in 155.537 hectares. The regional ore body V have been delineated in the adjacent lease (65.683 hectares) while all other ore body one located in this lease hold.

(a) The geological survey of India has surveyed the area in detail in the scale of 1:2,000. The gridding has been done at 100 x 100 mtrs. Thereafter detail geo-chemical sampling of the chrome bearing latertised ultrabasic has been carried out by way of surface sampling. Bore hole have been drilled (inclined) at 200 x 200 mtrs interval. The ore bearing zone covering ore bodies no. IV (proposed for mining in 65.683 hectares) has been drilled 200 x 100 mtrs. Grids. As per the latest data available 26 bore holes have been drilled in our granted area and we strongly feel the informations available are adequate to make the preliminary assessment.

(b) As suggested we have a future prospecting programme to go for intensive prospecting at 25 x 25 mts interval phase wise.

(c) By selective mining we mean to recover chromite with +40% Cr2O3 and to stack it separately after necessary grading. Low grade material with 10 %-40% Cr2O3 will be stacked separately for necessary beneficiation for future use.

3d. Future Prospecting Programme

The Geological Survey of India have completed 26 nos. of bore holes within the granted M.L area. After necessary prospecting of the bore hole samples and data, they have agreed to transfer the datas along with necessary plans and charts to chalk out the details exploratory

Mr. H. K. SAHOO
ROPICAL/257/97

mining and future prospecting programme. In addition to the work carried out by GIS and directorate of Mining & Geology, the I.D.C proposes to take up extensive pitting and trenching and close space drilling along the strike and dip of all the 5 ore bodies. Pits and trenches are proposed to be excavated on selected locations. The maximum interval between the pits and trenches is fixed at 50 mtrs Even if the preliminary appraisal of the Directorate of mining and geology and geological survey of India have established existence of all the ore bodies and mineability at some places, future prospecting is essential in order to mine out all the ore bodies in systematic and scientific manner. Further drilling of at least 20 bore holes in PBH 1 to PBH 20 at 100mtrs. interval along and across the main ore bodies will be taken up to establish the reserve of proved category during proposed plan period. Regular and systematic sampling of the bore hole cores at suitable interval will be taken up. Also systematic sampling of wall rock both in hanging and foot walls will be taken up in older to establish the geological continuity of the ore bodies. Close space exploratory drilling and exploratory mining will be taken up prior to regular mining. During mining sampling from different faces, stacks and benches will be done to guide the selective mining work and effective recovery of different grades of chromite.

The work carried out so far by GSI & Directorate of Mining & Geology has not covered the detail ground water studies. M/s. I.D.C of Orissa Ltd. Proposes to take up intensive ground water study by locating few more bore holes in addition to the datas available from the existing and proposed bore holes. The location of 5 large dimeter bore holes PBH 21 to PBH 25 has been shown in the future prospecting programme plan during conceptual period. This will establish not only the reserves and intensity of the fluctuation of ground water level but also indicate the permeability of the water bearing strata and its effect on exploitation of the deposit.

3e. Method of Estimation of Reserves

With the quantum of prospecting work carried out so far, some parts of the ore bodies of band-V & VI have been proved. The total extension of the proved block of ore body in band-V & VI is 950 mtrs and proved up to a depth of 40 mtrs within this area the ore body is steeply dipping at angle of 60° and the thickness of the individual ore bends varies from 0.20 mtrs to 6.05 mtrs which are separated by weathered ultramafic partings (in 65.683 hectares lease). Basing on the GSI bore hole data 2 ore bands such as V & VI have been delineated in this area. The

promising ore zone have been divided into two mining blocks such as ABCD(Bloc-A) & MNOP(Block-B). Considering the nature and occurrence of the ore body and intensity of prospecting over these blocks the reserve can be placed under proved, probable & possible category. The reserve calculation has been done by average cross sectional area methods. Two sections have been prepared each across one bore hole within the proved block basing on which the reserve calculation has been done. The details litho units are given in Annexure-4. The cross section which are prepared along the dip of the deposit showing the details litho units are provided in geological sections in plate III(a), III(b) III(c) and III(d).

In this mining Plan the reserve has been calculated for chrome ore by cross sectional area method for two blocks separately.. The reserve has been calculated by multiplying cross sectional area with length of influence to attain the volume and there by multiplying the bulk density, recovery factor to attain the geological reserve. The geological reserve has been calculated basing on the following parameters. All total 11 numbers of geological cross sections have been drawn such as 6-6', 7-7', 8A-8B, 9A-9B, 8-8', 9-9', 10-10', 11-11', 12-12', 13-13'& 14-14'. Basing on the bore hole data proved limit has been taken into 40 mts from the surface. In addition to these, probable limit has been taken 20 mts below the proved limit. Where the possible limit is 20 mts below the probable limit. The length of influence is variable for different sections. The recovery factor has been considered as 80% basing on the actual field practice of the area. The tonnage factor has been considered different for different grade of ore such as 3.8, 3.2, 3.0 & 2.8 for grade-I, grade-II, grade-III & grade-IV respectively.

3f. Geological Reserve & Grade

Reserves of 2339174 tones of chromite have been established up to a depth of 40 mtrs within the granted mining lease area. However, this is likely to increase considerably when the ore bodies 80 mtr depth will be mined in 2nd phase of mining.

During the first phase the planning for mining has been proposed up to 40 mts or little more than 40mts to attain the desired R.L of the quarry floor only.

On the basis of the above method and calculation the summary of Geological reserve of Chrome ore is given as follows:

Mr. H. K. SAHO
RQPICAL/257

अनुमोदित
APPROVED

CATEGORY	GEOLOGICAL RESERVE			MINEABLE RESERVE			(UNFC)
	Block-A	Block-A	Total	Block-A	Block-A	Total	
Proved	591233	688613	1279846	548320	657949	1206296	(121)
Probable	310847	247041	557888	100752	236070	336822	(122)
Possible	310847	190593	501440	--	184766	184766	(333)
Total	1212927	1126247	2339174	649072	1078785	1727857	

The Geological & Mineable reserve has been calculated in table 3.1(a), 3.1(b) & 3.2(a)and 3.2(b)respectively.

Grade:-

We have considered cut off grade as 40% Cr_2O3 minimum which will be directly utilized in our plant by blending with high grade ores. The ores having +10-40% Cr_2O3 will stacked separately for future beneficiation.

3f.i Quality of the ores

The present requirement of the ferrochrome plant is about 30.000 tones of hard lumpy intermediate variety ore having + 40% Cr_2O3 Keeping in view the requirement of the industry in which the ore for beneficiation 4 category of ore has been planned to be mined from this area.

Grade I Hard lumpy/intermediate ore (+) 40% of Cr_2O_3
Grade –II Chrome ore fines – 30% to 40% of Cr_2O_3
Grade – III Chrome ore fines -- 20% to 30% of Cr_2O_3
Grade –IV Chrome ore fines - 10% to 20% of Cr_2O_3

The thickness of the ore bands conforming to the above specification varies from 0.20 to 6.05 meters. The ore is proposed to be mined by method of selective mining and manual sorting. The grade (I) ore will be directly utilized after single stage and double stage beneficiation respectively. The up graded ore fines will be utilized after preparing briquette in the briqutting plant.

The quantity and average quality of the ore the above four categories planned to be mined in the first phase is as fallows:

Grade	Range of Cr_2O_3 In each grade	Quantity (In MT)
I	+ 40%	85,731
II	40% to +30%	96,953
III	20% to 30%	1,16,266
IV	10% to 20%	1,19,044
	Total	4,17,994

27/7/06
क्षेत्रीय खान नियंत्रक (ना.क्षे.)
Regional Controller of Mines (NR)
भारतीय खान ब्यूरो
Indian Bureau of Mines
नागपुर/Nagpur

Mr. H. K. SAHOO
REP/CAL/25.07.06

The quantity of different grade of chromite has been calculated proportionate to the length of each grade chromite encountered in the bore holes drilled within the proved block.

Following precautionary measures will be adopted during mining for proper and effective recovery of chromite ore of each grade.

Delineation of the extension of ore bands of different grade, in the mining face by close sampling.

Recovering proper quality material by hand picking.

Preventing entry of dumpers over the mineral bed to avoid crumbing of ore into powder.

Sprinkling of water on mines face to prevent dust and powdering of ore.

Providing wider working face to facilitate proper sorting.

The distribution of different grade ores within the proved block has been shown in the Table no. 4.6

Grade - I	-	+40% Cr_2O_3
Grade - II	-	+30% -40% Cr_2O_3
Grade - III	-	+20% to 30% Cr_2O_3
Grade - IV		10 % to 20% Cr_2O_3

The reserves of chromite for +10% cut off has been calculated out of which the grade wise reserve has been assessed basing on the assay logs.

Mr. H. K. SAHOO

Table No.3.1 (a)

GEOLOGICAL RESERVE (BLOCK-A)

Category	Section Considered	Ore Band	Grade	C/S Area (in Sq. m)	Length of Influence (in mm)	Volume of Ore Zone (in Cu m)	Bulk Density	Recovery Factor	Reserve (in MT)
Proved	6-6'	V	III	168	80	13440	3.0	0.8	32,256
	7-7'	V	I	256	125	32,000	3.8	0.8	97,280
			III	246	125	30,750	3.0	0.8	73,800
	8A-8B	V	II	104	125	13,000	3.2	0.8	33,280
		V	III	947	125	1,18,375	3.0	0.8	2,84,100
	9A-9B	V	I	154	96	14,784	3.8	0.8	44,943
			III	111	96	10,656	3.0	0.8	25,574
									591233
Probable	6-6'	V	III	94	80	7,520	3.0	0.8	18,048
	7-7'	V	I	137	125	17,125	3.8	0.8	52,060
			III	139	125	17,375	3.0	0.8	41,700
	8A-8B	V	II	83	125	10,375	3.2	0.8	26,560
		V	III	452	125	56,500	3.0	0.8	1,35,600
	9A-9B	V	I	79	96	7,584	3.8	0.8	23,055
			III	60	96	5,760	3.0	0.8	13,824
									310847
Possible	6-6'	V	III	94	80	7,520	3.8	0.8	18,048
	7-7'	V	I	137	125	17,125	3.8	0.8	52,060
			III	139	125	17,375	3.0	0.8	41,700
	8A-8B	V	II	83	125	10,375	3.2	0.8	26,560
		V	III	452	125	56,500	3.0	0.8	1,35,600
	9A-9B	V	I	79	96	7,584	3.8	0.8	23,055
			III	60	96	5,760	3.0	0.8	13,824
									310847
TOTAL									**1212927**

Mr. H. K. SAHO
RQP/CAL/257/97-A

Table No.3.1 (b)

GEOLOGICAL RESERVE (BLOCK-B)

Category	Section Considered	Ore Band	Grade	C/S Area (in Sq. m)	Length of Influence (in mm)	Volume of Ore Zone (in Cu m)	Bulk Density	Recovery Factor	Reserve (in MT)
Proved	8-8'	VI	I	47	175	8,225	3.8	0.8	25,004
			II	158	175	27,650	3.2	0.8	70,784
			III	191	175	33,425	3.0	0.8	80,220
	9-9'	VI	II	453	96	43,488	3.2	0.8	1,11,329
			III	53	96	5,088	3.0	0.8	12,211
			IV	63	96	6,048	2.8	0.8	13,548
	10-10'	VI	IV	46	100	4,600	2.8	0.8	10,304
	11-11'	VI	IV	1,472	75	1,10,400	2.8	0.8	24,7296
	12-12'	VI	IV	852	60	51,120	2.8	0.8	1,14,509
	13-13'	VI	III	16	40	640	3.0	0.8	1536
	14-14'	VI	IV	13	60	780	2.8	0.8	1872
									688613
Probable	8-8'	VI	I	22	175	3,850	3.8	0.8	11,704
			II	75	175	13,125	3.2	0.8	33,600
			III	111	175	19,425	3.0	0.8	46,620
	9-9'	VI	II	160	96	15,360	3.2	0.8	39,322
			III	69	96	6,624	3.0	0.8	15,848
			IV	07	96	672	2.8	0.8	1,505
	10-10'	VI	IV	23	100	2,300	2.8	0.8	5,152
	11-11'	VI	IV	211	75	15,825	2.8	0.8	35,448
	12-12'	VI	IV	420	60	25,200	2.8	0.8	56,488
	13-13'	VI	III	14	40	560	3.0	0.8	1344
									247041
Possible	8-8'	VI	I	22	175	3,850	3.8	0.8	11,704
			II	75	175	13,125	3.2	0.8	33,600
			III	111	175	19,425	3.0	0.8	46,620
	9-9'	VI	II	160	96	15,360	3.2	0.8	39,322
			III	69	96	6,624	3.0	0.8	15,898
			IV	07	96	672	2.8	0.8	1,505
	10-10'	VI	IV	23	100	2,300	2.8	0.8	5,152
	11-11'	VI	IV	211	75	15,825	2.8	0.8	35,448
	13-13'	VI	III	14	40	560	3.0	0.8	1344
									190593
TOTAL									**1126247**

Mr. H. K. SAHOO
ROPICAL/25/197-A

Table No.3.2 (a)
MINEABLE RESERVE (BLOCK-A)

Category	Section Considered	Ore Band	Grade	C/S Area (in Sq. m)	Length of Influence (in mm)	Volume of Ore Zone (in Cu m)	Bulk Density	Recovery Factor	Reserve (in MT)
Proved	6-6'	V	III	163	80	13040	3.0	0.8	31296
	7-7'	V	I	253	125	31625	3.8	0.8	96140
			III	241	125	30125	3.0	0.8	72300
	8A-8B	V	II	87	125	10875	3.2	0.8	27840
		V	III	841	125	105125	3.0	0.8	252300
	9A-9B	V	I	154	96	14784	3.8	0.8	44943
			III	102	96	9792	3.0	0.8	23501
									548320
Probable	6-6'	V	III	86	80	6880	3.0	0.8	16512
	7-7'	V	I	123	125	15375	3.8	0.8	46740
			III	125	125	15625	3.0	0.8	37500
	8A-8B	V	II	--	--	--	--	--	--
		V	III	--	--	--	--	--	--
	9A-9B	V	I	--	--	--	--	--	--
			III	--	--	--	--	--	--
									100752
Possible	6-6'	V	III	--	--	--	--	--	--
	7-7'	V	I	--	--	--	--	--	--
			III	--	--	--	--	--	--
	8A-8B	V	II	--	--	--	--	--	--
		V	III	--	--	--	--	--	--
	9A-9B	V	I	--	--	--	--	--	--
			III	--	--	--	--	--	--
									--
TOTAL									**649072**

Mr. H. K. SAHOO
RECLAIMING OFFICER

Table No.3.2 (b)

MINEABLE RESERVE (BLOCK-B)

Category	Section Considered	Ore Band	Grade	C/S Area (in Sq. m)	Length of Influence (in mm)	Volume of Ore Zone (in Cu m)	Bulk Density	Recovery Factor	Reserve (in MT)
Proved	8-8'	VI	I	47	175	8225	3.8	0.8	25004
			II	157	175	27,475	3.2	0.8	70336
			III	189	175	33075	3.0	0.8	79380
	9-9'	VI	II	451	96	43296	3.2	0.8	110838
			III	52	96	4992	3.0	0.8	11981
			IV	62	96	5952	2.8	0.8	13332
	10-10'	VI	IV	45	100	4500	2.8	0.8	10080
	11-11'	VI	IV	1320	75	99000	2.8	0.8	221760
	12-12'	VI	IV	846	60	50760	2.8	0.8	113702
	13-13'	VI	III	16	40	640	3.0	0.8	1536
									657949
Probable	8-8'	VI	I	20	175	3500	3.8	0.8	10640
			II	73	175	12775	3.2	0.8	32704
			III	98	175	17150	3.0	0.8	41160
	9-9'	VI	II	155	96	14880	3.2	0.8	38093
			III	65	96	6240	3.0	0.8	14976
			IV	07	96	672	2.8	0.8	1505
	10-10'	VI	IV	22	100	2200	2.8	0.8	4928
	11-11'	VI	IV	208	75	15600	2.8	0.8	34944
	12-12'	VI	IV	415	60	24900	2.8	0.8	55776
	13-13'	VI	III	14	40	560	3.0	0.8	1344
									236070
Possible	8-8'	VI	I	18	175	3150	3.8	0.8	9576
			II	74	175	12950	3.2	0.8	33152
			III	110	175	19250	3.0	0.8	46200
	9-9'	VI	II	159	96	15264	3.2	0.8	39076
			III	75	96	7200	3.0	0.8	17280
			IV	06	96	576	2.8	0.8	1290
	10-10'	VI	IV	22	100	2200	2.8	0.8	4928
	11-11'	VI	IV	190	75	14250	2.8	0.8	31920
	13-13'	VI	III	14	40	560	3.0	0.8	1344
									184766
TOTAL									**1126247**

Mr. H. K. [illegible]
ROP/CAL/257/197-A

4.0 MINING

(a) Brief description the existing/ proposed methods for mining

(i) Proposed method for developing.

It is proposed to adopt open cast method of mining in Tailangi area. It may be mentioned here that surface out- crops of chromite ore bodies are not seen in any part of the area. The existence of the concealed chromite bands has been established by process of pitting, trenching drilling and geochemical anamoly study. The chromite bands encountered in the pits are completely weathered and bouldary in nature. On the other hand bore hole cores from greater depth indicates the actual nature and grade of chromite. The chromite ore bodies covered with laterite and limonitic soil, the thickness of which varies from 5 to 12 meters.

1. Fencing the mining & forest areas.
2. Infrastructural facilities such as approach road, haulage road.
3. Construction of suitably located residential and non residential buildings.
4. Removal of soft overburden.
5. Preparation of protective embankment and drainage system.
6. Excavation of settling tanks.
7. Installation of sub station for supply of electricity.,
8. Preparation of plant nursery.

During the first year surface mining is to be taken up along with the infrastructure development work as detailed above. However, it is projected during the 2nd year required level of production will be achieved of the range of 84,000 tonnes hard lumpy/ intermediate variety ore.

The removal of overburden like laterite and limonitic soil and weathered ultramafics will be done by mechanized means with the help of hydraulic excavator of 1 Cum capacity and 10-T tippers in this 1st phase the mining planned for 5 years. The details are given at chapter 4.2. Form 2nd year onwards the production of chromite and excavation of overburden will be taken up in a phased manner. It has been planned to utilized directly the grade-I ore having average grade of 42.77% Cr_2O_3. While other three grades of ore will be stacked separately in the stacking yard near the proposed quarry.

Mr. H. K. SAHOO
RQ/ICAL125/...

(ii) Year wise development for the first five years

The mining plan has been prepared for next five year (2006-07 to 2011-2012) basing on the prospecting data collected so far in Tailangi area in two different mining blocks such as ABCD(Block-A) and MNOP(Block-B). Development and production plan have been proposed in the chromite ore zone considering the tectonic set up of the ore body. The four number of pits such as quarry-1(A), 1(B), 2 (A) and 2 (B) have been proposed to be developed. In due course of time these small pits will be merged to produce an annual target of 84,000 MT . Seven section lines such as ab, cd, ef, gh, ij, kl and mn have been considered to show the development plan as proposed for the ensuring five years. As the occurrence of ore body is very irregular and structurally controlled, care has been taken to develop the quarries from the proved zone towards the probable zone to facilitate the ore body to be exposed fully during ensuing 5 years.

The different types of work quantum and the duration of each work have been provided in year wise development plan and section (ref. Plate IV, IV(a) & IV(b)).

The year wise development including infrastructure and excavation of overburden and quantum of production of chromite grade wise are given in the table-4.4, 4.5 & 4.6..

4.2 Year Wise Production For The First Five Years

(ii) <u>Year wise Production For The First 5 (Five) Years: -</u>

Keeping a proposed production target of 84,000 MT/year the development for the ensuing five years has been proposed. Section lines have been shown (Plate-IV) to show the five-year development. The cross sectional area has been calculated, multiplied by length of influence, recovery factor and tonnage factor to attain the proposed production target. The year wise production planning is projected as the following parameters.

(i) The slope of the individuals bench will be 60° and over all slope will be 30°.

(ii) The height of the benches will be kept at 3.5 mt. and accordingly the width of benches will be kept at 5.8mt.

(iii) The benches of the quarry are named from top to bottom as 1st bench, 2nd bench and 3rd bench and so on.

(iv) Tonnage factor for different chromite grade have been considered as 3.8,3.2,3.0 and 2.8 for grade-I, grade-II, grade-III and grade- IV respectively.

(v) Recovery factor has been considered as 0.8 as per the actual field practice.

Mr. H. K. SAHOO
ROP/CAL/257/97-A

The details of generation of topsoil, overburden, intraburden and production of chrome ore are provided in the table 4.1, 4.2, 4.3 & 4.4 respectively.

DEVELOPMENT DURING 1ST YEAR: -

In the mining block ABCD the development work in the 1st year corresponds to the sections ab and cd for quarry-1A and 1-B repectively. During this year four benches will be developed as 1st, 2nd, 3rd,& 4th benches from top to bottom will be pushed towards north direction with a distance of 80 mts in quarry-1A and 40 mts in quarry-1B respectively. The height of each bench will be kept at 3.5 mts and width of the benches will be kept at 5.8 mts. These bench will attain the RLs as 150.5 mRL for 1st bench, 147 m RL for 2nd bench,143.5 m RL for 3rd bench while bottom most bench or 4th bench will attain 140 m RL which will be the RL of the quarry floor i.e 140 m RL.This year quarry-1A will be produce 19123 MT of chrome ore while quarry-1B will produce 3936 MT of chrome ore.

In the mining block MNOP the development work corresponds to the sections ef , gh in quarry 2A and ij and kl in quarry 2B. During this year six benches will be developed as 1st , 2nd , 3rd 4th , 5th and 6th benches from top to bottom will be pushed towards north direction with a distance of 80 to 92 meters in quarry 2A and 37 to 77meters in quarry 2B. The RL of the quarry floor for both the quarries will be 147 mts. This year quarry 2A will produce 36089 MT and quarry 2B will produce 11592 MT of chrome ore.

During this year the total production of chrome ore from different pit will be 70740 MT. The generation of overburden and intraburden will be around 614528 cum and 83855 cum respectively. This year the generation of top soil will be 17100 cum.

DEVELOPMENT DURING 2ND YEAR:-

In the mining block ABCD the development work in the 2nd year corresponds to the sections ab and cd for quarry-1A and 1-B repectively. During this year six benches will be developed as 1st, 2nd, 3rd, 4th , 5th & 6th benches from top to bottom will be pushed towards north-south direction with a distance of 106 mts in quarry-1A and 58 mts in quarry-1B respectively. The height of each bench will be kept at 3.5 mts and width of the benches will be kept at 5.8 mts. These bench will attain the RLs as 150.5 mRL for 1st bench, 147 m RL for 2nd bench,143.5 m RL for 3rd bench, 140 m RL for 4th bench, 136.5 m RL for 5th bench while bottom most bench

MR. H. K. SAHOO
ROP/CAL/257/97-A

or 6th bench will attain 133 m RL which will be the RL of the quarry floor i.e 133 mRL. This year quarry-1A will be produce 21146 MT of chrome ore while quarry-1B will produce 9024 MT of chrome ore.

In the mining block MNOP the development work corresponds to the sections ef, gh in quarry 2A and ij and kl in quarry 2B. During this year eight benches will be developed as 1st, 2nd, 3rd 4th, 5th,6th,7th & 8th benches from top to bottom will be pushed towards north-south direction with a distance of 97 to 120 meters in quarry 2A and 60 to 105 meters in quarry 2B. The RL of the quarry floor for both the quarries will be 140 mts. This year quarry 2A will produce 32251 MT and quarry 2B will produce 16408 MT of chrome ore.

During this year the total production of chrome ore from different pit will be 78829 MT. The generation of overburden and intraburden will be around 172302 cum and 170765 cum respectively. This year the generation of top soil will be 12922 cum.

DEVELOPMENT DURING 3RD YEAR: -

In the mining block ABCD the development work in the 3rd year corresponds to the sections ab and cd for quarry-1A and 1-B repectively. During this year eight benches will be developed as 1st, 2nd, 3rd, 4th,5th,6th,7th & 8th benches from top to bottom will be pushed towards north-south direction with a distance of 130 mts in quarry-1A and 80 mts in quarry-1B respectively. The height of each bench will be kept at 3.5 mts and width of the benches will be kept at 5.8 mts. These bench will attain the RLs as 150.5 mRL for 1st bench, 147 m RL for 2nd bench,143.5 m RL for 3rd bench, 140 m RL for 4th bench, 136.5 m RL for 5th bench, 133 m RL for 6th bench, 129.5 m RL for 7th bench while bottom most bench or 8th bench will attain 126 m RL which will be the RL of the quarry floor i.e 126 m RL.This year quarry-1A will be produce 16691 MT of chrome ore while quarry-1B will produce 15984 MT of chrome ore.

In the mining block MNOP the development work corresponds to the sections ef, gh in quarry 2A and ij and kl in quarry 2B. During this year ten benches will be developed as 1st, 2nd, 3rd 4th, 5th,6th,7th, 8th, 9th & 10th benches from top to bottom will be pushed towards north-south direction with a distance of 120 to 140 meters in quarry 2A and 80 to 127 meters in quarry 2B. The RL of the quarry floor for both the quarries will be 133 mts. This year quarry 2A will produce 35946 MT and quarry 2B will produce 18200 MT of chrome ore.

Mr. H. K. SAHOO

During this year the total production of chrome ore from different pit will be 86821 MT. The generation of overburden and intraburden will be around 109968 cum and 181901 cum respectively. This year the generation of top soil will be 5718 cum.

DEVELOPMENT DURING 4th YEAR: -

In the mining block ABCD the development work in the 4th year corresponds to the section cd for quarry-1-B only. There will be no production in quarry-1A in this year. During this year ten benches will be developed as 1st , 2nd , 3rd 4th , 5th ,6th ,7th , 8th , 9th & 10th benches from top to bottom will be pushed towards north-south direction with a distance of 102 mts in quarry-1B. The height of each bench will be kept at 3.5 mts and width of the benches will be kept at 5.8 mts. The bottom most bench or 10th bench will attain 119 m RL which will be the RL of the quarry floor i.e 119 m RL. This year quarry-1B will be produce 25880 MT of chrome ore.

In the mining block MNOP the development work corresponds to the sections ef , gh in quarry 2A and ij and kl in quarry 2B. During this year twelve benches will be developed as 1st , 2nd , 3rd 4th , 5th ,6th ,7th , 8th , 9th ,10th, 11th & 12th benches from top to bottom will be pushed towards north direction with a distance of 145 to 160 meters in quarry 2A and 105 to 150 meters in quarry 2B. The RL of the quarry floor for both the quarries will be 126 mts. This year quarry 2A will produce 44652 MT and quarry 2B will produce 16968 MT of chrome ore.

During this year the total production of chrome ore from different pit will be 87508 MT. The generation of overburden and intraburden will be around 96339 cum and 224659 cum respectively. This year the generation of top soil will be 7699 cum.

DEVELOPMENT 5TH YEAR-

There will be no development in the mining block-ABCD for 5th year.

In the mining block MNOP the development work in the 5th year corresponds to the sections ef , gh in quarry 2A and mn in quarry 2B. During this year thirteen benches will be developed as 1st , 2nd , 3rd 4th , 5th ,6th ,7th , 8th , 9th ,10th , 11th ,12th & 13th benches from top to bottom will be pushed towards north direction with a distance of 170 to 180 meters in quarry 2A and 140 meters in quarry 2B. The RL of the quarry floor for both the quarries will be 119 mts. This year quarry 2A will produce 47896 MT and quarry 2B will produce 46200 MT of chrome ore.

Mr. H. K. SAHOO
ROP/CAL/257/97-A

During this year the total production of chrome ore from different pit will be 94096 MT. The generation of overburden and intraburden will be around 85868 cum and 265620 cum respectively. This year the generation of top soil will be 5436 cum.

b) Details of Quantum of Development: -

The details about quantum development and production and grade wise production of chrome ore has been given in table 4.5 and 4.6 repectively.

c) Composite Year Wise Development Plan And Section: -

The composite year wise development plans and sections are provided in plate No. IV,IV(A) & IV(B).

d) Proposed Pit Lay Out: -

The proposed pit layout, dumps and ore stack are shown in the environment management plan, which is earmarked as plate No.VII.

e) Proposed rate of production when the mine is fully developed and the expected life of the mine:-

The proposed rate of production for chrome ore has been kept at 84000 MT per annum. During 1st year, there may be a deviation in proposed production as the mine will be newly developed. However this can be achieved during 2nd or 3rd year of operation. The mineable reserve of chrome ore comes around 1727857 MT. Keeping the proposed production target at a rate of 84000 MT per annum, the expected life of the mine would be around 21 years.

f) Conceptual Mining Plan: -

Since this is a fresh grant of lease for a period of 20 years, the proposed mine planning has been projected for a period of 5 years (1st year to 5th year) and conceptual mine planning is envisaged up to the end of the life of mine. Conceptual plan of the mine at the end of life of mine has been shown in Plate no VIII. The lease area has not been explored completely. Out of 155.537 hectares, around 77.139 hectares have been explored and during the plan period 47.447 hectares will be explored and the balance 30.951 hectares will be explored during conceptual period of mining. The exploration will be conducted during 6th year of mining in the form of DTH holes of 40 mts deeply each and which will be completed in the 2nd plan period. During plan period of first five year exploration will be conducted to prove the deposits further where by life of the mine will increase and in that case the conceptual plan as shown in Plate VIII will be changed. In addition to 20 bore holes during plan period of 1st five-year exploration, another 5 bore holes has been suggested for conceptual period i.ePBH $_{21}$ to PBH $_{25}$, the results of which will be helpful to ascertain the ore body as well as further reserve in and around contact zone and also will be helpful to study the ground water condition.

Mr. H. K. SAHU
RQP/CAL/257/97-A

Mining: - (During Conceptual period)

During conceptual periods, extraction will be from the mining block from sixth year onwards subsequent depth ward would continue to be mined in the block sustaining the production of 84000 MT/year. During the conceptual period of mining the over burden, intraburden, topsoil are likely to be generated as 450992 Cu.m., 3095276 Cu.m and 121492 Cu.m respectively. The ROM ore will be produced around 482380 Cu.m. The top soil will be stacked separately and may be utilised in future. But the total quantity of waste to be handled during conceptual period will be around (450992 Cu.m + 3095276 Cu.m.) = 3546268 Cu.m. The ore: waste ratio for mine during conceptual period comes around 1:7. Total 1299488 MT of saleable ore will be produced during the conceptual period. Total 33 no of benches will be developed and worked. Mining operation will continue up to RL 557 which will also be conceptual pit floor RL (Ref. Table 4.7,4.8,4.9,& 4.10)

Ultimate limits of pit

The mining would be done up to the possible reserve limits. Therefore, possible depth and possible zones are the ultimate pit limit. In conceptual section Plate VIII (a) to VIII(d) referring to the section 6-6', 7-7', 8A-8B, 9A-9B, 8-8' ,9-9' ,10-10',11-11',12-12'& 13-13'. The mining would continue up to 57 RL in each section. By joining the pits in each section, the pit or quarry becomes larger at surface and pit & quarry thus formed given in Plate No. VIII and over all pit slopes will be 30°. The quarry 1A and quarry 1B will be merged to a single quarry i.e quarry-1 and similarly quarry 2A and quarry 2B will be merged to a single large quarry i.e quarry-2. Besides these another quarry will be developed and which may be noted as quarry-3. The ultimate pit bottom RL of quarry-1 will be 117 mts above MSL and ultimate dimension of pit would be 85m x 28m x 38m.The ultimate pit bottom RL of quarry-2 will be 57 mts above MSL where the ultimate dimension of the pit would be about 155m x 73m x 115.5m. The ultimate pit bottom RL of quarry-3 will be 115 mts above MSL where the ultimate dimension of the pit would be about 67.5m x 22.5m x 35m.

Reclamation

The total estimated removal of over burden and waste from the mining during conceptual period is 450992+ 3095276 = 3546268 Cu.m. The rejects removed during conceptual period would be stacked to height up to 15m from the surface with repose of angle 37½ °. Once the ore is exhausted from the mining block the waste so stacked would be used in refilling the void generated during proposed as well as conceptual period. The mine planning had been

suggested from the top down wards so the excavation top benches may not available immediately for reclamation. Since this is a fresh mining, so no reclamation proposed has been provided during proposed plan period. During second five year of conceptual mining period, reclamation proposal will be provided and the mined out areas may be back filled and reclaimed completely at the end of the life of mine. Over the reclaimed mined out areas, plantation will be done. If any mine out areas could not attain the normal ground level then no void space will be left as such but that will be marked and fended with barbed weir. This can be used as a reservoir or pisciculture may be initiated. The non-active positions of the dump will be provided with a barrio wall of 3 mts height and slope stabilisation can be achieved by plantation.

But due to mining activities there will be degradation in land and the post mining land use will be as follows:

Final Land Use :

SLNo	Land Use Patten	Area in Hect (At the end of life of mine)
1	Quarry or mining	38.257
2.	Dumping	28.480
3.	Top soil stack	7.120
4.	Ore stack/mineral storage	12.824
5.	Site services	0.890
6.	Roads	16.099
7.	Green belt/safety zone	18.520
8.	Nala	2.396
9.	Future Exploration	30.951
	Total	**155.537 Hects.**

(i) Production of ore, waste, overburden and sub grade during conceptual period: -

The conceptual mining plan period will produce 1717482 MT of ore, 450992 Cu.m overburden and 3095276 Cu.m of intraburden (Ref. Table 4.7, 4.8 and 4.9). During this period 121492 Cu.m of topsoil will be generated (Ref table 4.10).

Mr. H. K. SAHOO
RQP/CAL/257/97

ii) Solid waste management: -

In chromite mine the generation of solid waste is much higher as the band continues depth ward. To attain the production lateral extension is required and as a result of which intraburden generation is maximum. So the total generation of waste is much higher and accordingly the dumping activities covering maximum area than mining.

For solid waste disposal, the dump yards suggested for the remaining period may be utilised for further dumping over terracing. Besides these number of ultimate dumps have been suggested in different party of the lease area.

(iii) Environmental Aspects: -

There will be no appreciable impact on environment, as this is a proposed mining project. However the land degraded during conceptual period of mining by creating quarry/void should be back filled at the end of life of mine. Efforts should be made to bring the land back to the normal ground level over which afforestation should be done to maintain the prevailing environment condition. If it could not be attended then void will remain as shallow pond where pesiculture may be practiced for best utilization of land during post mining period. There will be no effect on air, water and noise as the present mining method will be adopted as open cast manual mining method.

g. Open Cast Mines: -

i). Proposed method of mining: -

The open cast mining method will adopted for this mines. The mode of working will be semi-mechanised will the help of excavator, compressor, J.H.drills, trucks and dumpers. The over burden will be cleared by excavator, dumper combination and with the help of drilling and blasting where ever required. Transportation of over burden will be done completely by mechanized method and will be dumped in the dumping yard. The dump yards are proposed at split locations near each individual mining face. This will facilitate easy back filling and afforestation of the mined out areas. The residential and non-residential and ancillary structure have been placed at safer distance to keep the permanent structure away from the active mining site.

ii) Open cast working with mine lay out: -

In the proposed quarry, the successive benches will be developed at maximum vertical separation of 3.5 mt with the floor of the bench arranging in width at 5.8 mt. The lay out plan.

Mr. H. K. SAHOO
RQ (ICAL)257/97-A

and advancement of faces etc during the period of 5 years in the target area have been shown through plans and sections. (Ref plate No. IV, IV(A) and IV(B)).

h) Extent of mechanisation: -

The mine will be a semi mechanized one. As proposed, the overburden will be handled by mechanized method, transport of mine out chromite ore will also be done by dumpers. As both the ore and overburden zone are soft and partially weathered, can be excavated directly by hyd-excavator without drilling and blasting.

The different types of machineries their size and operation programme for both manual and mechanized method of mining proposed to be adopted for this mine are as follows. Besides this equipment required for ancillary mining work is also suggested.

Requirement of machinery

Considering the nature of overburden and the ore to be removed it is proposed to deploy 1cum. capacity Hyd-Excavator overburden, and 10-tone tippers combination to excavation and transport the chromite ore will be excavated ore and the rejects within the chromtie ore will be excavated manually, which will be transported by 10-tone tippers. The calculation showing the number and capacity of different type of machineries are as under.

1. Hyd Excavator 1 Cum capacity.

Average cycle time (120° slue) = 22 seconds

No. of cycle per hour taking effective

Working 50 minutes per hour = $\frac{50 \times 60}{22}$ =136

Bucket capacity 0.95 Cu.m

Bucket fill factor 0.85 cum

Hourly production = 136 x 0.95 x 0.85 = 109.8 tones

Hourly production = 109.8 x 1.5 = 164.7 tones

For working purposes 140 tones has been considered as standard.

Production per shift 140 x 5 = 700 tones.

In two shift one excavator cab handle 1400 tones.

Total quantity of overburden & waste to be handle by mechanized means in first 5 years is 2054710 Cum. Maximum quantity of overburden & waste to be handle in a year is 410942 Cum.

No working days available /excavator 225 days.

Rate of overburden handling by excavator 700M.T/shift

Quantity of material to be handle/per day = $\frac{410942}{225}$ =1826.4 Cum

No. of excavator required = $\frac{1826}{1400}$ = 1.3 nos. / days.

2. 10-Tippers to be loaded by 90-ck excavator

Average speed with load	-	20Kms/Hr
Average speed when empty	-	30 Kms/Hr
Loading time	-	3 min
Unloading time	-	1 min
Travel time to cover 2 km haul	-	5min
Distance		
Total time cycle	-	9 minutes

For calculation purpose one cycle durations is consideration to be 10 minutes, with filling factor 0.8 one 10-tones tipper can carry 8 tones.

Hourly transportation of overburden = $\frac{60}{10}$ x 8 = 48 tones

Considering 5 hours working shift, a dumper can transport =240 tones/shift

No. of tippers required to meet the 700 Tones. Production capacity of excavation per shift 700

$\frac{}{240}$ = 2.91 Nos.

3. Requirement of Machinery for manual working

Total quantity of rejects within chromite ore band	-	2054710 Cum.
Total volumeof chromite ore to be removed in first 5 years	-	167661Cum.
Maximum quantity of chromite and rejects to be handled in a year	-	444474 Cum
Considering 275 manual working days in a year. Material required to be handled per day	-	1616 Cum

No. of trips a dumper can make per day when loaded by manual means -

20 trips

Quantity of material to be transported by one tripper in a day - 10 x 20x 0.8 = 160 tones

Mr. H. K. SAHOO

Total no. of ten tones tippers required for manual working = $\frac{1616}{160}$ = 10.1 nos.

List of machineries to be available for operation		Total no. of machineries required considering 70 % utilization
1 cu.M Excavator 1.3 Nos.		2 nos (1+1 stand by)
10 MT tipper for machanised working	9 Nos	11 nos.
185-200 H.P Bull Doxer	1 nos	1 nos.
10 MT tipper manual working	10.1 nos	10nos.
Associated machinery		
Jack hammer	1 nos	1nos.
Water tanker 200 gln/cap)	1 nos.	1 nos.
Diesel tanker (200 gln/cap)	1 nos.	1nos.
Diesel jeep	2 nos.	2nos.
Ambulance	1 nos.	1 nos.
School bus	1 nos.	1 nos.
Explosive van	1 no.	1no.

Mr. H. K. SAHOO
OFFICIAL

Table No-4.1
GENERATION OF TOP SOIL DURING PROPOSED MINING PERIOD.

Year	Section Considered.	C/s Area in Sq.mt.	Length of influence in Mt.	Volume in Cum	TOTAL in Cum.
1st	ab	41	80	3280	17100
	cd	20	100	2000	
	ef	35	80	2800	
	gh	45	96	4320	
	ij	20	100	2000	
	kl	36	75	2700	
2nd	ab	11	80	880	12922
	cd	9	100	900	
	ef	14	80	1120	
	gh	82	96	7872	
	ij	11	100	1100	
	kl	14	75	1050	
3rd	ab	11	80	880	5718
	cd	11	100	1100	
	ef	11	80	880	
	gh	10.5	96	1008	
	ij	11	100	1100	
	kl	10	75	750	
4th	cd	11	100	1100	7699
	ef	47	80	3760	
	gh	9	96	864	
	ij	10	100	1000	
	kl	13	75	975	
5th	ef	11	80	880	5436
	gh	11	96	1056	
	mn	70	50	3500	
				Total	48875

Mr. H. K. SAHOO
RO(GEOLOGY)

Table No-4.2

GENERATION OF OVERBURDEN DURING PROPOSED MINING PERIOD.

Year	Sections	C/s Area in Sq.mt.	Length of Influence in Mt.	Volume in Cum	TOTAL
1st	ab	426	80	34080	614528
	cd	301	100	30100	
	ef	230	80	18400	
	gh	738	96	70848	
	ij	195	100	19500	
	kl	5888	75	441600	
2nd	ab	147	80	11760	172302
	cd	308	100	30800	
	ef	320	80	25600	
	gh	577	96	55392	
	ij	306	100	30600	
	kl	242	75	18150	
3rd	ab	120	80	9600	109968
	cd	248	100	24800	
	ef	69	80	5520	
	gh	238	96	22848	
	ij	304	100	30400	
	kl	224	75	16800	
4th	cd	248	100	24800	96339
	ef	85	80	6800	
	gh	234	96	22464	
	ij	227	100	22700	
	kl	261	75	19575	
5th	ef	84	80	6720	85868
	gh	238	96	22848	
	mn	1126	50	56300	
				Total	**1079005**

Table No-4.3

GENERATION OF INTRABURDEN DURING PROPOSED MINING PERIOD.

Year	Sections	C/s Area in Sq.mt.	Length of Influence in Mt.	Volume in Cum	TOTAL
1st	ab	211	80	16880	83885
	cd	3	100	300	
	ef	523	80	41840	
	gh	165	96	15840	
	ij	2.5	100	250	
	kl	117	75	8775	
2nd	ab	402	80	32160	170765
	cd	124	100	12400	
	ef	446	80	35680	
	gh	450	96	43200	
	ij	96	100	9600	
	kl	503	75	37725	
3rd	ab	500	80	40000	181901
	cd	124	100	12400	
	ef	477	80	38160	
	gh	446	96	42816	
	ij	237	100	23700	
	kl	331	75	24825	
4th	cd	423	100	42300	224659
	ef	682	80	54560	
	gh	644	96	61824	
	ij	287	100	28700	
	kl	497	75	37275	
5th	ef	885	80	70800	265620
	gh	695	96	66720	
	mn	2562	50	128100	
				Total	926830

Mr. H. K. SAHOO
TROPICAL

Table No. - 4.4

YEAR WISE PRODUCTION OF CHROME ORE

Year	Quarry With R.L.	Section Considered	Grade	C/S Area (in Sq. m)	Length of Influence (in mm)	Volume (in Cu m)	Tonnage Factor	Recovery Factor	Reserve (in MT)
1st Year	1-A, RL=140	ab	I	51	80	4,080	3.8	0.8	12,403
			III	35	80	2,800	3.0	0.8	6,720
	1-B, RL=140	cd	I	09	100	900	3.8	0.8	2,736
			III	05	100	500	3.0	0.8	1,200
	2-A, RL=140	ef	I	12	80	960	3.8	0.8	2,919
			II	33	80	2,640	3.2	0.8	6,758
			III	39	80	3,120	3.0	0.8	7,488
	2-A, RL=147	gh	II	45	96	4,320	3.2	0.8	11,059
			III	22	96	2,112	3.0	0.8	5,069
			IV	13	96	1,248	2.8	0.8	2,796
	2-B, RL=147	ij	IV	12	100	1,200	2.8	0.8	2,688
	2-B, RL=147	kl	IV	53	75	3,975	2.8	0.8	8,904
								Total	**70,740**
2nd Year	1-A, RL=133	ab	I	53	80	4,240	3.8	0.8	12,890
			III	43	80	3,440	3.0	0.8	8,256
	1-B, RL=133	cd	I	21	100	2,100	3.8	0.8	6,384
			III	11	100	1,100	3.0	0.8	2,640
	2-A, RL=140	ef	I	12	80	960	3.8	0.8	2,919
			II	32	80	2,560	3.2	0.8	6,554
			III	38	80	3,040	3.0	0.8	7,296
	2-A, RL=140	gh	II	41	96	3,936	3.2	0.8	10,076
			III	16	96	1,536	3.0	0.8	3,686
			IV	08	96	768	2.8	0.8	1,720
	2-B, RL=140	ij	IV	11	100	1,100	2.8	0.8	2,464
	2-B, RL=140	kl	IV	83	75	6,225	2.8	0.8	13,944
								Total	**78,829**

M.K. SAHOO

INDIAN BUREAU OF MINES, GOVT. OF INDIA, BHUBANESWAR

Table No. - 4.4(CONTD.)

Year	Quarry With R.L.	Section Considered	Grade	C/S Area (in Sq. m)	Length of Influence (in mm)	Volume (in Cu m)	Tonnage Factor	Recovery Factor	Reserve (in MT)
3rd Year	1-A, RL=126	ab	I	41	80	3,280	3.8	0.8	9971
			III	35	80	2,800	3.0	0.8	6,720
	1-B, RL=126	cd	I	36	100	3,600	3.8	0.8	10,944
			III	21	100	2,100	3.0	0.8	5,040
	2-A, RL=133	ef	I	12	80	960	3.8	0.8	2,919
			II	35	80	2800	3.2	0.8	7,168
			III	41	80	3,280	3.0	0.8	7,872
	2-A, RL=133	gh	II	39	96	3,744	3.2	0.8	9,585
			III	29	96	2,784	3.0	0.8	6,682
			IV	08	96	768	2.8	0.8	1,720
	2-B, RL=133	ij	IV	10	100	1,000	2.8	0.8	2,240
	2-B, RL=133	kl	IV	95	75	7,125	2.8	0.8	15,960
								Total	**86,821**
4th Year	1-B, RL=119	cd	I	52	100	5,200	3.8	0.8	15,808
			III	42	100	4,200	3.0	0.8	10,080
	2-A, RL=126	ef	I	12	80	960	3.8	0.8	2,919
			II	48	80	3,840	3.2	0.8	9,830
			III	72	80	5,760	3.0	0.8	13,824
	2-A, RL=126	gh	II	45	96	4,320	3.2	0.8	11,060
			III	23	96	2,208	3.0	0.8	5,299
			IV	08	96	768	2.8	0.8	1,720
	2-B, RL=126	ij	IV	12	100	1,200	2.8	0.8	2,688
	2-B, RL=126	kl	IV	85	75	6,375	2.8	0.8	14,280
								Total	**87,508**

Mr. H. K. SAHOO
RQPICA L/257/97

INDIAN BUREAU OF MINES, GOVT. OF INDIA, BHUBANESWAR

Table No. - 4.4(CONTD.)

Year	Quarry With R.L.	Section Considered	Grade	C/S Area (in Sq. m)	Length of Influence (in mm)	Volume (in Cu m)	Tonnage Factor	Recovery Factor	Reserve (in MT)
5th Year	2-A. RL=119	ef	I	12	80	960	3.8	0.8	2,919
			II	41	80	3,280	3.2	0.8	8,397
			III	61	80	4,880	3.0	0.8	11,712
	2-A. RL=119	gh	II	67	96	6,432	3.2	0.8	16,466
			III	29	96	2,784	3.0	0.8	6,682
			IV	08	96	768	2.8	0.8	1,720
	2-B. RL=119	mn	IV	275	100	20,625	2.8	0.8	46,200
								Total	**94,096**
								Grand Total	***4,17,994***
								Average	***83,598.80***

Mr. H. K. SAHOO
ROPICAL/25/97.

GOVT. OF INDIA ★ INDIAN BUREAU OF MINES, BHUBANESWAR

Table: 4.5
Details of Quantum of Development And Production of Chrome Ore

Year	Top Soil in Cu m	Overburden in Cum	Interburden in Cum	Total Waste (Col.3+Col.4) in Cum	ROM Ore in Cum	Salable Ore in MT	Ore: Waste
1	2	3	4	5	6	7	8
1st	17,100	6,14,528	83,885	6,98,413	27,855	70,740	1:25
2nd	12,922	1,72,302	1,70,765	3,43,067	31,005	78,829	1:11
3rd	5,718	1,09,968	1,81,901	2,91,869	34,241	86,821	1:9
4th	7,699	96,339	2,24,659	3,20,998	34,831	87,508	1:9
5th	5,436	85,868	2,65,620	3,51,488	39,729	94,096	1:9
Total	**48,875**	**10,79,005**	**9,26,830**	**20,05,835**	**1,67,661**	**417994**	

Table: 4.6
Details of Grade Wise Production During Ensuing 5 Years Plan Period

Year	Grade-I	Grade-II	Grade-III	Grade-IV	Total
1	2	3	4	5	6
1st	18,058	17,817	20,477	14,388	70,740
2nd	22,193	16,630	21,878	18,128	78,829
3rd	23,834	16,753	26,314	19,920	86,821
4th	18,727	20,890	29,203	18,688	87,508
5th	2,919	24,863	18,394	47,920	94,096
Total	**85,731**	**96,953**	**1,16,266**	**1,19,044**	**417994**

Mr. H. K. SAHOO
ROP/CAL/25/1997

क्षेत्रीय खान नियंत्रक (ना. क्षे)
Regional Controller of Mines (NR)
भारतीय खान ब्यूरो
Indian Bureau of Mines
नागपुर/Nagpur
27/7/06

अनुमोदित
APPROVED

INDIAN BUREAU OF MINES, GOVT. OF INDIA, BHUBANESWAR
भारत सरकार, भारतीय खान ब्यूरो

Table 4.7
Production Of Chrome Ore During Conceptual Period

Category	Section Considered	Ore Band	Grade	C/S Area (in Sq. m)	Length of Influence (in mm)	Volume (in Cu m)	Bulk Density	Recovery Factor	Reserve (in MT)
Proved	6-6'	V	III	163	80	13,040	3.8	0.8	31,296
	7-7'	V	I	108	125	13,500	3.8	0.8	41,040
			III	128	125	16,000	3.0	0.8	38,400
	9-9'	VI	II	214	96	20,544	3.2	0.8	1,10,838
			III	00	96	00	3.0	0.8	11,981
			IV	17	96	1,632	2.8	0.8	13,332
	8A-8B	V	II	87	125	10,875	3.2	0.8	27,840
			III	841	125	1,05,125	3.0	0.8	2,52,300
	9A-9B	V	I	36	96	3456	3.8	0.8	44,943
			III	23	96	2,208	3.0	0.8	23,501
	11-11'	VI	IV	1,004	75	75,300	2.8	0.8	1,68,672
	12-12'	VI	IV	846	60	50,760	2.8	0.8	1,13,702
	13-13'	VI	III	16	40	640	3.0	0.8	1,536
				Total	**3,13,080**				**8,79,381**

Mr. H. N. SAHOO
RQP/CAL/257/97-R

INDIAN BUREAU OF MINES, GOVT. OF INDIA, BHUBANESWAR

Table 4.7 (Contd.)

Category	Section Considered	Ore Band	Grade	C/S Area (in Sq. m)	Length of Influence (in mm)	Volume (in Cu m)	Bulk Density	Recovery Factor	Reserve (in MT)
Probable	6-6'	V	III	86	80	6,880	3.8	0.8	16,512
	7-7'	V	I	123	125	15,375	3.8	0.8	46,740
			III	125	125	15,625	3.0	0.8	37,500
	8-8'	VI	I	07	175	1,225	3.8	0.8	3,724
			II	41	175	7,175	3.2	0.8	18,368
			III	36	175	6,300	3.0	0.8	15,120
	9-9'	VI	II	155	96	14,880	3.2	0.8	38,093
			IV	07	96	672	2.8	0.8	1,505
	10-10'	VI	IV	14	100	1,400	2.8	0.8	3,136
	11-11'	VI	IV	208	75	15,600	2.8	0.8	34,944
	12-12'	VI	IV	140	60	8,400	2.8	0.8	18,816
	13-13'	VI	III	14	40	560	3.0	0.8	1,344
					Total	**94,092**		**Total**	**2,35,802**
Possible	8-8'	VI	I	18	175	3,150	3.8	0.8	9,576
			II	74	175	12,950	3.2	0.8	33,152
			III	110	175	19,250	3.0	0.8	46,200
	9-9'	VI	II	159	96	15,264	3.2	0.8	39,076
			III	75	96	7,200	3.0	0.8	16,819.20
			IV	06	96	576	2.8	0.8	1,290
	10-10'	VI	IV	22	100	2,200	2.8	0.8	4,928
	11-11'	VI	IV	190	75	14,250	2.8	0.8	31,920
	13-13'	VI	III	14	40	560	3.0	0.8	1,344
					Total	**75,208**			**1,84,305.20**
					Grand Total	***4,82,380***			***17,17,482***

Mr. H. K. SAHOO
ROPICAL/257/97

INDIAN BUREAU OF MINES, GOVT. OF INDIA, BHUBANESWAR

Table No-4.8

GENERATION OF OVERBURDEN DURING CONCEPTUAL PERIOD.

Sections Considered	C/s Area in Sq.mt.	Length of Influence in Mt.	Volume in Cum
66'	170	80	13600
77'	250	80	20000
88'	736	80	58880
99'	1552	96	148992
8A8B	6	100	600
9A9B	238	100	23800
1010'	812	50	40600
1111'	288	75	21600
1212'	1520	70	106400
1313'	413	40	16520
		Total	**450992**

Table No-4.9

GENERATION OF INTRABURDEN DURING CONCEPTUAL PERIOD.

Sections Considered	C/s Area in Sq.mt.	Length of Influence In Mt.	Volume in Cum
66'	737	80	58960
77'	271	80	21680
88'	7303	80	584240
99'	5286	96	507456
8A8B	1	100	100
9A9B	188	100	18800
1010'	3723	50	186150
1111'	1214	75	91050
1212'	21668	70	1516760
1313'	2752	40	110080
		Total	**3095276**

Mr. H. K. SAHOO
TROPICAL/257197-A

Table No-4.10

GENERATION OF TOPSOIL DURING CONCEPTUAL PERIOD.

Sections Considered	C/s Area in Sq.mt.	Length of Influence in Mt.	Volume in Cum
66'	21	80	1680
77'	24	80	1920
88'	340	80	27200
99'	307	96	29472
8A8B	3	100	300
9A9B	14	100	1400
1010'	55	50	2750
1111'	20	75	1500
1212'	593	70	41510
1313'	344	40	13760
		Total	**121492**

Mr. H. K. SAHOO
ROP/CAL/257/97-A

5.0 BLASTING

As evidenced from the borehole cores and excavation data, the overburden of this area mainly consists of soft soil, lateritic soil laterite and weathered ultramafics consisting of limonitic rocks with quartz and cherty materials. The chromite ore is also soft and friable in nature.

The overburden is planned to be excavation directly by hydraulic excavators. So, no systematic & regular drilling and blasting is proposed to be done in this area. In case of occurrence of large boulders of relict unaltered ultramafics of quartzitic rocks boulders which cannot be handled directly by machines, controlled blasting methods like jack hammer drilling with muffle blasting or plaster shooting will be adopted. The explosives will be brought from the magazine of the adjacent lease of the applicant.

The nature of blasting and amount of explosives to be used shall be suitable selected which will not cause ground vibration of any adverse frequency. Throw of rocks will be almost negligible and to a very limited distance, which will not affect the safety of area. However, to check air vibration, proper plastering by clayey materials and other such protective measures will be adopted. Besides the methods like mrittling and limitation of the charge quantity will also be adopted.

Mr. H. K. SAHOO
RQP/CAL/257/97-A

6.0 MINE DRAINAGE

The water of the dug well in the granted mining lease area and the water of the nearly perennial Damsala Nallah has been analyzed. The datas area as follows:

Source of water sample	Dug well	Damsal Nallah	Permissible standard.
Turbidity	9.5	120	10
PH	5.95	6.95	5.5-9
$Cr+^{6}$	0.01	0.06	0.05
Odour	Unobjectionable		
Taste	Agreeable	Agreeable	
Conductivity	70	140	

As per the analysis data, dug well water appears to be potable but the rain-wash accumulated and percolated water of the mine pits are likely to pollute the water of Damsala Nallah. It is, therefore, proposed to utilize the major portion of mine water for watering the afforestation area without any processing. The balance water will be discharged to the nearby Damsala Nallah, only after necessary processing.

The average rain fall during the year is about 1880 mm. It has been assessed that the impurity of mine water which will be discharged after necessary processing into the Damsala Nallah is also negligible. In addition to the above, as a precautionary measure it is also proposed to construct several silt dams to restrict/ check the flow of suspended material with rain wash water from the mine dump into the Damsala Nallah.

HKSahoo

Mr. H. K. SAHOO
ROPICAL/257/97-A

7.0 DISPOSAL OF WASTE

The waste rock is mainly composed of top lateritic soil laterites and weathered ultramafics. The quantities of waste rock likely to be generated in different years are as per the statement given below;

Years mining	Soil in Cu.m	Overburden in Cu.m	Interburden waste in Cu.m
1st year	17100	614528	698413
2nd year	12922.	172302	343067
3rd year	5718	109968	291869
4th year	7699	96339	320998
5th year	5436	85868	351488
	48875	**1079005**	**2005835**

Separate dump yards are earmarked for dumping different type of overburden. The top soil will be stored in a separate place so that it can be utilized to provided a top cover over the back filled areas after reclamation. The overburden and intraburden removal during the initial 5 years has been planned to dump over an area of 60000 sq.mt. The dumps will be purely for a overburden and designed to be located in northwest part of the lease area and non-mineralized zone. An other dump has been proposed to dump intraburden waste covering an area of 37500 sq,mt in north eastern part of the lease area. Besides these, if nickeliferous limonite is found in the waste material then the provision for separate dumping will be arranged in due course of time. However afforestation programme has been planned out in compacted segments of the dumps. Sub grade low-grade ore which cannot be utilized directly without beneficiation, will be preserved in a separate stack. The feasibility and process of beneficiation is to be decided after pilot plant studies.

However, it is planned in such a manner that after removal of the dumps for back filling, necessary afforestation programme will be taken up. After dumping, the dump yards will be leveled by Bull Dozer. The slope of the dump will be maintained at less than the angle of repose of the weathered ultramafic in order to prevent the slide of the materials along the slope. The dimension of the dumps are as follows:

Mr. H. K. SAHOO
ROPICAL/257197-A

	Average Length	Average width	Maximum height
Top Soil Stack	246M	68M	3M
OB Dump	250M	240M	18M
Intra burden dump	300M	125M	25M
Ore stack grade I	84M	78M	3M
Ore stack grade II	78M	38M	3M
Ore stack grade III	86M	62M	3M
Ore stack grade IV	158M	122M	3M

According to geological survey of India the dumping ground is reported to be barren. The bore holes GJ-31,28,29 38,44 and 43 reveals that dumping grounds are devoid of any mineralized zone. Besides the surface geological surveys and the excavation data in pits 13,14 , 19 , 30 further justifies the non- occurrences of any mineralized zone in the areas selected for dumping.

Mr. H. K. SAHOO
ROPICAL/257/97-A

8.0 USE OF MINERAL

The chromite produced from the mine will be exclusively used for the captive ferrochrome plant of IDC of Orissa Ltd, located at Jajpur Road. This plant presently is of 10,000 tones capacity and is designed to produce low carbon ferrochromo and silico chrome. In addition to this, we have already received licence to produce 15,000 tones of high carbon ferrochrome. For production of low carbon ferrochrome, high grade lumpy/intermediate type of ores will be used, whereas for production high carbon ferrochrome the chromite fines may be used either directly of in form of briquettes.

In course of mining the low grade ore generated will be stacked separately, which will be up graded by beneficiation. Though the tentative beneficiation process has been chalked out, the most appropriate process of beneficiation will be adopted after the actual meantime necessary pilot plant studies have been taken up in our ferrochrome plant to set up a large sized briquetting plant and we have no programme of selling or exporting the chromite ore, since the entire ore produced from this mine will be utilized in our own industry.

Mr. H. K. SAHO
ROPICAL/257197-A

9.0 OTHERS

9.1 Surface Transport.

The useable chromite ore from the mine face/dump yard and from the processing plant is proposed to be transported by road with the help of suitable dumpers. The dumper will be loaded directly from the hopper and will be transported up to the factory site located at Jajpur Road. The distance from Tailangi mines up to the plant site is about 80kms.

9.2 Site Services

The location of general office, stores, workshop, power supply sub-station, first aid center and canteen will be provided. The following facilities are proposed to be provided in each of the above sections.

General office

- Office
- Time office
- Office room fro clerical staff and other assisting personnel.

Work shop

- Air compressor
- Lathe
- Radial drilling machine
- Mobile service unit
- Grease pump and washing machine, with ramp
- Welding machine (Electric and gas)
- Repairing shed
- Tools and implements as per requirement.
- Battery charger.
- Auto electrical repairing bench.
- Office and site stores.

Stores

Six separate rooms will be provided in order to facilities the storage of the following items, with provision of a open store yard.

- Oil and lubricants
- Spares and machineries

Mr. H. K. SAHOO
TROPICAL/1257/97

- General store item
- Tyre and accessories
- Store keeper's office & record room.

First aid center

To be equipped as per statutory provision.

Canteen

Separate kitchen and dining hall properly equipped to cater 100 person at a time.

9.3 Employment potential

The following personal are proposed to be employed in the first phase in order to take up mining work

-	Mines manager	:	1
-	Mining Engineer	:	2
-	Geologist	:	1
-	Mining foreman	:	3
-	Mining mate	:	6
-	Junior Engineer (Electrical)	:	1
-	Mechanical Engineer	:	1
-	Junior Engineer (Mechanical)	:	2
-	Junior Engineer (Civil)	:	1
-	Medical officer	:	1
-	Clerk cum typist	:	4
-	Accounts officer	:	1
-	Accounts clerk	:	2
-	surveyor	:	1
-	Chemist	:	2
-	Geologist Assistant	:	2
-	Mechanic	:	8
-	Helper	:	8
-	Electrician	:	3
-	Pump operator	:	3
-	Excavator /Bull Dozer operator	:	10
-	Tipper operators	:	25

-	Heavy vehicle Driver	:	8
-	Light Vehicle Driver	:	5
-	Jack Hammer operator	:	2

Mr. H. K. SAHOO
ROPICAL/257/97-A

10.0 MINERAL PROCESSING.

The gravity separation process is proposed to be adopted for beneficiation of the low grade chrome ore to be generated from this Tailangi Mines. The chrome ore will be processed in the existing processing plant of the adjacent lease of M/s.IDC Orissa Ltd,.The material is to be crushed and grounded to the size of 100 to 500 micron. The material is to be separated by primary and secondary hydrocyclones to a fine fraction ranging from –150 micron to 30 micron and to a course fraction is treated in the spiral concentrators, employing 4 stages cleaner, recleaner and scavanger. All the middling form the scavanger and a part of the middling from primary and a part from tallings are reground and recirculated through primary hydrocyclone. The fine fraction is deslimed in the secondary hydrocyclones and is processed in 3 stage spirals i.e primary cleaner and scavanger. The concentrate from cleaner is processed in sline table.

The tailings from primary spirals are dewatered in hydrocyclone before the scavanger in both the circuits. Final tailing after the scavenger from both circuits joints the over flow from secondary hydrocyclone and flow to the clarifies the water is reclaimed on the sludge is disposed off in tailings pond. Water will be reclaimed from the tailings pond.

The concentrates from the coarse and that from the fine circuits dewatered in hydrocyclone, will be dewatered in a spiral classifier and sent to piles.

Feed Preparation

ROM ore is dumped in a hopper having grizzly with 300 mm square opening. Apron feeder underneath the hopper extracts the ore from the hopper and rate of feed is controlled by variable speed. The feed passes over a wobbler feeder having 75mm opening. The high pressure water from water monitors would ensure washing and screening of the wobbler feeder and also help to extract the sticky ore form the hopper.

Cursing and Scrubbing and Screening

Over size (+75mm) from wobbler feeder is crushed by a jaw crusher to –75mm and joint the –75mm from wobbler feeder and is fed into a scrubber. The materials from the scrubber is discharged into a vibrating screen having 15mm opening and with water spray. Over size +15mm fraction is crushed in a cone crusher to – 15mm and return to the screen.

Mr. H. K. SAHOO
ROP/CAL/257/97-A

Dewatering and Stock piling

The slurry with -15mm product is pumped to a spiral classifier for dewatering the dewatered crushed product is stocked in an intermediate stock pile from which it is reclaimed with pay loader and belt conveyor.

Grinding.

The –15mm crushed product (either reclaimed from the intermediate stock pile or directly fed from the spiral classifier) is ground in a variable speed ball mill to 150-500 micron. The discharge from the grinding mill is screened in a vibratory screen bend having 0.5 mm opening oversize is recirculated to grinding mill. The ground product is pumped to beneficiation section.

Beneficiation Circuits

The ground product of primary Grinding mill is pumped to primary hydrocyclones.

Coarse

The underflow from primary hydro cyclone is pumped to coarse primary spiral the concentrate of coarse primary spirals is pumped to coarse cleaner spiral, the tailings is pumped after dewatering in hydro cyclone to coarse scavanger and the middling are recirculated. The concentrate from the coarse cleaner is pumped to coarse recleaner spirals, the tailing is recirculated to coarse primary and middling is recirculated in the same circuits. The concentrate from the coarse recleaner is pumped to spiral classifier for dewatering, tailing is recirculated to coarse cleaner and middling is recirculated in the same circuits. The concentrate from the scavanger is recirculated to coarse cleaner, the middling is pumped to regrinding mill and tailing is partly sent to regrinding mill and rest to clarifier.

Fine

The over flow from the primary hydrocyclones is pumped to secondary hydrocyclone and the over flow slimes of –30 to 40 micron size is sent to clarifier. The underflow from the secondary hydrocyclone of fine primary is pumped to fine cleaner spirals, the tailing is pumped after dewatering in hydrocyclone to fine scavanger spirals and the middling is recirculated in the same circuits. The concentrate from the fine cleaner is pumped to slime tables with provision of bypass. The tailing is recirculated to coarse primary spiral, the middling is

Mr. H. K. SAHOO
ROP/CAL/25/197-A

recircualted in the same circuit. The concentrate from slime tables is dewatered in a hydrocyclone and pumped to dewatering spiral classifier, the tailing is pumped to clarifier with a provision of partly recirculating to fine primary spiral and the middling is recirculated in the same circuit. The concentrate from fine scavanger is pumped to fine cleaner, the tailing is pumped to clarifier with a provision of partly recirculating to secondary hydrocyclone, the middling is recirculated in the same circuit.

Regrinding

A part of middling from coarse primary spiral the middling from coarse scavanger and a part of coarse tailing is reground to – 100/-150 micron in the regrind ball mill after dewatering in a hydrocyclone for proper liberation and rejoins the circuits at the primary hydrocyclone.

Concentrate

The concentrate is dewatered in the spiral classifier and is stockpiled on the ground. It will be loaded in to truck by pay loader.

Tailings

The slimes from overflow of secondary hydrocyclone and tailings from coarse and fine circuit are sent to a 48mm dia clarifier from which most of the water is reclaimed and sludge is pumped into a tailing pond. The tailing pond is formed in between overburden dumps and any over flow from it will be collected in an abandoned pit from which it will be pumped back to circuit after treatment.

Water

It is estimated that make up water required is about 150 M^3 /Hr. with the arrangement of reclaiming from tailing pond, the requirement will come down considerably. The complete requirement of water is not from the water being pumped out of quarry pits. This water will be treated is a water treatment plant before it goes to process water tank.

As indicated earlier we propose to utilize the chromite ore with + 40% Cr_2O_3 directly during first five years. The low grade ores with 10-40% Cr_2O_3 will be stacked separately and followed by a detailed beneficiation process.

PART-B

11 ENVIRONMENTAL MANAGEMENT PLAN

The main ecological imbalances that are likely to occur in this type of semi-mechanised opencast mining methods are land degradation, damage to forest growth and the problems due to solid waste disposal. In order to integrate the environmental management planning with the future mine planning with the future mine workings, it is necessary to study the existing position of environment, environmental impact assessment and the remedial measures to reduce future environmental damages. The present report covers the above aspects in the following manner.

i) Study of the existing ecosystem, which include existing land use pattern, water regime, human settlements, quality of air and water etc. (i, e base line information).

ii) Study of likely impact on environment due to proposed mining activity.

Steps for implementing corrective measures in terms of proposed land use planning by rehabilitation, consolidation of solid waste disposal and restoration measures for mined out areas.

a) Base Line Information:-

i) Land use pattern: -

Total lease area of 155.537 hects is a fresh grant lease over which mining is proposed. Most of the land is Pahar land, which are undisturbed. The topography of the area is mostly covered with lateritic and limontic soil, some of the area have moderate forest growth and the rest are being covered by agricultural lands. The area has gentle slope from North to South and coverage to Dasmala valley which is the deepest part in this region.

Water regime: -

The surface water of this region is carried through Dasmala nallah and its tributaries. The ground water level of the area is recorded in bore hole and Dug well. The water level is at a depth of 2 to 3 mtrs. during rainy season, and during summer the ground water level goes down to a depth of 8 to 10mtrs. The local habitants depend on the dug walls for drinking purposes. The water samples of both the dug well and Damsala nallah were tested by National Environmental Engineering Research Institute (NEERI) to find out the presence of different

constituents, particularly the hexavalent chromium, which is very harmful constituent. The result of the analysis are given below:

Source of water sample	Dug well	Damsala nallah	Permissionable standard
Turbidity	9.5	120	10
PH	5.95	6.95	5.5-9
Cr+6	0.01	0.06	0.05
Odour		Un-objectionable	
Taste	Agreeable	Agreeable	
Conductivity	70	140	

The above water indicates that the dug well water is quite potable whereas the Damsala Nallah water needs slight treatment.

Besides this the water of Damsala Nallah has been tested by the Directorate of Mining & Geology. The findings of test are as follows:

Ingredient tested		Sample	Number
		A	B
I	**Bacterialogical test** Coliform group of organism	Countless + 1800	Countless + 1800
II	**Chemical Test**		
	PH	7	6.5
	Cl	16	19
	Total Cl hardness	124	120
	Ca Hardness	26	24
	Mg. Hardness	98	96
	Co_3	96	92
	HeO_3	132	127
	SIO_2	40	40
	Fe_2	0.22	0.04
	PO_4	Nil	Nil
	Total Solid	118	132
	Total developed solid	108	108
	Total suspended solid	10	24

ii) Flora & Fauna

Flora: - There is no dense forest or jungle in the lease hold area. However the types of flora that are noticed in the local area such as Mango, Jamun, Sal Dhaora, Bahara, Accassia.

Mr. H. K. SAHOO
ROP/CAL/257/92

In order to fauna the following species are occasionally found.

Animals	Zoological name
Bhalu	Malursus ursinus
Bilua	Canis qurens indicus
Kattas	Riverra Zibatha
Birds	Zoological name
Baga	Gaus gaus
Bana kukuda	Galus galus
Kau	Corvus splendeus
Snake	
Dhamana	Ptyes mucosus

iv) Quality of air and water :-

The mining activity is yet to be started and there is no use of any machinery so the ambient air is free from Pollution. Due to heavy mining activities surrounding to our applied area, this region is not free of air pollution. The open cast mining will generate the fine particles which will ultimately pollute the atmosphere. Deployment of heavy transporting machineries may increase the nose level. From the studies of noise pollution it has been established that continuous exposure for a period of 8 hours to noise level not exceeding 60 dB (a) is considered safe. Considering the above requirement necessary preventive measure will be taken up to mining the noise level which will not exceed 60dB (a) during the mining or allied operations.

Since the mining has not been started so there is no noise pollution. The quality of surface water and ground weter have no impact due to proposed mining activities.

v) Climate Condition :-

The Tailangi chromite deposit being situated at highest altitude of 211 mts above the M.S.L. enjoys a temperate climate through out the year. The minimum and maximum temperature recorded in this area during winter and summer months is 10°c & 42°c. respectively. Monsoon is spread over the months of July and October. The average rainfall is approximately 1880 mm.

Mr. H. K. SAHOO
ROP/CAL/257/97-A

vi) Human Settlements: -

There are three villages such as Tailangi, Penthasahi and Balipada adjacent to this deposit. The manpower will be available from the near by villages. The major part of the working population is of mine workers category very much engaged in mining & allied activities and deal with forest products where as the other about 4%-5% of the total working population of near by villages only are cultivators and agricultural labourer.

vii) Public buildings, places and monuments :-

There are no public buildings, Structures/monuments, Place of worship, parks within the specified limits of 8-10 kms of the limits of the M.L. area.

b) Environment Impact Assessment: -

The environmental impact due to this proposed mining activity of small magnitude and which is worth consideration as because the rate of proposed production is low and is entirely by manual means with little use of machineries never the less, mining activities will cause alteration in the existing eco-system and environment to some extent during next five years as enumerated below.

i) Land area to be degraded: -

There will be change in the land use pattern during next five years because of proposed quarry. The mining operation will change the topography. The land degradation during next five years as well as at the end of life of mine will be in the following manner: -

Purpose	Area in Hects.	Area in Hects.
	At the end of plan period	At the end of life of mine
Quarrying	8.0	38.257
Dumping	8.786	28.480
Storage of top soil	0.462	7.12
Ore stack	7.776	12.824
Road	3.879	16.099
Site service & colony	0.890	0.890
Green belt/	3.072	18.520
Nala	2.396	2.396
Total	**35.261**	**124.586**

Mr. H. K. SAHOO
ROP/CAL/257/97-A

iii) Air quality: -

Due to destruction of vegetation growth by active mining and mining work, the dioxide and oxygent balance in the air environment will be affected. Beneficiation of ores may generate some dust in the process which will pollute the air. During initial 5 years of mining there is no proposal for beneficiation of low grade ore. The problem will be dealt in subsequent mining plan, in detail, after the pilot plant study is completed in collaboration with Regional Research.

Due to operation and movement of heavy earthmoving equipments the noise level of the area will be definitely raised, which will lead to automatic noise pollution of the area and the existing noise level of the area will got imbalanced. Also due to exhaust of the vehicle and heavy earthmoving equipments, there will be pollution of air due to both dust and exhaust fumes.

iv) Water quality :-

The water environment of an area get affected mostly in two ways;

1. effect on the ground water and
2. effect on the surface run of water.

The Damsala nallah and the Tailangi Nallah (which is a tributary of Damsala Nallah) forms the promitent drainage system of the area. This is a seasonally flowing nallah. Except in rainy season the quantity of water flow in the nallah is very much scanty. The mining methods suggested for this area will neither obstruct the nallah nor there is proposal for diversion of the same. The proposal has been made to discharge the mine water and the water of the beneficiation plant into the Tailangi Nallah. This water will deteriorate the quality of the water of both Tailangi and Damsala Nallah. This will cause the silting of the water stream in addition to the run off water being affected by the polluting agents of the water to be discharged into this.

In the first phase it has been planned to develop the mine up to a depth of 40 mtrs Because of deep mining and dewatering of the accumulated water, there is likely hood of fall in the ground water level of the area. but as the rock of this area is not permeable in nature, the affect of dewatering will be localized and will not affect the ground water of the entire area.

Mr. H. K. SAHOO

There is no such picnic spot place of tourist interest wild life park, temple or national monument in this area. so the effect of mining such structure does not arise.

iv) Noise and vibration :-

The impact of the noise and vibration in the area will also be negligible because no heavy earth moving machineries will be used during proposed plan period.

v) Water regime: -

Since the water table is laying much below the proposed quarry floor so there will be no impact of the water regime. Also there is no pumping or industrial use of water so the impact on the water regime is nil.

v) Socio-economics: -

Two villages are coming within our proposed Tailangi Mining lease area. The land is covered with mostly forest growth. The cultivable land is very much scanty and the same is also rain-fed. The area is surrounded by active mines, where the people of this locality gets scope for engagement in the present active mines. As such by developing this mine and the degradation of the area will not create any socio-Economic imbalance.

The health environment of an area is directly influenced by the intensity of pollution made in land, water and air environment. As described, there is possibility of affect of dust on the residential area due to close proximity of the dump and the mine pits.

The mine is situated at a upper proximity of the drainage system of this area. in the down stream the water is being utilized by the colony residents of Kaliapani mine workers, after due beneficiation and processing. So, the discharge of any harmful ingredients into the run-off water stream may cause problem to the users at the down stream.vii)

Historical monuments :-

Since the historical monuments, and public buildings are situated in far away from the this area, so there will be no impact on these due to this proposed mining activity

Mr. H. K. SAHOO

c) Environmental Management Plan: -

In order to minimise the effects of proposed mining on the local environment, the following measures are to be taken care of.

i) Temporary storage and utilisations of topsoil: -

During plan period 48875 Cum of top soil will be generated (Ref Table-4.1) which will be stored at the proposed top soil stack covering an area of 4620 sq mt for future use.

ii. Proposal for reclamation of land affected by mining: -

The following measures are proposed to be adopted to mitigate the environmental degradation The initial pit proposed within the lease area extends over an area about 8.0 hectares. The overburden to ore ration in this areas is 1:7. At the initial stage the mine is proposed to be excavated up to a depth of 40mtrs. The dumps are designed to facilitate back filling of the material after the mine is abandoned and to restore the area by the process of reclamation. The dumps covers an area of 8.786 hects. The area affected by active mining and by dumping of overburden will be restored immediately after the exhaust of the ore of one locality within the area.

Besides this, an area of 0.89 hectares will be blocked for construction of ancillary structure, residential and non-residential buildings.

The dumping of overburden will be done at phase wise manner. The maximum height of the dump will be 20 mtrs while dumping the yard will be started from the periphery of the yard and the dumps will be of retreating type so that the same will get stabilized and will act as natural barrier.

Weathered ultramafics and top will be dumped in separate stacks to facilitate proper back filling of the area in desired sequences.

The part of stabilized dump and the slope of the dump yards will be thickly guarded with heavy variety of grasses like Agav Sisalana. This will help to stabilize the slope and will protect erosion from dump yards.

Mr. H. K. SAHOO
ROP/CAL/257/97-A

A check dam is provided to prevent free flow of spating water of Damsala nallah into the quarry area during heavy rain fall days case the nallah overflows. A barrier has been maintained between earth/dump yard and Tailangi nallah in which grass plantation will be done, to check the flow of rain was sediments into the nallah.

vi) Programme of afforestation: -

Since this is a fresh grant of lease area, the mining operation will be taken place in near future, so the plantation proposal has been provided along to maintain the eco-system and the slope of the stabilised dump. Other parts of the area remaining virgin have considerable forest growth.

The plantation programme is planned to be taken up along with mining operation in a systematic manaer. Ther detail programme for plantaion is as follows;

अनुमादित
APPROVED

Table No:-11.1

YEAR WISE AFFORESTATION PROGRAMME.

Year	Area in hects.	No. of saplings	Species
1st	0.620	1550	Sal, Asan, Cashew, Acacia, etc.
2nd	0.623	1558	-do-
3rd	0.600	1500	-do-
4th	0.626	1565	-do-
5th	0.603	1507	
Total	**3.072**	**7680**	

27/7/06
क्षेत्रीय खान नियंत्रक (ना.क्षे)
Regional Controller of Mines (NR)
भारतीय खान ब्यूरो
Indian Bureau of Mines
नागपुर/Nagpur

Provision for protection and proper growth of the plants.

Will be adopted as follows:

1. Selection of proper species for getting optimum successful plants.
2. Separate plant nursery to generate seedings suitable to different areas.
3. Preparation of pits before plantation by sun drying burning and by applying proper manner.
4. Regular watering by permanent nallah interval.

Mr. H. K. SAHOO
TROPICAL

5. Application of pesticides at proper interval.
6. Trimming and mainating branches.
7. Protecting the area by a peripheral trench.
8. Maintaining a fire line around the plantation area of 10 mtrs. wide which is to be cleaned prior to summer season.

(a) As suggested a Key Plan within 5Kms from the lease hold area has been furnished giving location of the villages plan.The socio-economic & demographic profile of these local inhabitants are provided in table no-11.2.

vii) Stabilisation and vegetation of dumps: -

A retaining wall of 3 mts height along the periphery of dump will be constructed and which will act a check dam to prevent any wash offs from the dump. So also plantation will be done around the non-active potion of dump slopes to stabilized it. A garland drain with setting tank will be provided around the check dam for free passage of surface run off.

viii) Treatment and disposal water from mine: -

The rain wash accumulated water and percolated water in the mine pit and the waste water from the beneficiation are likely to pollute the water of Damsala nallah. It is therefore proposed to utilize the major portion of mine water for watering the afforestation without any processing . The balance water of mine will be discharged to near by Damsal nallah only after necessary processing. However the waste water discharged from the beneficiation plant needs proper treatment before discharging in to the Damsala nallah. For this purpose it has been proposed to chanalise the same through the settling tank. Two tanks will be filled alternatively and the water will be stored for a considerable time for without sediments will be discharged to Damsala nallah by a properly designed sluice system and the 3rd settling tank will be kept as stand by to meet the requirement while maintenance work of other tanks are under taken.

As the analysis of water indicates, which has been collected from different sources, the dug well water is quite potable. So it is proposed to supply water to the colony by digging a sufficient number of wells. However, if the dug well water will be insufficient, the only. Alternative sources is to us to Damsala Nallah water or the mine discharge water. In such case the water is to be perfectly treated to make it free from both suspended and soluble impurities.

From the analysis data it is indicated that the hexavalent chromium as soluable impurity is the harmfull constituent for the water to be utilized for drinking purpose. So appropritate processing of Damsala water should be done for utlilising the same for drinking purpose. The hexavalent chromium in solution can be converted to the trivalent form by using ferrous sulphate. The trivalent chromium can then be precipitated as hydroxide using lime. After settling of the solids,

MR. H. K. SAHOO

the water will be free from hexavalent chromium. Addition of aluminium sulphate improves the settling of these solids and also helps in removing the turbidity.

Besides this, the rain wash water from the overburden dumps will carry the suspended impurities into the Tailangi Nallah. So a barrier has been planned to be created covering a width of 10 mtrs. over which thick vegitation will be grown and silt dams will be provided to arrest the flow of suspended impurities into the nallah. Further to check the flow of wash off from the dumps, the following measures will be taken to minimize the effect.

(a) Proper slope will be maintained both in case of soft and hard dumps.

(b) A barrier consisting of bushy grassy vegitation will be maintained within the nallah and the dump yards.

(c) Silt dams will be provided to check the sediment.

(d) By checking the erosion of the dumps, tailing ponds, mine sides by providing suitable vegitable cover.

(e) By re cycling the water from the beneficiation plant with a minimum discharge.

(f) By treatment of water before final discharge for complete control of pollution from this sources.

Due to impervious nature of the rocks of this area, the dewatering of the mine pit will cause only local effects of lowering the water table. So far no toxic substance has been delineated which may cause adverse effect to the ground. Water. According it has been decided to use the accumulated mine water for watering the afforestation area.

However, five large diameter bore holes have been proposed to be drilled at different locations to study the effect of mining on ground water. Accordingly preventive measures will be taken after detailed observation is made by testing the ground water level from these observation bore-holes.

The discharged water from the applied lease hold area not require special attention, as it will get seeped in to the sub soil because of its negligible quantity. No cause of water for industrial purposes exists. There is no chance of contamination. There is no presence of toxic element. So no special treatment of disposal water is required.

Mr. H. K. SAHOO
ROP/CAL/257/97-A

vi) Protective measures for ground vibration / air blast caused by blasting :-

The effect of ground vibration, air blast and noise will not be much pronounced as the blasting operation will generally be limited to comparatively small scale. Proper care will be taken for charging, stemming and muffle blasting to avoid risky of generation of flying fragments generated due to blasting.

The following preventive measures are proposed to be adopted to minimize the effect of air pollution due to various mining activities.

1. The major source of emission of dust will be from the haul roads, due to movement of heavy earth moving equipments.
2. Dust generated from dump yards due to dumping of overburden and ore.
3. Due to both working and movement of machinery along the benchies.
4. For the grinding and beneficiation plants.

The effect of dust generated from the above process can be minimized by taking proper step i.e by taking preventive measures to check the generation of dust nearest to the sources of its generations.

1. By providing tar macadamed road in and adjacent to the mining area
2. By sprinkling water on the haul roads at frequent intervals and by providing sprinkling in turning points.
3. By planting trees in a multitier system on either side of the traffic lene to act as a screen at all levels.
4. By planting grass, shrubs over the dumps tailing ponds and pit slopes to check aeolin erosion .
5. By locating the residential area, workshop, office etc. at a greater distance opposite to the direction of the wind (for which the same has been selected to be located on the northern extermity of the lease area.)
6. By providing dust extractors and spray of water at the source of dust in crushing and beneficiation plants.

To minimize the noise and to maintain the same within the permissible linit, the following precautionary measures will be taken up.

Mr. H. K. SAHOO
ROP/GAL/257/91-A

(a) By selecting the proper type of machinery having adequate noise control system.

(b) By adopting stay guard methods keep the number of machineries operating at a time, creating disturbing sound within the permissible limit.

(c) By providing a green belt of mulit tier plantation within residential area and mine consisting of dense variety of plants.

(d) By providing ear protectors to the operators and other personenel who will be working near such machineries.

(e) As the area is presently free from any mining activities the air is quite pure and natural. After mining operation has started the air quality will be deteriated. Keeping pace with the mining activities regular monitoring of air quality will be done by collecting samples from different mine site at different levels as per the statutory provisions.

vii) Measures for protecting historical monuments: -

As already mentioned earlier, the area is free for any national monuments, places of worship, national park of wild life park etc. which are of public or place of interest of tourism. So, the precautionary measures to be taken to avoid effect on such structures does not aries.

The mine will develop new employment potential to the villagers of Tailangi and Balipara Basti. Though the villagers are already employed in he surrounding mines, interested villagers can be employed in Tailangi chromite mine. Drinking water, road communication and educational facilities will be provided to the villagers and the workers employed in Tailangi mine. Due to development of marketing, education communication and health care center, the socio –economic condition of the villages coming within the influence of the Tailangi mine will be improved.

viii) Socio economic benefits: -

There will be no adverse effect of the mining as the socio-economic aspect of the inhabitants within and adjacent to the area because the workers will be mainly local. The employment avenues due to mining will definitely hike the socio-economic status of the local people.

Mr. H. K. SAHOO

TABLE N0:11.2
SOCIO-ECONOMIC & DEMOGRAPHIC PROFILE

Name of Village	No. of House hold	Total Population			S.C. Population		S.T. Population		Literates		Main Workers		Non Workers		Agriculture labors	
		Total	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Kaliapani	954	4416	2223	1893	132	127	763	709	1468	899	993	84	1218	1803	22	04
Gurujanga	292	1251	643	608	28	25	347	343	316	168	276	66	347	527	11	12
Ostapal	287	1217	617	600	60	66	03	03	376	275	227	22	329	566	107	15
Sukurangi	93	445	226	219	11	07	132	144	135	85	83	09	114	201	09	00
Tailangi	82	409	194	215	00	00	186	205	55	13	66	17	84	122	39	68
Balipada	62	369	184	185	07	02	177	183	63	15	64	08	116	169	08	01
Kamarda	39	207	108	99	00	00	108	99	57	21	68	00	32	44	09	55
Kensa	201	1063	539	524	18	11	497	485	143	55	198	29	289	431	44	59
Dhabahali	64	344	182	162	05	02	149	139	88	33	68	01	82	74	68	86

Annexure-1

Government of Orissa

Department of Steel & Mines

No. 9701 /SM.Bhubaneswar,the

III(G)SM.70/2000

PROCEEDINGS

Sub: Grant of Mining Lease in the dist. of Cuttack.

Read: Application presented on 8.01.1992 by M/s Industrial Development Corporation of Orissa Ltd. for grant of Mining Lease for Chromite over an area of 585.00 acs. or 236.74 hects. in Village-Tailangi in the dist. of Cuttack.

ORDER

Whereas M/s Industrial Development Corporation of Orissa Ltd. have applied to the State Govt. for grant of a Mining Lease by their application read above;

Whereas the mineral in the land in respect of which the Mining Lease has been applied for belongs to Govt. and the land is at their disposal;

Whereas the applicant being a Limited Company is incorporated in India;

Whereas the applicant(s) by themselves or with any person joint in interest with them do not in respect of Chromite or related group of mineralsxx held such area in the State as with the area over which the M.L. has now been asked for will exceed ten square kilometres in the aggregate;

Whereas the Govt.of India in their letter No. 5(37)/92-MV,dt.14.12.92 have conveyed their approval to the grant of M.L. Under Section-5(1) of the M.M.(R&R D&R)Act,1957 over 221.22 hects. and they have also in exercise of the powers conferred by Section-30 of the said Act, directed the State Govt. to take into consideration of this M.L. and pass orders thereon on merits;

MD may kindly see. 28.8.2000

Whereas the party was asked in this Department letter No.9529/SM,dt.21.08.2000 to accept the terms and conditions under which the M.L. was proposed to be considered xx for grant and the party in their ref.letter No.geo.ML.140(iii)/7200, dt.24.8.2000 accepted those conditions;

Therefore,the State Govt. are hereby pleased to order that M.L. in respect of the area over 221.22 hects. in Village-Tailangi in the dist.of Cuttack be granted to M/s Industrial Development Corporation of Orissa Ltd. for a period of 20 years subject to the conditions laid down in the State Govt. letter No.9529/SM,dt.21.08.2000. The party should comply with all the terms & conditions including furnishing of a surveyed map and description within 3 months from the date of this order to the Collector,Cuttack.

By order of the Governor

P.K.Patnaik

Joint Secretary to Government

......2

Memo No. 9462 /SM, Bhubaneswar, the 26.8.2000

Copy forwarded to the Managing Director, M/s IDC Ltd. Bhubaneswar-751001.

Joint Secretary to Government

Memo No. /SM. Bhubaneswar, the

Copy forwarded to the Collector, Cuttack for information and necessary action. On receipt of all documents in full compliance of the terms and conditions laid down in Govt. letter No. 9529 SM, dt. 21.08.2000, he will please forward the same to Government with a report about security deposit and any other matter which the Collector might consider necessary to bring to the notice of Government.

Joint Secretary to Government

Memo No. /SM. Bhubaneswar, the

Copy forwarded to the Director of Mines, Orissa for information & necessary action with reference to his letter No. 13445/DMG, dt. 14.5.92/Mining Officer, Cuttack for information & necessary action.

Joint Secretary to Government

SNN/-

Government of Orissa
Department of Steel & Mines

No.III(G)SM-70/2000- 5970 /SM. Bhubaneswar, the 4-6-03

PROCEEDINGS

Sub:- Grant of Mining Lease in the district of Jajpur.

Read:- Application presented on 8.1.1992 by M/s. Industrial Development Corporation of Orissa Ltd. for grant of Mining lease ~~for~~ for Chromite over an area of 585.00 Acres or 236.74 hects. in village-Tailangi in the district of Cuttack (now Jajpur).

ORDER:

Whereas, the Govt. of India in their letter No.5(37)/92-MV. dt.14.12.92 have conveyed their approval under section 5(1) of M&M(D&R) Act 1957 on grant of mining lease for Chromite over an area of 221.22 hects. in village-Tailangi of Jajpur District in favour of M/s.IDC Ltd. for a period of 20 years subject to approval of Government of India in Ministry of Environment and Forest for diversion of forest land over 158.921 hects. under F.C.Act, 1980 before execution of the mining lease ;

Whereas, M/s. IDC have not obtained forest clearance over the entire forest area involved, pending grant of mining lease State Govt. had allowed them to work over the non-forest portion of the area under agency ship as per erstwhile rule 75(2) of M.C. Rules, 1960 on payment of agency fee @ Rs.226/- per M.T. in addition to usual royalty ;

Whereas, M/s. IDC were asked in this Department letter No.9529/S dt.21.8.2000 to accept the terms and conditions under which the mining lease ~~x~~ was proposed for grant and the party in their letter No.140(III)/7200 dt.24.8.2000 accepted the same ;

Whereas, the grant Proceeding No.9761/SM. Dt.26.8.2000 was issued granting the ML over 221.22 hects. in favour of M/s. IDC Ltd. for a period of 20 years subject to condition laid down in the Steel and Mines Department letter No.9529/SM. Dt.21.8.2000.;

Whereas, M/s. IDC Ltd. have obtained approval of MOEF over area of 17.483 hects. only out of the forest area of 158.921 hects. and in order to continue mining operation, M/s. IDC Ltd. have come up with a proposal vide their letter No.663 dt.1.2.2002, requesting the Government for issue of two separate grant orders in respect of two blocks consisting, one block comprising of non-forest land alongwith forest land cleared by Govt. of India MOEF and the other block comprising of only forest land for which clearance of MOEF has not been received ;

Whereas, the Director of Mines, Orissa, was requested in letter No.1125/SM. Dt.5.2.2002 to examine the proposal of IDC Ltd. and furnish his views. Director of Mines, Orissa in his letter No.8781 Dt.25.9.2002 has reported that, the area proposed by IDC Ltd. comprising 17.483 hects of forest land for mining, 3.390 hects., of forest land towards safety zone and 44.810 hects. of non-forest land from the aforesaid area form a compact block of 65.683 hects. and the rest of the area which splits into three more blocks comprising 4.383 hects., 9.364 hects. and 141.790 hects. adjoining to one another requires clearance of MOEF.;

Whereas, the Director of Mines has clarified in his above mentioned letter dt.25.9.2002 that there is no such restriction in M&M(D&R)Act, 1957 and M.C.Rules, 1960 to grant mining lease in two or more separate blocks when they are compact and contiguous and accordingly recommended to the Government for grant of ML over 65.683 hects. in ~~x~~ favour of M/s. IDC for early execution of ML and continuance of mining operation ;

P.T.O.

Whereas, since Rule 75(2) of M.C.Rules, 1960 regarding agencyship for working mines has been omitted with effect from 4.1.99 and Govt. of India is pressing hard to discontinue the practice of allowing mining operation on agency-ship;

Therefore, keeping in view the above reasons, in supersession of the previous grant Proceeding No.9761/SM, Dt.26.8.2000, the State Govt, after careful consideration are hereby pleased to order for grant of mining lease for Chromite in respect of an area of 65.683 hects. in one block and 155.537 hects. in three separate Blocks in village-Tailangi of Jajpur District in favour of M/s. IDCOL for a period of 20 years subject to the condition laid down in this Department letter No.9529/SM, Dt.21.8.2000. The party should comply all the terms and conditions including furnishing of surveyed map and description over the area of 65.683 hects. within 3 months from the date of issue of the order to the Collector, Jajpur for early execution of the same and to take necessary steps for obtaining clearance from Government of India, MOEF in respect of the other three blocks comprising of 155.537 hects.

By Order of the Governor
A. K. Sahu
Joint Secretary to Government.

Memo No. 5971 /Dt. 4-6-03

Copy forwarded to the Managing Director, M/s. Industrial Development Corporation Ltd., Bhubaneswar for information.

Memo No. /Dt. 3.6.03
Joint Secretary to Government.

Copy forwarded to the Collector, Jajpur for information and necessary action with reference to this Department Memo No.9763 Dt.26.8.2000. On receipt of all the documents in full compliances of the terms and conditions laid down in Govt. letter No.9529 Dt.21.8.2000 he will please forward to Government with a report about security deposit and any other matter which the Collector might consider necessary to bring to the notice of the Government.

Joint Secretary to Government.

Memo No. /Dt.

Copy forwarded to the Director of Mines, Orissa, Bhubaneswar/ Deputy Director of Mines, Jajpur Road, Dist.Jajpur for information and necessary action with reference to this Deptt. Memo No.9764 Dt.26.8.2000.

Joint Secretary to Government.

Memo No. /Dt.

Copy forwarded to the Under Secretary to Govt. of India, Ministry of Mines, Department of Mines, Shastri Bhawan, New Delhi for kind information.

Joint Secretary to Government.

pcp.

Annexure 2

TALANGI CHROMITE MINE
LAND SCHEDULE OF BALANCE AREA OF 155.537 HACT OR 384.34 ACRES

VILL: TALANGI

Khata No.	Name of the Tenant	Plot No.	Kisam of Land	Area in Acres	Remarks
2	Arun Pradhan	152/P	Sarad -III	0.03	
3	Kala Dehuri Others	76	Patita	0.09	
5	Kanduru Dehuri and others	200/P	Sarad -III	0.04	
6.	Giridhari Dehuri	62	Patita	0.11	
7.	Gudu Dehuri and others	77	Patita	0.21	
		185/P	Sarad -III	0.09	
16	Dhaneswar Dehuri and others	187/P	-do-	0.05	
19	Babaji Dehuri and others	174/P	-DO-	0.02	
20	Bari Charan Dehuri and others	82	Patita	0.10	
21	Bibhisan Dehuri and others	63	-Do-	0.12	
		140/P	Sarad -III	0.02	
		171/P	-Do-	0.03	
		172/P	-Do-	0.04	
23	Maheswar Pradhan and others	153/P	-Do	0.27	
24.	Maheswar Pradhan and others	78/P	Patita	0.01	
		81/P	-Do	0.17	
26	Rangadhar Dehuri and others	139/P	Sarad-III	0.37	
30.	Saita Dehuri and others	145/P	-D0-	0.03	
		150/P	-do-	0.09	
		196/P	-D0-	0.01	

VILL: TALANGI

34	Abad Yogyaanabadi	4/P	Sal Jungle	0.36	
		5/P	Sal Jungle	0.08	
		6/P	Sal Jungle	0.21	
		9	Sal Jungle	0.23	
		10	Sal Jungle	0.19	
		11	Sal Jungle	0.30	
		12	Sal Jungle	0.07	
		13	Sal Jungle	0.10	
		14	Sal Jungle	0.04	
		16	Sal Jungle	0.31	
		17	Sal Jungle	0.26	
		18	Sal Jungle	0.21	
		19	Sal Jungle	0.27	
		20	Sal Jungle	0.26	
		21	Sal Jungle	0.22	
		22	Sal Jungle	0.16	
		23	Sal Jungle	0.23	
		24	Sal Jungle	0.26	
		25	Sal Jungle	0.08	
		26	Sal Jungle	0.16	
		27	Sal Jungle	0.53	
		28	Sal Jungle	0.26	
		29	Sal Jungle	0.24	
		30	Sal Jungle	0.29	
		31	Sal Jungle	0.28	
		33	Sal Jungle	0.41	
		34	Sal Jungle	0.08	
		35	Sal Jungle	0.60	
		36	Sal Jungle	0.31	
		37	Sal Jungle	0.18	
		38	Sal Jungle	0.40	
		39	Sal Jungle	0.15	
		40	Sal Jungle	0.17	
		41	Sal Jungle	0.16	
		42	Sal Jungle	0.17	
		43	Sal Jungle	0.13	
		44	Sal Jungle	0.13	
		45	Sal Jungle	0.09	
		46	Sal Jungle	0.96	
		47	Sal Jungle	0.38	
		49/P	Sal Jungle	0.98	
		50	Patita	1.07	
		52/P	Sal Jungle	0.05	
		53/P	Sal Jungle	0.07	
		54/P	Sal Jungle	0.27	
		55	Sal Jungle	0.21	
		57/P	Sal Jungle	0.16	

VILL:TALANGI

		61	Sal Jungle	0.58	
		126	Sal Jungle	1.00	
		127	Sal Jungle	0.11	
		128	Sal Jungle	0.15	
		129	Sal Jungle	0.19	
		130	Sal Jungle	0.11	
		131	Sal Jungle	0.14	
		132	Sal Jungle	0.29	
		133	Sal Jungle	0.13	
		134	Sal Jungle	0.13	
		135	Sal Jungle	0.28	
		137	Sal Jungle	0.37	
		138	Sal Jungle	1.11	
		141	Sal Jungle	0.10	
		143/P	Sal Jungle	1.59	
		144	Sal Jungle	0.68	
		173/P	Sal Jungle	0.16	
		186	Sal Jungle	0.30	
		201	Sal Jungle	0.90	
		202	Sal Jungle	0.26	
		285/P	Sal Jungle	0.10	
		289	Sal Jungle	0.98	
		290	Sal Jungle	0.78	
		291	Sal Jungle	1.34	
		293	Sal Jungle	0.24	
		294	Sal Jungle	2.00	
		295	Sal Jungle	0.42	
		296	Sal Jungle	0.74	
		297	Sal Jungle	0.22	
		298/P	Sal Jungle	0.20	
		280/P	Sal Jungle	0.28	
		302/P	Sal Jungle	2.17	
		303/P	Sal Jungle	3.63	
		304	Sal Jungle	0.71	
		306/P	Sal Jungle	0.05	
		307/P	Sal Jungle	0.54	
		309/P	Sal Jungle	3.07	
		310	Sal Jungle	0.31	
		311/P	Sal Jungle	0.25	
		312/P	Sal Jungle	0.22	
		313/P	Sal Jungle	0.28	
		321/P	Sal Jungle	0.96	
		322/P	Sal Jungle	0.66	
		324	Sal Jungle	2.10	
		325	Sal Jungle	0.87	
		326	Sal Jungle	0.45	
		327	Sal Jungle	0.18	

VILL:TALANGI

		328	Sal Jungle	1.95	
		329	Sal Jungle	0.50	
		330	Sal Jungle	0.30	
		332/P	Sal Jungle	1.08	
		334	Sal Jungle	0.16	
		336	Sal Jungle	0.16	
		337	Sal Jungle	0.55	
		338	Sal Jungle	0.06	
		339	Sal Jungle	0.09	
		340	Sal Jungle	0.23	
		341	Sal Jungle	0.21	
		342	Sal Jungle	0.08	
		343	Sal Jungle	0.04	
		344	Sal Jungle	0.02	
		345	Sal Jungle	0.11	
		346	Sal Jungle	0.11	
		348	Sal Jungle	0.17	
		350	Sal Jungle	2.50	
		351/P	Patita	0.79	For Jawans
		352	Sal Jungle	1.90	
		353	Sal Jungle	1.05	
		354	Sal Jungle	3.66	
		355	Sal Jungle	0.86	
		356	Sal Jungle	0.29	
		357	Sal Jungle	0.33	
		358	Sal Jungle	2.18	
		359	Sal Jungle	3.01	
		360	Sal Jungle	2.78	
		361	Sal Jungle	0.32	
		362	Sal Jungle	3.35	
		363	Sal Jungle	0.87	
		364	Sal Jungle	0.18	
		365	Sal Jungle	2.71	
		366	Sal Jungle	0.41	
		367	Sal Jungle	0.41	
		368	Sal Jungle	0.34	
		369	Sal Jungle	0.69	
		370	Sal Jungle	1.33	
		371	Sal Jungle	0.81	
		372	Sal Jungle	1.00	
		373	Sal Jungle	0.59	
		374	Sal Jungle	1.26	
		375	Sal Jungle	0.54	
		376	Sal Jungle	1.06	
		377	Sal Jungle	0.14	
		378	Sal Jungle	0.50	

VILL:TALANGI

		380	Sal Jungle	0.70	
		382	Sal Jungle	0.14	
		383	Sal Jungle	1.78	
		385/P	Sal Jungle	0.26	
		386/P	Sal Jungle	4.01	
		387	Sal Jungle	0.13	
		388/P	Sal Jungle	2.33	
		389	Sal Jungle	0.04	
		390/P	Sal Jungle	3.93	
		391/P	Sal Jungle	5.89	
		392	Sal Jungle	0.11	
		393	Sal Jungle	0.32	
		395	Sal Jungle	0.39	
		396	Sal Jungle	3.68	
		397	Sal Jungle	0.37	
		398	Sal Jungle	1.43	
		399	Sal Jungle	0.44	
		400	Sal Jungle	0.80	
		401	Sal Jungle	0.70	
		402	Sal Jungle	0.44	
		403	Sal Jungle	0.41	
		404	Sal Jungle	0.04	
		405	Sal Jungle	2.69	
		406/P	Sal Jungle	1.96	
		407/P	Sal Jungle	3.97	
		411/P	Sal Jungle	0.60	
		412/P	Sal Jungle	0.73	
		413/P	Sal Jungle	0.36	
		414	Sal Jungle	0.97	
		415/P	Sal Jungle	0.70	
35	Abad Ajogya Anabadi	279/P	Pathrabani	0.04	
36	Sarbasadharan	15	Rasta	0.53	
		48	=do-	0.72	
		51/P	-do-	0.06	
		84/P	-do-	0.17	
		333/P	-do-	0.12	
		335	-do-	0.15	
		349	-do-	0.55	
		381	-do-	0.06	
		415/422/P	Smasan	0.30	
37	Rakhita	1/P	Jungal-1	47.28	
		7/P	Nalla	1.30	
		8/P	Gramya Jungale	16.53	
		32	Mahara	0.21	
		60/P	Gochar	0.40	
		83	Gramya Jungle	0.34	

VILL: TALANGI

		114/P	Basti Yogya	0.04	Reserve for future basti
		125/P	Mahara	0.12	
		136	Grama Jungle	0.31	
		142	-do-	1.19	
		281/P	Gramya Jungle	0.03	
		282/P	-do-	0.79	
		288/P	Gochar	0.07	
		292/P	-Do-	0.14	
		305/P	-do-	0.20	
		308/P	Nallah	1.15	
		323/P	-DO-	1.59	
		331	Unnat jojaja Jogya	2.14	Reserve for School and play ground
		347	Gochar	0.55	
		379	-DO-	5.50	
		384/P	Jungle	23.43	
		394	Gramya jungle	1.30	
		408	Nallah	1.25	
		410/P	Gramya Junghle	1.81	
		416/P	Nallah	0.16	

Total: 239.85

VILL: OSTAPAL

Khata No.	Name of the Tenant	Plot No.	Kisam of Land	Area in Acres	Remarks
19	Natabar Dehuri	308/438	Sarad-II	0.14	
24	Birsingh Munda and others	277/P	-Do-	0.77	
31	Shree Khandurai Thakurani C/O Snkar Dehuri and others	307/P	Sarad-II	0.35	
33	Sikhar Munda	275/P	Taila	0.19	
36	Abad Jogya anabadi	263/P	Patita	0.02	
		264/P	-do-	0.23	
		269/P	-do-	0.18	
		279/P	-do-	0.23	
		280/P	-do-	0.65	
38	Sarbasadharan	247/P	Rasta	1.60	
		310/P	Debastali	0.32	
39	Rakhita	1/P	Jungl	45.22	
		241/P	Sal jungle	0.47	
		242	Sal jungle	0.49	
		243	Sal jungle	0.87	
		244	Sal jungle	0.45	
		245	Sal jungle	2.33	
		246	Sal jungle	0.56	
		248	Sal jungle	4.16	
		249	Gramya jungle	4.41	
		250	Sal jungle	4.35	
		251/P	Sal jungle	0.48	
		252	Sal jungle	0.88	
		253	Sal jungle	1.22	
		254	Sal jungle	0.51	
		256	Sal jungle	0.96	
		257/P	Sal jungle	0.70	
		261	Sal jungle	0.64	
		262	Sal jungle	0.77	
		273/P	Sal jungle	0.81	
		276	Sal jungle	1.27	
		278	Pond	1.02	
		281	Sal jungle	0.30	
		308	Sal jungle	0.05	
		309	Sal jungle	0.44	
		311/P	Sal jungle	0.54	
		312	Sal jungle	0.02	
		313/P	Sal jungle	0.02	
		278/423	Pokhari Huda	0.54	
		277/459	Sal jungle	0.26	
			TOTAL:	79.38	

BALIPADA - Village

Khata No.	Name of the Tenant	Plot No.	Kisam of the Land	Area in Acres	Remarks
1	Kalyan Majhi	9	Sarada-3	1.68	
2	Khetramajhi & Others	13	Sarada-3	0.66	
		15	Sarada-3	0.09	
6	Budan Majhi	60	Sarada-1	2.05	
13	Singrai Majhi	17	Gharbari	0.25	
		21/P	Sarada-1	2.64	
		22	Sarada-1	0.06	
		32	Gharbari	0.06	
		31	Gharbari	0.38	
15	A.J.A.	3	Salajungle	4.20	
		4	Salajungle	0.73	
		5	Salajungle	0.48	
		6	Salajungle	1.20	
		7	Salajungle	0.14	
		8	Salajungle	0.10	
		10	Salajungle	0.17	
		11	Salajungle	0.09	
		12	Salajungle	0.49	
		14	Salajungle	0.10	
		16	Salajungle	0.19	
		18	Salajungle	0.25	
		19	Salajungle	0.56	
		20	Salajungle	0.55	
		23/P	Salajungle	1.50	
		26/P	Salajungle	0.85	
		27	Salajungle	0.61	
		28	Salajungle	0.09	
		29	Salajungle	0.09	
		30	Salajungle	0.40	
		33	Salajungle	0.08	
		34	Salajungle	0.41	
		35	Salajungle	0.03	
		36	Salajungle	0.42	
		37	Salajungle	0.44	
		38	Salajungle	0.41	
		39	Salajungle	0.49	
		40	Salajungle	0.04	
		41	Salajungle	0.60	
		42	Salajungle	0.80	
		46	Salajungle	0.24	
		47	Salajungle	1.98	
		48	Salajungle	0.91	
		49	Salajungle	0.45	
		50	Salajungle	0.47	
		51	Salajungle	1.26	

VLL:- BALIPADA

			52	Salajungle	0.38
			53	Salajungle	0.91
			55	Salajungle	0.20
			56	Salajungle	0.33
			57	Salajungle	0.35
			58	Salajungle	0.39
			59	Salajungle	0.66
			61	Salajungle	0.19
			62	Salajungle	0.73
		63/P		Salajungle	3.55
			64	Salajungle	1.18
			66	Salajungle	0.87
		112/P		Salajungle	0.02
		116/P		Salajungle	3.05
		117/P		Salajungle	0.20
			120	Salajungle	1.13
			121	Salajungle	2.19
			122	Salajungle	0.37
			123	Salajungle	0.67
			124	Salajungle	0.29
			125	Salajungle	0.74
			126	Salajungle	0.49
			127	Salajungle	0.48
			128	Salajungle	0.48
		129/P		Patita	2.84
			130	Salajungle	0.59
			131	Salajungle	0.09
		132/P		Salajungle	0.59
		133/P		Salajungle	0.13
		134/P		Salajungle	0.35
		142/P		Salajungle	0.08
		15/332		Salajungle	0.32
		9/333		Salajungle	0.53
		9/343		Salajungle	0.10
16	Sarbasadharana				
			2	Rasta	0.10
			25	Rasta	0.97
			43	Rasta	0.15
			45	Rasta	0.13
17	Rakshit				
			1	Gochara	0.33
			24	Sarbasadharana jogya	0.01
			44	Gochara	1.52
			54	Mahara	0.14
			65	Gramya Jungle	0.13
		67/P		Gramya Jungle	0.33
		68/P		Gochara	1.70
		69/P		Nala	0.47
			70	Gochara	0.09
		71/P		Gochara	0.08
		111/P		Gramya Jungle	0.40
		115/P		Gramya Jungle	0.01
		118/P		U.J.J.	0.01
		119/P		U.J.J.	0.63
				Total	62.36 Acres

or 25.236 Hects.

SARUABIL - Village

Khata No.	Name of the Tenant	Plot No.	Kisam of the Land	Area in Acres	Remarks
56	A.J.A.	555	Jungle	0.85	
		557	Gramya Jungle	1.90	
			Total	2.75 Acres	or 1.113 Hects.

ABSTRACT

VILLAGE	TOTAL FOREST LAND (IN ACRES)	TOTAL NON-FOREST LAND (IN ACRES)	TOTAL AREA OF THE VILLAGE (IN ACRES)
TALANGI	218.57	21.28	239.85
OSTAPAL	73.17	6.21	79.38
BALIPADA	45.32	17.04	62.36
SARUABIL	2.75	-	2.75
TOTAL AREA	339.81 Acres or 137.516 Hact.	44.53 Acres or 18.021 Hact.	384.34 Acres or 155.537 Hact

Annexure-5

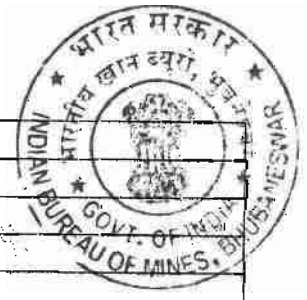
INDIAN BUREAU OF MINES, BHUBANESWAR
GOVT. OF INDIA

Talangi Chromite Mine

Boundary description of the M.L. Area over 155.537 Hact or 384.33 Acres within the granted M.L. area over 221.22 hact or 546.63 Acres.

Line	Fore bearings	Interior Angle	Distance		Remarks
			Feet	Mtr.	Δ Trijunction point of village Talangi, Ostapal & Saruabil
Δ - 1	95° 30'	-	630	192.02	
1 - 2	307°	-	1575	480.05	
2 - 3		234° 00'	380	115.82	
3 - 4		262° 30'	460	140.21	
4 -5		51° 30'	280	85.34	
5 - 6		310° 30'	275	83.82	
6 – 7		259° 00	200	60.96	
7 - 8		76° 00	190	57.91	
8 - 9		161° 00	260	79.24	
9- 10		67° 30' 00"	400	121.92	
10 - 11		255° 30' 00"	290	88.39	
11 - 12		92° 00'	430	131.06	
12 - 13		89° 00'	150	45.72	
13 - 14		92° 30	200	60.96	
14 - 15		299° 30'	230	70.10	
15 - 16		243° 30'	180	54.86	
16 - 17		262 30'	550	167.64	
17 - 18		268° 00'	100	30.48	
18 - 19		93° 00'	60	18.29	
19 - 20		261° 30'	170	51.82	
20 - 21		93° 30'	270	82.30	
21 - 22		247° 00'	250	76.20	
22 - 23		303° 00	510	155.45	
23 - 24		81° 00'	1250	381.09	
24 - 25		117° 00	640	195.12	
25 - 26		241° 30'	850	259.08	
26 - 27		204° 30'	340	103.63	
27 - 28		262° 00'	600	182.08	
28 - 29		91° 00'	530	161.54	
29- 30		86° 00'	320	97.54	
30 - 31		139° 30 '	480	146.30	
31 - 32		250° 00'	140	42.67	
32 - 33		245 ° 00'	450	137.16	
33 - 34		270°00'	750	228.60	
34 - 35		108° 00'	400	121.92	
35 - 36		236° 30'	250	76.20	
36 - 37		89° 00'	780	237.74	
37 - 38		127° 00'	550	167.64	
38 -39		267° 30	770	234.76	
39 - 40		58° 00'	40	12.19	

40 - 41		270° 00'	150	45.72	
41 - 42		270° 00'	150	45.72	
42 - 43		270° 00'	150	45.72	
43 - 44		270° 00'	40	12.19	
44 - 45		122° 00'	760	231.65	
45 - 46		94° 00'	530	161.54	
46 - 47		233° 00'	800	243.84	
47 - 48		91° 00'	450	137.16	
48 - 49		237° 00'	410	124.97	
49 -50		297° 30 '	430	131.06	
50 - 51		106°.00'	1300	396.24	
51 - 52		131°.30'	630	192.02	
52 - 53		137°.30'	170	51.82	
53 - 54		90° 00'	560	170.69	
54 - 55		194° 00'	290	88.39	
55 - 56		157° 00'	390	118.87	
56 -57		154° 00'	200	60.96	
57 - 58		129° 00'	290	88.39	
58 - 59		262 °30'	350	106.68	
59 - 60		264 °30'	140	42.67	
60 - 61		234° 30'	640	195.07	
61 - 62		209° 00'	370	112.78	
62 - 63		197° 30'	440	134.11	
63 - 64		184° 30'	400	121.92	
64 - 65		91° 00'	510	155.45	
65 - 66		264° 00'	103	31.39	
66 - 1		133° 00'	480	146.30	The point 67 occurs ↔ on 1 – 2 and the interior angle 72° means m ∟66-1-67 = 72°
1 - 67		72° 00'	93	28.35	
67 - 68		50° 00'	118	35.97	→ 67 – 68 meets ↔ 1 – 66 at point 68 Stn. 67 = Stn A is on the 16" = 1 mile map
68 - 66		235° 35'	368	112.17	
66 - 69		267° 00'	228	69.49	
69 - 70		52° 00'	470	143.26	
70 - 71		240° 00'	110	33.53	
71 - 72		203° 00'	480	146.30	
72 - 73		180° 00'	182	55.47	
73 - 74		170° 30''	500	152.40	
74 - 75		172° 30'	220	67.06	



75-76		138° 36'	547	166.73	
76-77		200° 00'	470	143.26	
77-78		94° 39''	65	19.81	
78-79		279° 10'	290	88.39	
79-80		188° 30'	722	220.07	
80-81		153 ° 45'	141	42.98	
81 -82		228° 00'	923	281.33	
82-83		72° 30'	508	154.84	
83 -84		234° 40'	448	136.55	
84-85		224° 30'	830	252.98	
85 -86		255° 45'	495	150.88	
86 -87		107° 00'	78	23.77	
87 -88		106° 00'	352	107.29	
88-89		233° 10'	124	37.80	
89-90		245° 05'	321	97.84	
90 -91		79° 10'	415	126.49	
91 - 92		263° 00'	359	109.42	
92 -93		86° 00'	252	76.81	
93- E		251° 35'	422	128.63	
E- 94		81° 30'	520	158.50	
94 - 95		90° 00'	275	83.82	
95 - 96		221°.45'	370	112.78	
96-97		169°.00'	650	198.12	
97 -98		184° 00'	663	202.08	
98 - 99		173° 30'	630	192.02	
99 - D		214 °00'	130	39.62	
D - 100		118° 30'	590	179.83	
100 -101		180° 00'	1120	341.38	
101 -102		180° 00'	760	231.65	
102-103		180° 00'	1145	349.00	
103-104		180° 00'	600	182.88	
104-105		180° 00'	670	204.22	
105-106		180° 00'	1150	350.52	
106 - C		180° 00'	530	161.54	
C - 107		90° 00'	630	192.02	
107 -108		180° 00'	630	192.02	
108-17		180° 00'	845	257.56	
17 - 16		180° 00'	550	167.64	
16 - 3		180° 00'	550	167.64	

At last the traverse line form an interior angle of 82° 30' at Station – 3 with Station – 4 and thus the traverse is closed covering an area of 155.537 hact.

Annexure-4

LITHOLOGS OF BOREHOLES SHOWING ORE ZONES, OVER BURDEN & INTRABURDEN

Sl.No	Bore hole	R.L	Drilled	Depth	Location	Ore zone		Lithology
	Angle		by F.S	in mt.		From	To	
1	GJ-36	151.63	GSI 85-86	87.5	3392 N	0.0	11.5	Laterite
	45				1136W	11.5	12.5	Limonite
						12.5	59.5	Talc-limo
						59.5	60.5	Chert-limo
						60.5	62.5	Chromite
						62.5	63	Chert-limo
						63	68	Chromite
						68	75.5	Talc-limo
						75.5	78	Chert
						78	84.5	Chromite
						84.5	87.5	Chert-limo
2	GJ-37	162.68	GSI 85-86	113.7	3818N	0	15	Laterite
	45				634W	15	1.6	Limonite
						16	18.5	Laterite
						18.5	19	Chert
						19	20.5	Laterite
						20.5	22.5	Limonite
						22.5	24.5	Chert-limo
						24.5	26.5	Limonite
						26.5	36.5	Chert-limo
						36.5	86.5	Serpentine
						86.5	89	Diss-chrom
						89	89.5	Serpentine
						89.5	94.5	Dolerite
						94.5	107.5	Diss-chrom
						107.5	113.7	Serpentine
3	GJ-38	164.575	GSI 85-86	63.4	3398N	0	2.5	Soil
	45				1430W	2.5	13.5	Chert
						13.5	23	Chert-limo
						23	28.5	Talc-limo
						28.5	36	Quartzite
						36	40	Talc-limo
						40	63.4	Quartzite
4	GJ-39	156.895	GSI 85-86	81.2	3446N	0	2.5	Soil
	45				1238W	2.5	10	Laterite
						10	17.5	Chert
						17.5	18	Chert-limo
						18	20	Limonite
						20	25	Chromite
						25	26	Chert-limo
						26	27	Chromite
						27	29	Chert-limo
						29	36.5	Chromite
						36.5	38.5	Chert-limo
						38.5	41	Chert
						41	41.5	Talc-limo
						41.5	43.5	Chert
						43.5	52.5	Talc-limo
						52.5	53	Diss-chrom
						53	54.5	Talc-limo

						54.5	57	Chromite
						57	62.5	Chert-limo
						62.5	81.2	Serpentine
5	GJ-40	152.165	GSI 85-86	71.5	3428N	0	1	Soil
	45				942W	1	14.5	Laterite
						14.5	52	Chert
						52	54	Chert-limo
						54	56	Chert
						56	57	Talc-rock
						57	60	Talc-limo
						60	62	Chromite
						62	62.5	Chert-limo
						62.5	66	Chromite
						66	71.5	Serpentine
6	GJ-41	162.355	GSI 85-86	116.25	3856N	0	7.5	Soil
	45				786W	7.5	19.5	Laterite
						19.5	21.5	Limonite
						21.5	26	Serpentine
						26	28.5	Dolerite
						28.5	49	Serpentine
						49	51	Diss-chrom
						51	70	Serpentine
						70	71.5	Talc-limo
						71.5	76.5	Dolerite
						76.5	109	Serpentine
						109	110.5	Dolerite
						110.5	116.25	Serpentine
7	GJ-42	169.28	GSI 85-86	84.15	3956N	0	1.5	Soil
	45				976W	1.5	4.5	Laterite
						4.5	6.5	Chert
						6.5	18.5	Chert-limo
						18.5	22	Chromite
						22	27.5	Chert-limo
						27.5	34	Talc-rock
						34	38.5	Limonite
						38.5	40	Diss-chrom
						40	47.5	Limonite
						47.5	48.5	Chert-limo
						48.5	53.5	Talc-limo
						53.5	54	Diss-chrom
						54	55	Talc-limo
						55	55.5	Chromite
						55.5	56.5	Talc-limo
						56.5	57.5	Chromite
						57.5	58	Talc-limo
						58	60	Chromite
						60	65	Talc-limo
						65	69	Limonite
						69	84.15	Quartzite

8	GJ-43	166.645	GSI 85-86	73.6	3996N	0	1	Soil
	45				1162W	1	4	Laterite
						4	23	Limonite
						23	24.5	Chert
						24.5	27.5	Chert-limo
						27.5	37.5	Limonite
						37.5	51.5	Chert
						51.5	59	Chert-limo
						59	59.5	Quartzite
						59.5	60.5	Chert
						60.5	63.5	Quartzite
						63.5	66	Talc-limo
						66	68	Chert-limo
						68	71.5	Chert
						71.5	73.6	Quartzite
9	GJ-44	165.415	GSI 85-86	37.5	3892N	0	2.5	Soil
	45				1316W	2.5	15.5	Laterite
						15.6	17.5	Chert-limo
						17.5	33	Limonite
						33	37	Chert-limo
						37	37.5	Chert
10	GJ-45	167.645	GSI 85-86	111.45	3892N	0	0.5	Soil
	45				864W	0.5	11	Laterite
						11	17.5	Talc-limo
						17.5	25	Talc-rock
						25	2.6	Talc-limo
						26	50	Chert-limo
						50	54	Chromite
						54	54.5	Diss-chrom
						54.5	56	Chromite
						56	57.5	Talc-limo
						57.5	58	Diss-chrom
						58	62	Chromite
						62	63	Diss-chrom
						63	82	Talc-limo
						82	84	Talc-rock
						84	88.5	Talc-limo
						88.5	89.5	Limonite
						89.5	92	Serpentine
						92	94.5	Dolerite
						94.5	101	Talc-limo
						101	111.45	Serpentine

11	GJ-48	165.125	GSI 85-86	108.9	3876N	0	18	Diss-chrom
	45				884W	18	20.5	Diss-chrom
						20.5	22	Talc-limo
						22	25.5	Diss-chrom
						25.5	32	Talc-limo
						32	34	Serpentine
						34	34.5	Talc-limo
						34.5	35.5	Diss-chrom
						35.5	36.5	Serpentine
						36.5	37.5	Serpentine
						37.5	44.5	Diss-chrom
						44.5	78.5	Serpentine
						78.5	79.5	Dolerite
						79.5	89.5	Serpentine
						89.5	93	Dolerite
						93	108.9	Serpentine
12	GJ-49	158.67	GSI 85-86	127.55	3882N	0	4	Soil
	45				492W	4	8	Laterite
						8	12	Chert-limo
						12	17	Limonite
						17	19	Chert
						19	46.5	Serpentine
						46.5	47.5	Diss-chrom
						47.5	127.55	Serpentine
13	GJ-50	159.185	GSI 85-86	149.8		0	1	Soil
	45					1	20.5	Laterite
						20.5	26	Chert
						26	34	Limonite
						34	37	Chert-limo
						37	47	Chert
						47	59	Serpentine
						59	60	Chert
						60	149.8	Serpentine
14	GJ-51	161.895	GSI 85-86	125.5		0	4	Soil
	45					4	5	Laterite
						5	11.5	Chert
						11.5	13	Limonite
						13	29	Chert
						29	30	Chromite
						30	35.5	Chert-limo
						35.5	125.5	Serpentine
15	GJ-52	163.64	GSI 85-86	73.15		0	40	Soil
	45					40	23.5	Laterite
						23.5	25.5	Serpentine
						25.5	26.5	Chert
						26.5	27.5	Serpentine
						27.5	38	Diss-chrom
						38	39	Chert
						39	40	Diss-chrom
						40	60.5	Serpentine
						60.5	69	Dolerite
						69	73.15	Serpentine

16	GJ-53	164.455	GSI 85-86	119.5		0	3	Soil
	45					3	10.5	Laterite
						10.5	11.5	Chert-limo
						11.5	13	Laterite
						13	13.5	Chert-limo
						13.5	21.5	Laterite
						21.5	26.5	Chert-limo
						26.5	30.5	Serpentine
						30.5	32.5	Chert
						32.5	57.5	Serpentine
						57.5	67.5	Dolerite
						67.5	119.5	Serpentine

Annexure-5

SOIL ANALYSIS REPORT

Taliangi Agricultural land
Location: Gurjang Agricultural land
Sukarangi forest land.

Sl. No	Characteristic	Location		
		Gurjang Agricultural land	Sukarangi Forest land	Tailangi Agricultural land
1	colour	Yellowish brown	Redissh brown	Redissh brown
2	Texture	Sandy loam	Sandy loam	Sandy loam
3	Moisture contents %	12.7	9.8	4.28
4	P.H	9.53	7.47	6.99
5	Electrical Conductivity in micromhoms /cm	2.3	5.85	12.65
6	Coefficient % permeability in cm/sec.at 28°C	0.0194	0.045	0.096
7	Water holding capacity %	32.8	34.0	39.04
8	Bulk density	1.45	1.37	1.345
9	Porosity %	45.28	48.30	49.245
10	Calcium (mg/gm)	2.44	0.78	0.6
11	Organic carbon %	4.18	0.99	1.43
12	Organic matter %	7.24	1.71	2.48
13	Phosphate (Po_4) Mg/Gm	2.70	1.0	10.0
14	Iron (Fe) Mg/Gm	0.04	0.15	0.01
15	Manganese (Mn) Mg/Gm	36.50	2.01	28.70
16	Chromium (Cr.) Mg/Gm	1.516	2.394	0.64
17	Potassium (K) Mg/Gm	0.194	0.079	0.008

Annexure-6

TOP SOIL & WASTE ROCK ANALYSIS REPORTS

TOP SOIL

Bulk density	:	01.240 to 02.300
Porosity	:	13.090 to 53.210
Calcium, mg/gm	:	00.040 to 00.210
Organic carbon %	:	00.165 to 01.673
Organic matter %	:	00.286 to 02.898
Phosphate, mg/gm	:	04.143 to 10.430
Iron (Fe) mg/gm	:	00.100 to 00.320
Manganese (Mn) mg/gm	:	00.030 to 01.940
Chromium (Cr) mg/gm	:	01.026. to 03.544
Potassium (K) mg/gm	:	00.002 to 00.111
Water holding capacity %	:	16.992 to 42.350
Permeability at 28°C cm/sec	:	00.012 to 00.270
Moisture %	:	01.430 to 19.330
Elect. conductivity	:	03.230 to 70.600
PH value	:	06.000 to 07.100

Nickeliferous Limonite %

Magnetite	:	6.90
Hematite	:	8.30
Goethite	:	10.90
Limonite	:	22.10
Chromite	:	6.00
Quartz	:	30.00
Kaolinite	:	12.40
Serpentine	:	1.60
Pyrolusite	:	0.30
Nickel oxide	:	0.77
Co-Mn oxide	:	0.07
Weight Percentage		100.00

Quartzite %

Silica (SiO_2)	:	96.000 – 98.000
Alumina (Al_2O_3)	:	1.000 – 2.000
Phosphate	:	0.0047 – 0.006

Annexure-7

DUST FULL MEASUREMENT DURING VARIOUS SEASONS IN THE BUFFER ZONE AREA

(All readings are in gm/sq.m per day)

Sl. No	Sampling site	Winter	Summer	Monsoon	Post Monsoon
1	TISCO Township	0.28	0.16	NA	0.33
2	TISCO COB plant	0.13	0.19	0.34	0.76
3	OB X Quarry	1.23	0.80	0.65	1.29
4	OMC Township Kalarangi	0.25	0.23	0.26	0.41
5	OMC Town ship Kaliapani	0.16	0.17	0.21	0.33
6	South Kaliapani	0.34	0.19	0.26	0.36
7	Village Ransol	0.10	0.14	0.17	0.21
8	Village Kharkhari	0.16	0.13	0.13	0.28
9	Village Virasol	0.14	0.18	0.22	0.31
10	Village Kansa	0.15	0.16	0.21	0.25
11	Saruabil Township	0.36	0.26	0.28	0.45
12	Surkarangi	0.25	0.21	0.39	0.26

Annexure-8

WATER TABLE MEASURED IN DIFFERENT LOCATION AROUND TAILANGI LEASE HOLD.

Sl.no	Location	Summer		Post Monsoon(m)	Fluctuation (m)
		M.P	W.T		
1	2	3	4	5	6
1	OMC	0.46	6.53	4.29	1.87
2	TISCO (Oppisite to GSI Camp)	0.62	5.83	4.29	0.92
3	TISCO lease	0.46	5.76	2.99	2.29
4	Ransol Village	0.65	2.7	1.19	0.86
5	Ransol Village	0.46	3.18	1.4	1.22
6	Kansa (forest Dept.)	0.6	5.79	3.36	1.83
7	Kansa village	0.3	5.55	1.61	3.64
8	Misrilal Mines Lease	0.84	8.64	7.30	0.5
9	Misrilal Mines Lease	0.60	6.0	4.23	1.17
10	Misrilal Mines Lease	1.00	4.42	3.20	0.22
11	Saruabil Village (close to Tailangi mines)	0.58	5.11	1.16	3.37
12	Saruabil Village (close to Tailangi mines)	0.54	8.00	3.39	1.07
13	Kaliapani (Temple)	0.54	3.42	1.67	1.21
14	Bennagadia village	0.61	3.26	1.6	1.05
15	Bennagadia village	0.22	3.76	1.8	1.74
16	Kendupani village	0.659	13.83	3.68	9.58
17	Ragadish village	0.47	9.30	5.21	3.62
18	OMC Kalarangi	0.79	5.59	3.97	0.83
19	OMC Colony (Pump House)	0.71	5.4	4.62	0.07
20	Kathpal Village	G.L	5.89	4.89	1.0
21	Kathpal Village	0.22	2.25	1.63	0.4
22	Birasal Village	NA	NA	NA	N.A
23	Sendhasara Village	0.16	2.58	G.L	2.42
24	Sendhasara Village	0.46	2.63	G.L	2.17
25	Bandhasara Village	0.25	9.62	3.25	6.12
26	Kamplai Village	0.43	2.86	1.83	0.6
27	Maruabil Village	0.52	4.47	2.66	1.29
28	Maruabil Village	0.39	4.43	2.70	1.34
29	Sukurangi village	0.49	4.42	3.4	0.53
30	Sukurangi village	0.61	1.67	1.60	-(0.54)
31	Saruabil village	G.L	0.35	0.35	-

Annexure-9

ANALYSIS OF GROUND WATER AT KALIAPANI (TUBE WELL)

Sl.no	Characteristic	Season I W	Season II S	Season III M	Season IV PM	Limit as per *CPHEEO
1	Colour (pt-co scale)	<5	<5	<5	<5	<5
2	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	TDS mg/l	298	188	198	232	500
5	PH	7.9	7.95	7.6	7.5	7.8-8.5
6	Total Hardness (as $CaCo_3$) mg/l	144	82	140	136	200
7	Chloride (as Cl) mg/l	7.0	5.0	5.0	2.0	200
8	Sulphate (as So_4)mg/l	2.3	2.5	0.3	1.4	200
9	Nitrate (as No_3) mg/l	<0.1	<0.05	<0.01	<0.1	45
10	Fluoride (as F) mg/l	<0.1	0.17	0.25	0.39	1.0
11	Mineral oil , mg/l	<0.10	<.10	<.10	<.10	0.01
12	Phenolic compounds mg/l	<0.001	<0.001	<0.001	<0.001	0.001
13	Cyanide (as CN) mg/l	<0.01	<0.01	<0.01	<0.01	0.05
14	Aresenic (as AS)mg/l	<0.01	<0.01	<0.01	<0.01	0.05
15	Hexavalent chromium (as cr + 6) mg/l	<0.01	<0.01	<0.01	<0.01	0.05
16	Cadmium(as Cd) mg/l	<0.005	<0.005	<0.005	<0.005	0.01
17	Lead (as pb) mg/l	<0.01	<0.01	<0.01	<0.01	0.1
18	Cupper (as cu)mg/l	<0.01	<0.01	<0.01	<0.01	0.05
19	Mercury (as Hg) Mg/l	<0.001	<0.001	<0.001	<0.001	0.001
20	Selenium(as Se) mg/l	<0.005	<0.005	<0.005	<0.005	0..01
21	Zinc (as Zn) mg/l	<0.1	<0.1	0.23	0.14	5.0
22	Iron (as Fe) mg/l	0.03	2.05	0.07	0.18	0.1
23	Coliform organism MPN/100 ml	0	1.0	0	0	0
24	Turbidity N.T.U	<10	<10	<10	<10	25
25	Calsium (as Ca) mg/l	30.5	17.6	30.5	32.1	75
26	Magnesium (as Mn) mg/l	16.5	10.7	15.6	13.6	30
27	Manganese (as Mg) mg/l	<0.1	0.1	<0.01	<0.01	0.05
28	Anionic detergents mg/l	<0.1	<0.1	<0.1	<0.1	0.2
29	Ploynuclear Aromatic Hydrocarbons (PAH) mg/l	-	-	-	-	0.2

Annexure-10

ANALYSIS OF TUBE WELL WATER (VILLAGE BALIPARA) (WITHIN OUR LEASE AREA)

Sl.no	Characteristic	Season I W	Season II S	Season III M	Season IV PM	Limit as per *CPHEEO
1	Colour (pt-co scale)	<5	<5	<5	<5	<5
2	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	TDS mg/l	174	164	84	136	500
5	PH	6.55	6.45	6.75	6.7	7 to 8.5
6	Total Hardness (as $CaCo_3$) mg/l	100	60	82	108	200
7	Chloride (as Cl) mg/l	8	5	14	1	200
8	Sulphate (as So_4)mg/l	<0.1	<.1	0.7	2.2	200
9	Nitrate (as No_3) mg/l	2.7	2.1	2.4	0.9	45
10	Fluoride (as F) mg/l	<.01	<.01	<.01	<.01	<.01
11	Mineral oil , mg/l	<.10	<.10	<.10	<.10	<.10
12	Phenolic compounds mg/l	<0.001	<0.001	<0.001	<0.001	0.001
13	Cyanide (as CN) mg/l	<0.01	<0.01	<0.01	<0.01	0.05
14	Aresenic (as AS)mg/l	<0.01	<0.01	<0.01	<0.01	0.05
15	Hexavalent chromium (as cr + 6) mg/l	<0.01	<0.01	<0.01	<0.01	0.05
16	Cadmium(as Cd) mg/l	<0.005	<0.005	<0.005	<0.005	0.01
17	Lead (as pb) mg/l	<0.01	<0.01	<0.01	<0.01	0.1
18	Cupper (as cu)mg/l	<0.01	<0.01	<0.01	<0.01	0.05
19	Mercury (as Hg) Mg/l	<0.001	<0.001	<0.001	<0.001	0.001
20	Selenium(as Se) mg/l	<0.005	<.005	<.005	<.005	<.01
21	Zinc (as Zn) mg/l	05	<.1	<.1	<.1	5
22	Iron (as Fe) mg/l	.09	.38	0.01	0.11	0.1
23	Coliform organism MPN/100 ml	1	2.0	2	1	0
24	Turbidity N.T.U	<10	<10	<10	<10	25
25	Calsium (as Ca) mg/l	9.6	8	10.4	8	75
26	Magnesium (as Mn) mg/l	18.5	9.7	13.6	21.4	30
27	Manganese (as Mg) mg/l	<.10	.005	.02	<10	.05
28	Anionic detergents mg/l	<.1	<.1	<.1	<.01	0.2
29	Ploynuclear Aromatic Hydrocarbons (PAH) mg/l	-	-	-	-	0.2

Annexure-11

WATER QUALITY ANALYSIS OF DAMSALA NALA 6 KM UPSTREAM OF TISCO JACK WELL

Parameter	Summer	Monsoon	Post monsoon
PH	8.1	7.5	6.5
Conductivity, US/cm	110	95	130
P-alkalinity mg/1 as $CaCo_3$	0	0	0
N-alkalinity mg/1 as $CaCo_3$	65	52	84
Total hardness, mg/1 as $CaCo_3$	60	56	70
Calcium hardness, mg/1 as $CaCo_3$	20	20	22
Magnesium hardness mg/1 as $CaCo_3$	40	36	48
Calcium, mg/1ca	8	8	9
Magnesium mg/1 as Mg	10	9	12
Sodium , mg/1 Na	4	3	2.3
Potassium mg/1 as K	0.8	0.7	0.4
Silical mg/1 Sio_2	12	10	8
Chloride mg/1 as cl	9	8	8
Fluoride, mg/1 as F	0.09	0.09	0.06
Sulphate, mg/1 So_4	9	8	3
Nitrates, mg/1 as No_3	5	4	2
METALS			
Cadmium, mg/1 as cd	ND	ND	ND
Chromium (total), mg/1as cr	0.05	0.06	0.08
chromium Hexavalent mg/1 as cr + 6	0.04	0.04	0.06
Cobalt, mg/1 as Co	ND	ND	ND
Iron , mg/1 as Fe	1.1	1.21	0.34
Lead, mg/1 as pb	ND	ND	ND
Manganese, mg/1 as Mg	0.08	0.07	0.07
Nickel, mg/1 as Ni	ND	ND	ND
Zinc, mg/1 as Zn	ND	ND	ND

Annexure- 12

Future exploration schedule:

Year	Boreholes
1st	PBH_1-PBH_5
2nd	PBH_6-PBH_{10}
3rd	PBH_{11}-PBH_{15}
4th	PBH_{16}-PBH_{20}

Block wise exploration schedule:

Year	Block-A(ABCD)	Block-B(MNOP)	Surrounding area
1st	--	--	PBH_1-PBH_4
2nd	--	PBH_6	PBH_7-PBH_{10}
3rd	PBH_5	PBH_{12}	PBH_{11}, PBH_{13}-PBH_{15}
4th	--	PBH_{19}	PBH_{16}-PBH_{18}, PBH_{20}

Conceptual exploration schedule: PBH_{21}-PBH_{25}

PROGRESSIVE MINE CLOSURE PLAN IN REPSECT OF TAILANGI CHROMITE MINE OVER 155.537 HECTARES IN JAJPUR DIST. ORISSA.

(SUBMITTED UNDER RULE 23 B (1) OF MCDR, 1988

For & on Behalf of

The Industrial Development Corporation of Orissa Ltd.

Prepared by

H.K.Sahoo
RQP/CAL/257/97-A
IGMA Consultants (p) ltd.
S-26, BDA Market Complex
Nilakantha Nagar, Nayapalli
Bhubaneswar-751012
Ph: 0674-2560725

1. INTRODUCTION

Name of the Lessee : The Industrial Development Corporation of Orissa Ltd. (A Government of Orissa Undertaking)
Post Box No. 78
Bhubaneswar 751001
Ph: 252120

Plant Address: Idcol Ferro Chrome & Alloys Limited.
Ferrochrome Project, At/P.o-Jajpur Road, Dist: Jajpur
Phone: (06726)-220212 /220494/ 220524 (Fax)

अनुमोदित
APPROVED

Location and extent of the Lease area : The area of the leasehold having an extent of 155.537 hectares or 384.34 acres lying in the Survey of India Toposheet No. 73G/16. The area extends between longitude 85° 48' 04" to 85° 50' 00" E and Latitude 21° 03' 05" N to 21° 04' 02" N.

क्षेत्रीय खान नियंत्रक (ना.क्षे)
Regional Controller of Mines (NR)
भारतीय खान ब्यूरो
Indian Bureau of Mines
नागपुर/Nagpur

Type of lease are : The lease area comprise of forest and as well as non-forest land. The lease area over 155.537 hectares belong to state Government.

Present Land use pattern : Tailangi M.L area over 155.537 hectares include wasteland and forest located in hilly as well as plain land. The land use pattern, however, is as follows:

CLASS	REVENUE CLASS	AREA	
		IN ACRES	IN HECTS.
Non-forest	Waste land	44.53	18.021
Forest	Gramya Jungle	339.81	137.516
Total		**384.34**	**155.537**

Mr. H. K. SAHOO

Method of Mining	:	Method of mining will be opencast semi mechanised.
Mineral Processing	:	The low grade ore will be beneficiated for up gradation of ore.

1.1 Reasons for closure :

Predictable	:	It is expected that during proposed five years chromite ore will be available up to 40m below surface level and consequently the life of the mine may further increase after detailed exploration. Therefore, we don't fore see any eventuality to close the mine.
Unpredictable	:	Closure is also possible due to natural calamities mine related accident, local issues etc.

Hence, closing of the mine as a whole does not arise at present.

1.2 Statutory Obligations:

Progressive mine closure is required under rule 23B (1) of MCDR, 1988 for fresh grant lease vide notification GSR 330(E) dated 10.04.2003.

1.3 Closure Plan Preparation.

Name & Address of the Applicant

The Industrial Development Corporation of Orissa Ltd. (A Government of Orissa Undertaking)
Post Box No. 78
Bhubaneswar 751001
Ph: 252120

Plant Address: Idcol Ferro Chrome & Alloys Limited.
Ferrochrome Project, At/P.o-Jajpur Road, Dist: Jajpur
Phone: (06726)-220212 /220494/ 220524 (Fax)

Name & Address of the RQP preparing progressive Mine Closure Plan.

Sri. H.K. Sahoo
S-26, BDA, Market Complex.
Nilakantha Nagar, Nayapalli.
Bhubaneswar-12
Reg. No : IBM Regn.No RQP / CAL / 257 / 97-A

Name of the Executing Agency:

Closure plan will be implemented by the Industrial Development Corporation of Orissa Ltd..

Mr. H. K. SAHOO

2. MINE DESCRIPTION

2.1 GEOLOGY

General Geology: -

The Tailangi chromte deposit forms a part of Sukinda ultramafic complex. The associated formations are limontic rocks, cherts, talc and quartzitic rock. The parent rock is dunite, which is altered into serpentine, limonitised and silicified.

The stratigraphic succession of the area is as follows:

Soil and laterite.

Weathered ultramafic consists of talc &

Limonite with cherty materials,

Chromite with limonite partings at places

Weathered ultramafic composed of serpentine ,

Talc and dunite

Older quartzities.

This forms a segment of the northern limb of the synclinally folded sukinda ultramafic complex. A number of mineable ore bodies are found in the area. The ore bodies are more or less parallel to each other and often exhibits pinching and swelling character. The ore bodies are narrow, elongated and steeply dipping. The amount of dip varies from 50° to 80°. The average dip is about 60° towards south west. In some of the bore hole sections the relict olivines are observed which grades into pure olivinite at depth. Thus it indicates that the parent rock is dunite which alterted into serpentine. The wall rock mostly exhibits dunite suite of rocks consisting of serpentine, Dunite, Talc, Limonite and cherts as evident from the bore hole sections. Mostly the wall rock is monomineralic olivinites which occasionally altered to limonite. The general trend of the deposit is N 75° W to S 75° E, with local variation in the strike at places. XX

2.2 Reserve

Geological Reserve

Type	Chromite in MT.
Proved	1279846
Probable	557888
Possible	501440
Total	**2339174**

Mineable reserve

Type	Chromite in MT.
Proved	1206269
Probable	336822
Possible	184766
Total	**1727857**

2.3 Mining Method:

Method of mining

Method of mining will be opencast & semi-mechanised on single shift basis. Machines under deployment are Hydraulic excavator, Compressor, Dumper, Dozer, Water pump, jack hammer drill, wheel loader, etc. Eight meters wide haul road will be developed between quarry, dump and stack at 1:16 to 1:20 gradient.

Quarries under working:

This is a fresh area so no quarries under working.

Bench Geometry:

Height & width of the bench will be maintained at 3.5m & 5.8m respectively. Individual benches will be kept nearly vertical.. Overall quarry slope will be maintained at around 30° with the horizontal.

Machines Under Deployment:

Loosening of rock mass will be done by drilling & blasting, loading will be done pay loader. Transportation of ore and waste will be effected through 10 ton capacity tippers. Machines under deployment are Hydraulic excavator, Compressor, Dumper, Dozer, Water pump, jack hammer drill, Wheel loader, etc.

Production Level.

Year	Proposed production in MT
	Chromite.
1st	70740
2nd	78829
3rd	86821
4th	87508
5th	94096
Total	**417994**
Average	**83598.8**

2.4 Minerals Beneficiation:

Mineral beneficiation will be done and the details are provided in the chapter 10 of mining plan.

Mr. H. K. SAHO
RQP/CAL/257/97

3. REVIEW OF IMPLEMENTATION OF MINING PLAN/SCHEME OF MINING INCULDING FIVE YEARS PROGRESSIVE CLOSURE PLAN UP TO THE FINAL CLOSURE PLAN OF THE MINE.

Tailangi Mining lease area under reference is a fresh lease for which mining plan with progressive mine closure plan is submitted as a component of mining plan for approval and implementation during the planned period of 5 year.

4. CLOSURE PLAN:

4.1 Mined out Land:

During proposed plan period an area 8.0 hects. will be degraded due to quarrying. The ore may not be exhausted at this level so no reclamation proposal has been suggested. Only the plantation measure may be taken at the non active portion of the dump. Similarly during conceptual period a total area of 38.257 hects. will be degraded due to quarrying.

4.2 Water Quality Management:

Existing Surface Water Bodies

There is a perennial nala within the lease area, one branch of which flows from north to south and another flows at the southern boundary. This is a seasonally flowing nallah. Except in rainy season the quality of water flow in the nallah is very much scanty. The mining methods suggested for this area will neither obstruct the nallah nor thre is proposal for diversion of the same. The rain wash accumulated water and percolated water in the mine pit and the waste water from the beneficiation are likely to pollute the water of Damsala nallah. It is therefore proposed to utilize the major portion of mine water for watering the afforestation without any processing . The balance water of mine will be discharged to near by Damsal nallah only after necessary processing. However the waste water discharged from the beneficiation plant needs proper treatment before discharging in to the Damsala nallah. For this purpose it has been proposed to chanalise the same through the settling tank. Two tanks will be filled alternatively and the water will be stored for a considerable time for without sediments will be discharged to Damsala nallah by a properly designed sluice system and the 3rd settling tank will be kept as stand by to meet the requirement while maintenance work of other tanks are under taken.

Existing Ground Water Bodies:

There is no tube well or dug well within the lease area.

Water Quality of Management

Besides these working benches will be kept free form loose overburden/ waste materials. Check dam will be constructed around the dump to prevent washing off of the loose sediments. All the drainage system used for surface flow water will be cleared off and will be utilized for the natural flow of rain water from the very beginning of 1st year working of the proposed mining plan period.

Mr. H. K. SAHOO
RQ/ICAL/257/97-A

4.3 Air Quality Management:

Existing Air Quality Status

There exist no industrial activities within 5km radius of the M.L area. Therefore air pollution is felt to be below the permissible limit.

Corrective Measures :

Monitoring :

Regular monitoring of air & noise level will be carried out in the mining area.

Management :

An area of 30720 Sq.mt or 3.072 hect.is proposed to be planted with 7680 saplings and an equivalent no of saplings are to be planted beyond five years. Water sprinkling will be done over the dust prone areas such as haul road, working faces, loading & unloading points etc. Beyond the planned period it is proposed an area of 37000 Sq.mt or 3.7 hect. to be planted. All total an area of 6.772 hect. area will be planted at the end of conceptual period.

4.4 Waste Management:

Waste materials likely to be generated are a total 2005835 m^3 (Ref. Table-4.2 & 4.3 of mining plan) of waste to be generated during first five years of plan period. Toxic elements form the said waste materials are not expected. Beyond the planned period a total of 3546268 m^3 (Ref. Table-4.8 & 4.9 of mining plan) of waste will be generated. By considering the swell factor as 1.2 the broken volume of waste required to be dumped is around 2407002 Cu.m and 4255522 Cu.m during proposed plan period and conceptual period respectively. Keeping proposed height at 25m during plan period the dump will cover an area of 97500 sq. mt. During conceptual period4255522 Cu.m of waste will be dumped covering an area of 212776 Sq.mt and the dump height will be 20 mts. To control erosion in the proposed waste dump, regular compaction development of terraces and vegetation are proposed. Also the retaining wall and garland drain for the proposed waste dump will be constructed to arrest wash offs from the dump. It is proposed to construct both the retaining wall and garland drain at the beginning of 1st year of plan period. The Plantation will be done in the non active portion of the dump terraces from 6th year on wards an in conceptual period.

Mr. H. K. SAHOO
RQP/CAL/257/97-A

4.5 Top soil Management:

During plan period 48875 Cum of top soil will be generated (Ref Table-4.1) which will be stored at the proposed top soil stack covering an area of 4620 sq mt for future use. Beyond the plan period 121492 Cum waste will be generated and will stacked on the conceptual top soil stack covering an area of 21200 Sq. mt.

4.6 Tailing dam Management:

There is a proposal for processing plant within the lease area, so proper care for management of tailing dam is required.

4.7 Disposal of mining Machinery:

There is no possibility of decommissioning of mining machinery during the planned period of five (5) years.

4.8 Safety & security:

During mining

- Mining area will be fenced off to prevent falling down of man and animals.
- A guard will be employed to prevent pilferage of theft.

4.9 Disaster Management and Risk Assessment:

- Geological and climatic hazards such as landslide, subsidence and inundation is not expected due to opencast mining.
- Though earthquake is felt many times in Orissa, damage to man & materials so far have not been occurred to this part of area.
- Keeping in view the past occasions, flooding is not expected, as the area is located in hilly terrain.
- Small-scale fire is possible, which can be extinguished by fire extinguisher.

4.10 Care and Maintenance during Temporary Discontinuance:

Temporary discontinuance may happen due to various causes such as:

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

Since it is a temporary discontinuance, the following measures can be undertaken partly/ fully depending upon the causes.

Mr. H. K. SAHO
TROPICAL/257197

- Intimation to local mine & legal administrative authorities regarding the discontinuance
- List of the machines & materials
- Care and maintenance of machinery as per the machine operating manuals.
- There will be complete guard over the area by the security guard during respite discontinuance.
- Repair & maintenance of haul road
- Regular monitoring of air, water, noise etc in the permitted area.

5. ECONOMIC REPRECUSSIONS OF CLOSURE OF MINE AND MANPOWER RETERNCHMENTS:

5.1 Number of local residents employed in the mine, status of continuation of family occupation.

Management - 31 nos.

Skilled - 32 nos.

Semiskilled - 15 nos.

Unskilled - 25 nos.

The final proposal regarding the status of the continuation family occupation and scope of joining the occupation back will be given at the time of MCP FINAL.

5.2 Compensation given or to be given to the employees connecting with sustenance of himself and their family member.

Compensation or any other benefits as per the statutory provisions will be given to the employees associated at the time of closure mine.

5.3 Satellite occupations connected to the mining industry number of persons engaged there in, continuance of such business after mine closes.

This can only be given at the time of financial closure plan depending on the number of satellite occupations present at that time.

5.4 Continued engagement of employees in the rehabilitated status of mining lease area and any other remnant activities.

This can only be given at the time of final closure depending on the number of continued engagement of employees present at that time.

Mr. H. K. SAHOO

5.5 Envisaged Repercussions on the Expectation of the Society around due to closure of mine

This can be envisaged depending on the conditions prevailing in the society around at the time of final closure of the mine and will be mentioned in final closure plan.

6. TIME SCHEDULING FOR ABANDONMENT :

(i) Reclamation & rehabilitation of mine out land:

All total a volume of 2832000 m^3 will be back filled. On an average taking 2000^3 to be filled in one day, total no of days required for back filling the conceptual pit will be 2832000 m^3 / 2000m^3 = 1416days. Taking 20% excess the total number of days required is 1416 + 283= 1699 days.

(2) Measure to be taken for protection of water bodies available in the lease area including control of erosion sedimentation and siltation, water treatment, diversion of water courses, protection of contamination of ground water from leaching its; treatment of acid mine drainage etc.

(3) Corrective measure taken for prevention of pollution of air quality.

(4) Disposal of waste material and protective measures to be taken from generation of air, water and land pollutants while handling of waste materials.

(1) Terraces will be provided along the dump slopes for better stability. Simultaneously leveling & compaction will be done on the dump top. All these activity will take a period of two months of time.

(ii) Vegetation will be done around the dump and also along the terraces for further stability. This will taken at-least 8 to 10 months for completion.

(5) Management of top soil and protective measures to be taken:

Topsoil in the proposed mining area is fertile in nature. So top soil generated during the course of mining will be used for plantation purposes.

(6) Protection and stabilization of tailing dam frequency of desilting of tailing materil protective measure to be taken for prevention of water bodies.

(7) Decommissioning, dismantling and disposal of various infrastructure facilities.

Not applicable

(8) Decommissioning of mining machineries

As this is a opencast semi-mechanised mine machineries like hydraulic excavator, compressor, jack hammer, pay loader will be used. For transportation

ore 10 tonne capacity tipper will be in use. All these equipments will be kept with lessee for its future use in other projects.

(9) Safety measures to be implemented to prevent access to surface openings excavations.

Entire surface opening will be backfilled. Therefore no need to take any type of safety measures for the purpose.

(10) Measures of care, maintenance and monitoring of status of unplanned discontinued mining operations:

Not applicable.

7. ABANDONMENT COST

(1) Decommissioning/ Demolition:

Not applicable

(2) Removal of infrastructure:

Not applicable

(3) Removal of equipments and heavy machineries :

The mining lease area will neither have any foundation work for crushing/ beneficiation plant etc nor the deployment of any heavy machinery. Therefore, there will be no additional expenditure in respect of the above.

(4) Site Safety:

Not applicable

(5) Remediation / Mitigation measures :

An area of 236600 m^2 is proposed for conceptual dumping. Total cost required for constructing check-dam, garland drain and reclamation and rehabilitation of dumps through plantation are calculated as follows:

(i) Construction of check dam:
Taking an average length of 1500 m, total amount required will be Rs. 30000/- @ Rs. 20/- per meter. Size of the check dam will be 1500 m (length) x 2m (width) x 1.5m (height).

(ii) Providing garland drain:
Taking an average length of 1500 m, total amount required will be Rs. 15000/- @ Rs. 10/- per meter. Dimension of the garland drain will be of 1500m (length) x 1m (width) x 1m (depth).

Mr. H. K. SAHO
ROP/CAL/25707

(ii) **Total amount required under item no. i & ii comes to be Rs.30,000/- + Rs.15,000- = Rs. 45,000/-**

(iii) Standard cost norm for enrichment of plantation per hectares is as under:

(a) PRE-PLANTING & NURSERY:

Sl.No	2500 plants/ hectare	Wage Rare Rs. 50	
	Item of work	**Mandays required**	**Amount (In.Rs.)**
1	Site preparation	8	4000=00
2	Alignment & stacking	4	200=00
3	Cost of stacking materials	Lump sump	200=00
4	Nursery cost of 1250 seedling @ Rs. 3.00	----	3750=00
5	Pitting	12	600=00
Sub Total :			**5150=00**

(b) CREATION AND MAINTENANCE :

	Carriage & planting	30	1500=00
2	Weeding, soil working and m	18	900=00
3	Application insecticide (thrice)	3	150=00
4	Fireline tracing inspection path	4	200=00
5	Cost of tantalizer & insecticides	Lump sum	1500=00
6	Watch & ward	30	1500=00
	Sub total		**5750=00**
	Grand total		**10900=00**

(6) Reclamation and rehabilitation of workings :

(i) Waste available during planned period (refer broken volume in Para 4.4 of PMCP) = 2407002 m^3

(ii) Waste available during conceptual period (refer para 4.4 of PMCP) = 4255522 m^3

(iii) Total waste required to be rehandled/ backfilled = 2407002 + 4255522
= 6662524 m^3

(iv) Cost required for rehandling/ backfilling @ Rs. 1/- per m^3 = 6662524 x Rs. 1
= Rs. 6662524/-

Mr. H. K. SAHU

(v) Cost required for leveling and compaction of 38.257 hectares @ mined out area @ Rs. 1000 /- per hectare. = 38.257 x Rs. 1000/- =Rs. 382570/-

(vi) Cost required for rehabilitation by way of vegetation in backfilled area over 38.257 hectare @ Rs. 10900/- hect. (Ref. Previous para 7 (5) (iv)] = 38.257 x 10900/- = Rs.417001/-

(vii) Total amount required for reclamation and rehabilitation = Rs. 6662524/- +Rs 382570/- +Rs.417001 = Rs 7462095/-

(7) Maintenance / monitoring during and after closure operation.

Not applicable

(8) Retrenchment and relocation cost:

Not applicable

(9) Research and development:

Not applicable

(10) Administrative/ management :

(i) Fees to be paid for preparation of closure plan procurement of information and data from various institution / Organisation is Rs.50,000/-

(ii) Salary and wages of supervisory and managerial personnel for maintenance and monitoring activities for 2 years Rs. 72,000/- @ Rs.3000/- month.

(iii) **Total amount requirement under administrative expenditures is Rs. 50,000/- + Rs. 72,000/- = Rs.122,000/-**

Therefore, the required for abandonment is Ref. 7 (5), (6) & (10)] = Rs.45,000/- + Rs. 74,62,095 /- + Rs.122,000/- = Rs.76,29,095/- or say 76.29 Lakh rupees.

Mr. H. K. SAHOO

8. FINANCIAL ASSURANCE
(As per the CCOM'S Circular No. 4/2006)

अनुमोदित
APPROVED

Sl No.	Head	Area put on use at start of plan(in Ha)	Additional area requirement during plan period (in Ha)	Total (in Ha)	Area considered as fully reclaimed & Rehabilitated (in Ha)	Net are considered for calculation (in Ha)*
1.	Area under mining	--	8.0	8.0	--	8.0
2.	Storage for topsoil	--	0.462	0.462	--	0.462
3.	Overburden /dump	--	8.786	8.786	--	8.786
4.	Mineral storage	--	7.776	7.776	--	7.776
5.	Infrastructure (workshop, administrative building etc.)	--	0.890	0.890	--	0.890
6.	Roads	2.149	1.73	3.879	--	3.879
7.	Railways	--	--	--	--	--
8.	Greenbelt	--	3.072	3.072	--	3.072
9.	Tailing pond	--	--	--	--	--
10.	Effluent Treatment plant	--	--	--	--	--
11.	Mineral separation plant	--	--	--	--	--
12.	Township area	--	--	--	--	--
13.	Others (Nala)	2.396	--	2.396	--	2.396
GRAND TOTAL		4.545	30.716	35.261	--	35.261

* Area for financial assurance

Area under which financial assurance is computed

=8.0+ 0.462 +8.786 + 7.776 + 0.890 + 3.879 + 3.072 + 2.396 = 35.261 hect.

The deposit is proposed to be worked as a category –A(OTFM) mine. Therefore, financial assurance calculated to be 35.261 x Rs.25.000/- = Rs. 8,81,525/- at the rate of Rs. 25,000/- per hectare. The said amount under Rule 23(F) will be submitted as and when required in form of bank guarantee from any nationalized bank.

27/7/06

क्षेत्रीय खान नियंत्रक (ना.क्षे)
Regional Controller of Mines (NR)
भारतीय खान ब्यूरो
Indian Bureau of Mines
नागपुर / Nagpur

Mr. H. K. SAHO
ROP/CAL/257/07

भारत सरकार
भारतीय खान ब्यूरो, भुवनेश्वर
GOVT. OF INDIA
INDIAN BUREAU OF MINES, BHUBANESWAR

9. CERTIFICATE & UNDERTAKING

A certificate duly signed by the lessee is attached to consider the closure plan to approach the concerned authorities wherever necessary. Similarly, an undertaking is attached to implement progressive closure plan in a time bound manner

10. PLANS, SECTION ETC.

The plan and section submitted along with the mining plan may please be referred.

Mr. H. K. SAHO
REP/CAL/25/107-A

Gram : CHROME

ISO 9001 : 2000
APPROVED BY IRQS
IRQS
A DEPARTMENT OF INDIAN REGISTER OF SHIPPING
ACCREDITED BY THE DUTCH COUNCIL FOR ACCREDITATION

Phone :(06726) 220212 / 220494 / 220508 /220707
220516 / 220317 / 220517
Fax : (06726) 220524 / 220318
E. Mail - fcp@sify.com

IDCOL FERRO CHROME & ALLOYS LIMITED

(A WHOLLY OWNED SUBSIDIARY OF IDCOL)
A GOVT. OF ORISSA UNDERTAKING
REGD. OFFICE : FERROCHROME PROJECT - 755020
JAJPUR ROAD , DIST. JAJPUR (ORISSA) INDIA

OUR REF :

DATE : 10.01.06

CERTIFICATE

The above mentioned actions have been taken to be stated clearly in the progressive Mine Closure Plan of Talangi Chromite mine over an area of 155.537 hectares in Village Talangi in district Jajpur, State Orissa. The said Progressive Mine Closure Plan complies all statutory rules, regulations, order made by the Central or State Government , Statutory Organisations, Court etc. have been taken into consideration and wherever any specific permission is required the lessee will approach the concerned authorities.

Ashok kumar Mishra

Signature of the Applicant in full

Full name in Block letters (ASHOK KUMAR MISHRA)
Managing Director, IFCAL,
Agent , Talangi Chromite Mines,
For IDC of Orissa Ltd.
Jajpur Rod, Dist: Jajpur.

Gram : CHROME

ISO 9001 : 2000
APPROVED BY IRQS
IRQS
A DEPARTMENT OF INDIAN REGISTER OF SHIPPING
ACCREDITED BY THE DUTCH COUNCIL FOR ACCREDITATION

Phone :(06726) 220212 / 220494 / 220508 /2203707
220516 / 220517 / 220517
Fax : (06726) 220624 / 220318
E Mail : cpl@ sify.com

INDIAN BUREAU OF MINES, BHUBANESWAR * GOVT. OF INDIA *

IDCOL FERRO CHROME & ALLOYS LIMITED

(A WHOLLY OWNED SUBSIDIARY OF IDCOL)
A GOVT. OF ORISSA UNDERTAKING
REGD. OFFICE : FERROCHROME PROJECT - 755020
JAJPUR ROAD , DIST. JAJPUR (ORISSA) INDIA

OUR REF :

DATE : 10.01.06

UNDERTAKING

We do here by undertake that all the measures proposed in this Progressive Mine Closure Plan will be implemented in a time bound manner as proposed.

Ashok Kumar Mishra

Signature of the Applicant in full

Full name in Block letters (ASHOK KUMAR MISHRA)
Managing Director, IFCAL,
Agent , Talangi Chromite Mines,
For IDC of Orissa Ltd.
Jajpur Road, Dist: Jajpur