

PRE – FEASIBILITY REPORT

1.0 EXECUTIVE SUMMARY

1.1 Introduction

M/s MOIL has proposed underground mining of Manganese ore in an area of 76.409 Hectares at Awaljhari and Bharveli Village, Balaghat Tehsil and District, Madhya Pradesh at Awaljhari Survey No: 201/1k,201/2kh, 201/1kh,203/1,203/2,204/1,205, 206/1-2,204/1,205,206/1-4,207/1-2,208/1-2,209,210/1-2,(213/1,2,4,214/1,215/1)k, (213/1,2,4,214/1,215/1)kh,(213/1,2,4,214/1,215/1)gh, (213/1,2,4,214/1,215/1)d, (213/1,2,4,214/1,215/1)ch,(213/1,2,4, 214/1,215/1)ksh, (213/1,2,4, 214/1,215/1)j/1, (213/1,2,4,214/1,215/1)j/2, (213/1,2,4,214/1,215/1)ksh/1,(213/1,2,4,214/1,215/1) ksh/2,(213/1,2,4,214/1,215/1)jh,213/6-214/2-215/2,213/7,(213/8-214/3-215/3)d, (213/8-214/3-215/3)kh,213/9,213/10,213/14,213/3,216/1,216/2,217/1,2,3,218/1/j-218/3k-220/1,218/2, 218/kh,218/2/ch,218/3k,218/3/kh-220/3,218/3/g-220/4,218/3/gh-220/5,219, 220/2,221/1-6,8-11,222/1-5,223/1-4,224/1-7,225 etc and Bharveli Village, 1/1,1/2,7/1k, 7/1g,6/1-8/1k,6/2-8/1kh,5/4,5/2,4/2,8/1gh,7/2,8/3kh, 8/4g, 6/5, 8/1d,6/9-8/1jh,6/8-8/1ch,6/6-8/1ksh,6/3-8/1g,6/10-8/1lra-8/3gh,8/2k,8/2kh, 8/2g, P.O.8/4k,8/4kh,8/4g,8/4gh,8/4d,9,10/1-16,19/1-20/1,19/2-20/2k,19/3-20/2kh,19/4-20/5,19/4k-20/5k,19/4kh-20/5kh,19/4g-20/5g,19/5-20/6,19/6-20/7,19/7-20/8,19/8k-20/9k,19/8kh-20kh,19/8g-20/9g,19/9-20/10,19/10-20/11,19/11-20/12,19/12-20/13, 19/13-20/14,19/14-20/15,19/15-20/16,19/16-20/17,19/17-20/18,19/18- 20/19, 20/3k,20/3kh,20/4,22/1k,22/5k, 22/4/k/1,22/4/k/2,22/4/kh,94/1/k/1-6,94/1kh,94/1/g, 94/1/gh,94/1/d,94/1/ch,94/1/d,94/1/dh,94/1/g etc. The proposed production of Manganese is 0.120 MTPA. Mining Lease was granted for a period of 50 years by Department of Mineral Resources, Government of M.P. vide letter no.F-3-25/2013/12/2, dated 24.09.2015 [Annexure-I].The Mining plan was approved by IBM,Nagapur Regional Office, L.No.BGT/MN/ MPLN-1166/NGP, dated 21/03/2016.

Mining operations in this lease were started by MOIL in early sixties. The production of Manganese ore from the underground was commenced in the year 1982 prior to that it was worked by opencast mine by MOIL and then British company, the CPMO.

The proposed manganese ore production is 0.120 MTPA. The mining is underground mining. The region has good deposits of Manganese and has major demand in Steel industry. Geographically the mine is located in the center of India with well-connected networks of Roads. The location advantage of the mine makes it possible to dispatch the Manganese in all the directions giving easy accessibility to the market.

The salient features of the project are given **Table 1**.

Table 1: The Salient Features of the Project

Project Name	Awaljhari, Bharveli Manganese Mine of M/s. MOIL Limited
Mining Lease Area	76.409ha
Location of Mine	<p>Awaljhari and Bharveli Village, Balaghat Tehsil and District, Madhya Pradesh at Awaljhari Survey No :201/1k,201/2kh, 201/1kh,203/1,203/2,204/1,205,206/1-2,204/1,205,206/1-4,207/1-2,208/1-2,209,210/1-2,(213/1,2,4,214/1,215/1)k, (213/1,2,4,214/1,215/1)kh,(213/1,2,4,214/1,215/1)gh, (213/1,2,4,214/1,215/1)d,(213/1,2,4,214/1,215/1)ch, (213/1,2,4, 214/1,215/1)ksh, (213/1,2,4, 214/1,215/1)j/1, (213/1,2,4,214/1,215/1)j/2,(213/1,2,4,214/1,215/1)ksh/1, (213/1,2,4,214/1,215/1)ksh/2,(213/1,2,4,214/1,215/1)jh, 213/6-214/2-215/2,213/7,(213/8-214/3-215/3)d,(213/8-214/3-215/3)kh,213/9,213/10,213/14, 213/3, 216/1,216/2, 217/1,2,3,218/1/j-218/3k-220/1, 218/2,218/kh, 218/2/ch,218/3k,218/3/kh-220/3,218/3/g-220/4,218/3/gh-220/5,219,220/2,221/1-6,8-11,222/1-5,223/1-4,224/1-7,225 etc and Bharveli Village, 1/1,1/2,7/1k,7/1g,6/1-8/1k,6/2-8/1kh,5/4,5/2,4/2,8/1gh,7/2,8/3kh,8/4g,6/5,8/1d,6/9-8/1jh,6/8-8/1ch,6/6-8/1ksh,6/3-8/1g,6/10-8/1lra-8/3gh,8/2k,8/2kh,8/2g,P.O.8/4k,8/4kh,8/4g,8/4gh, 8/4d,9,10/1-16,19/1-20/1,19/2-20/2k,19/3-20/2kh,19/4-20/5,19/4k-20/5k,19/4kh-20/5kh,19/4g-20/5g,19/5-20/6,19/6-20/7,19/7-20/8,19/8k-20/9k,19/8kh-20kh,19/8g-20/9g,19/9-20/10,19/10-20/11,19/11-20/12,19/12-20/13,19/13-20/14,19/14-20/15,19/15-20/16,19/16-20/17,19/17-20/18,19/18-20/19,20/3k,20/3kh,20/4,22/1k,22/5k,22/4/k/1,22/4/k/2,22/4/kh,94/1/k/1-6,94/1kh,94/1/g,94/1/gh,94/1/d, 94/1/ch,94/1/d,94/1/dh,94/1/g , etc.</p> <p>Khasra No's details are attached as Annexure -II</p>
Toposheet number	64 C/1
Proposed production of mine	0.120 MTPA of Clean Manganese Ore
Method of mining	Underground Mechanized mining

Drilling/Blasting	Controlled Blasting and drilling is proposed.
No. of working days	300 days
Water demand	100 m ³ per day
Sources of water	Water will be supplied from Water tankers from the nearby area
Man power	50
Nearest railway station	Balaghat Junction Railway station- 4.89 Kms (SW)
Nearest airport	Nagpur Airport –148km

2.0 INTRODUCTION OF THE PROJECT/ BACKGROUND INFORMATION

2.1 Identification of Project and Project Proponent

A Miniratna PSU was originally set up in the year 1896 as Central Province Prospecting Syndicate which was later renamed as Central Provinces Manganese Ore Company Limited (CPMO), a British Company incorporated in the UK. In 1962, as a result of an agreement between the Government of India and CPMO, the assets of the latter were taken over by the Government and MOIL was formed with 51% capital held between the Govt. of India and the State Governments of Maharashtra and Madhya Pradesh and the balance 49% by CPMO. It was in 1977, the balance 49% shareholding was acquired from CPMO and MOIL became a 100% Government Company under the administrative control of the Ministry of Steel.

At present, MOIL operates 10 mines, six located in the Nagpur and Bhandara districts of Maharashtra and four in the Balaghat district of Madhya Pradesh. All these mines are about a century old. Except 3, rests of the mines are worked through underground method. The Balaghat Mine is the largest mine of the Company. The mine has now reached a mining depth of 309 meters from the surface. Dongri Buzurg Mine located in the Bhandara district of Maharashtra is an opencast mine that produces manganese dioxide ore used by dry battery industry. This ore in the form of manganous oxide is used as micro-nutrient for cattle feed and fertilizers. MOIL fulfills about 50% of the total requirement of dioxide ore in India. At present, the annual production is around 1,093,363 tonnes which is expected to grow in the coming years. MOIL has set up Ferro Manganese Plant (10,000 TPY) and Electrolytic Manganese Dioxide (EMD) Plant (1000 TPY) as per its diversification plan for value addition to manganese ore. MOIL has also set up a Captive Power Plant and is further considering, expanding the capacity of ferro manganese plant and setting up a new Silico Manganese Plant by means of joint ventures entered into with Rashtriya Ispat Nigam Limited and Steel Authority of India Limited.

The Company is having its Registered Office at A-1 MOIL Bhavan, Katol Road, Nagpur, Maharashtra - 490 001. The Mining plan of Awalajhari Mine for the leasehold area of 76.409 Ha was approved by IBM, Nagapur Regional Office L.No.BM/MN/MPLN-1166/NGP/2015, dated 21/03/2016

2.2 Brief Information about the Project

M/s. MOIL Limited has proposed mining of Manganese ore Awalajhari and Bharveli Villages, Balaghat Tehsil, Balaghat District, Madhya Pradesh. In order to cater the need for deeper underground Manganese ore the company applied for the mining lease adjacent to Bharveli 182.3004 ha, Lease of MOIL. The proposed Manganese mine (76.409 hectares) will be developed as Mechanized Mine by Underground – Over hand flat back cut and fill stoping with back filling of sand hydraulically from surface to stope by HDPE pipes. The production capacity will be 0.120 MTPA.

2.3 Need for the Project and Its Importance to the Country or Region

Manganese is one of the major mineral deposits occurring in the Indian sub-continent. It has played a great role in development of civilization and industrialization. The occurrence of Manganese ore in the proposed area is proved by the way of exploration and its production has important role in the steel industries. The mine lease area over 76.409 hectares is covered within the Survey of India toposheet No. 64 C/1. The capacity of the proposed Manganese mine to cater the need of Manganese plant is 0.120 MTPA. The region, where the project is situated is mostly dependant on agriculture and other mining industry. The development of mining in the area is directly and indirectly going to contribute in increasing employment, infrastructure, communication, and socioeconomic infrastructure.

As per EIA notification 2006 project proponent is submitting the proposal to get Clearance for production capacity of 76.409 TPA from Expert Appraisal Committee (EAC) constituted by MoEFCC, GOI for the purpose of grant of Environmental clearance.

2.4 Demands-Supply Gap

The bureau estimates that India has 142 million tonnes of manganese in reserve, with the majority of that material classified in the mixed, low-grade (less than 25 percent manganese) and unknown categories. Current production is in the range of 2.5 million tonnes per year, with manganese content in the neighborhood of 30 to 35 percent.

The combined installed capacity of the manganese alloy industry throughout the country is 3.16 million tonnes per annum, and it is operating at about 60 percent of that capacity.

India's manganese production by 2020 is forecast to hover around 5 million tonnes, with demand forecast for 9 million tonnes per year. At that consumption rate, the country's total reserves would dry up in 10 to 15 years. This project will help in reducing the Demand-Supply gap in the area.

2.5 Domestic/ Export Markets

Manganese is used in steel alloys to increase many favorable characteristics such as strength, hardness and durability. In fact steel cannot be produced without manganese; it is an essential ingredient in the process. Manganese is also used to color glass an amethyst color. India is the fifth largest producer of Manganese in world.

2.6 Employment Generation

Proposed mining is mechanized method and this project operation will provide livelihood to 50 workers. It will provide employment to the people residing in vicinity.

3.0 PROJECT DESCRIPTION

3.1 Type of Project Including Interlinked and Interdependent Projects, If Any.

The proposed Awalajhari,-Bharveli mine area is 76.409 Hectare with production capacity of 0.120 MTPA. No interlinked projects are associated with this project.

3.2 Location of the project

Awalajhari, Bharveli mine is located in Balaghat Tahsil of Balaghat District, Madhya Pradesh. Awalajhari –Bharveli Manganese mine can be approached by road from Nagpur. It is 2.0 km from Balaghat town. Balaghat is connected by all-weather roads to important places like Nagpur, Gondia, Jabalpur and Raipur etc.

The mine lease area comes in Survey of India toposheet No. 64 C/1. The latitude and longitude of the boundary pillars are 21°50' 16.79" N, 80°13' 23.03" E, 21°50' 14.16" N, 80°13' 24.16" E etc. The detailed Latitudes and Longitudes are given in Table 2. Location map of the project site is given in Figure 1. A 10 km radius topo sheet of Awalajhari, Bharveli Mine is given in Figure 2.

Figure 1 : Location Map of The Project

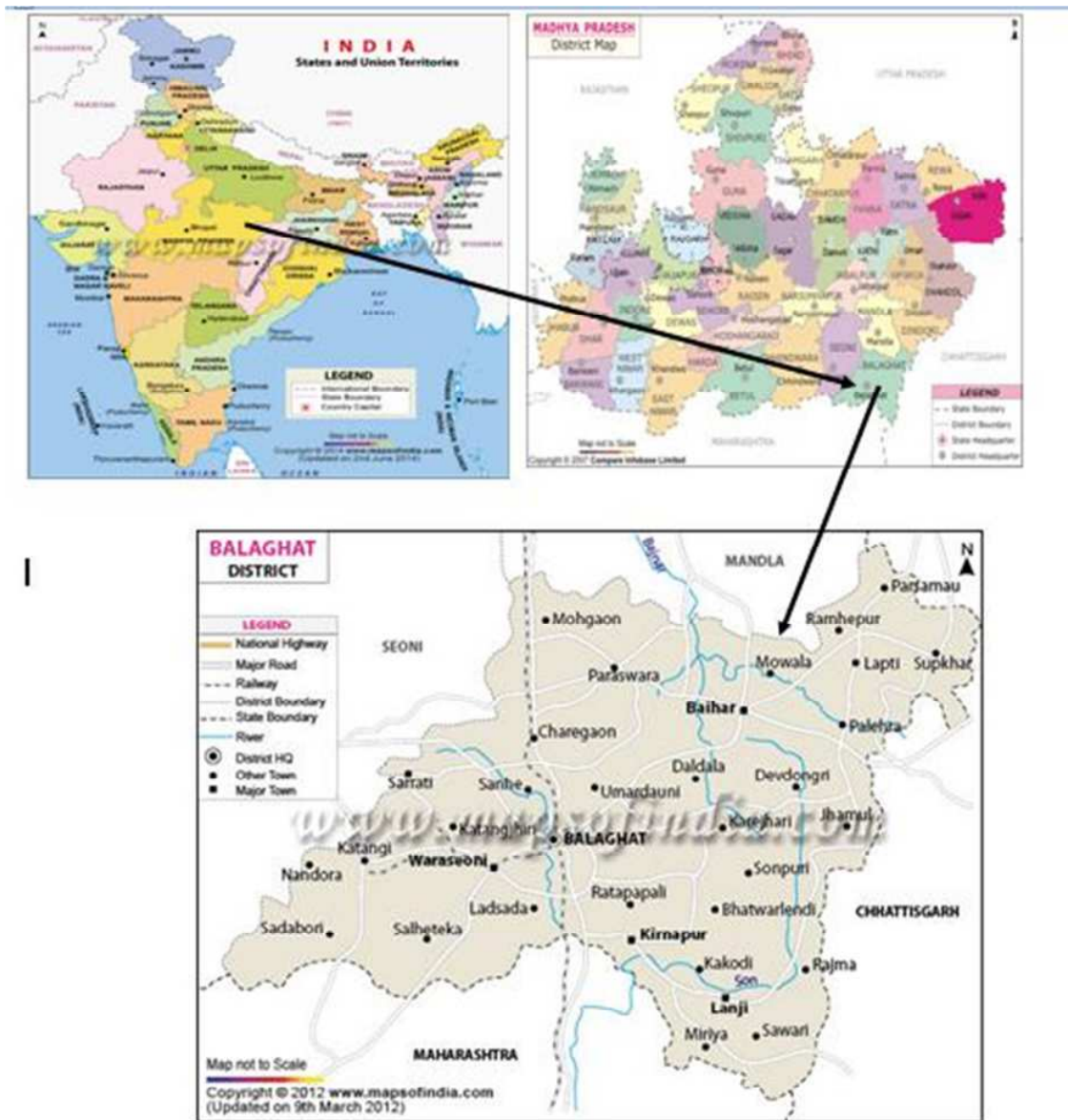


Figure 2 : Topo Map of 10 km Radius of the Awalajhari, Bharveli Mine Project

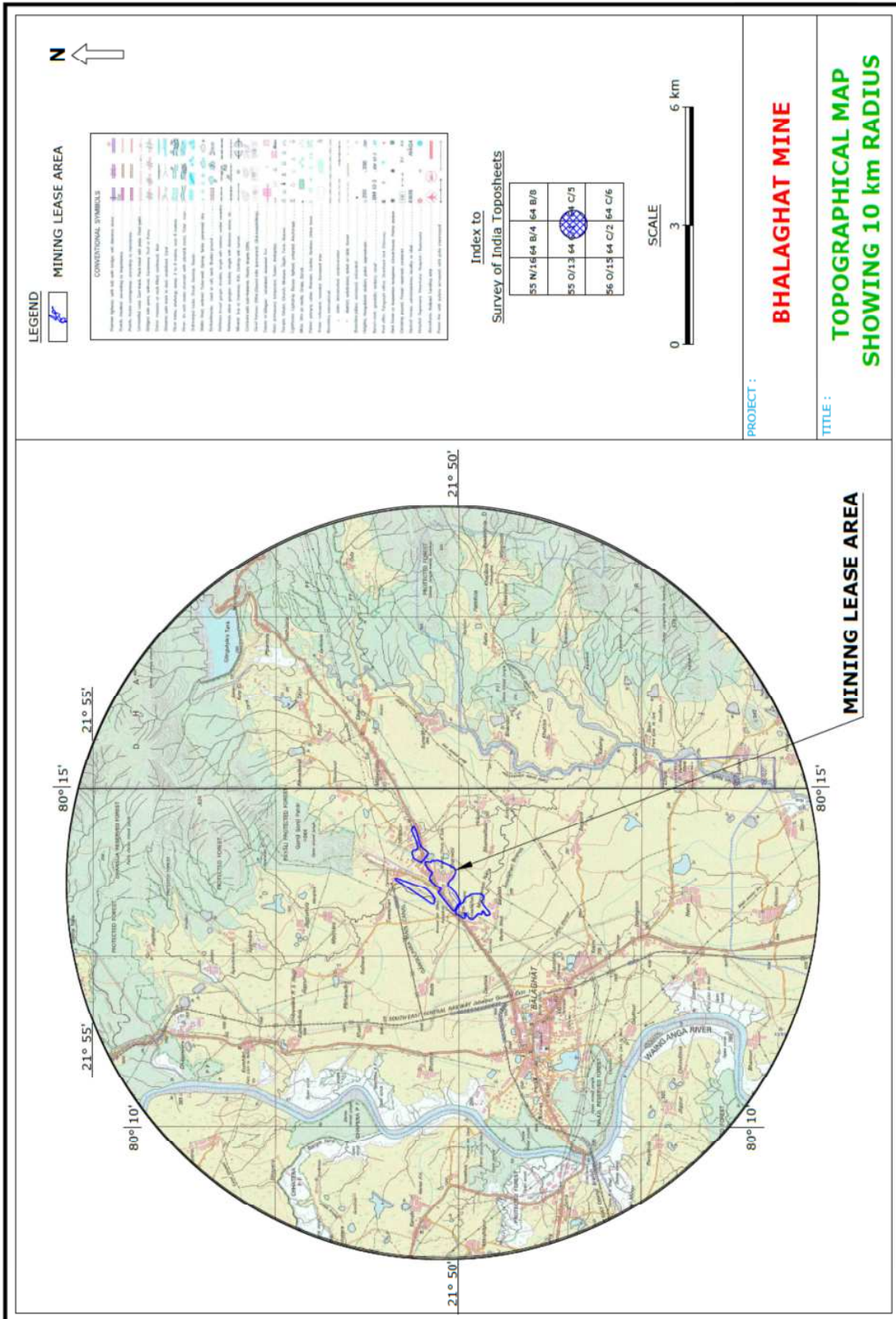


Table 2 : Latitudes and Longitudes of Awalajhari, Bharveli Mine

S.No	LATITUDE	LONGITUDE
1	21°50'49.40"N	80° 13' 40.50"E
2	21°50'4.0"N	80° 13' 40.50"E
3	21°50'46.305"N	80° 13' 43.452"E
4	21°50'44.48"N	80° 14' 4.242"E
5	21°50'16.79"N	80° 13' 23.03"E
6	21°50'14.16"N	80° 13' 24.16"E
7	21°50'2.439"N	80° 13' 12.6"E
8	21°49'53.60"N	80° 13' 7.408"E
9	21°49'41.33"N	80° 13' 9.74"E
10	21°49'46.11"N	80° 13' 17.506"E
11	21°49'53.5"N	80° 13' 26.31"E
12	21°49'56.6"N	80° 13' 28.6"E
13	21°49'56.3"N	80° 13' 31.56"E
14	21°50'5.11"N	80° 13' 33.38"E
15	21°50'5.3"N	80° 13' 37.12"E
16	21°50'33.327"N	80° 13' 51.445"E
17	21°50'39.354"N	80° 14' 1.535"E

3.3 Details of Alternate Sites

No alternate site was considered as the project is mineral specific and site specific.

3.4 Size or magnitude of operation

The Awalajhari, Bharveli Mine proposed production is 0.120 MTPA. The lease follows Underground mechanized mining method. The Lease sketch/Plan and Surface Plan are enclosed as Annexure – III & IV.

3.5 Geology and Reserves

3.5.1 Topography

Awalajhari, Bharveli Manganese Deposit lease area is located near the Southern side of Baihar Plateau. There are almost two parallel ridges striking NNE to SSE. The distance between the crests of two ridges is about 400 mtrs. To the North about 2500 mts (PWI). road. two ridges merge to form to high hill (570 mtrs) known as Somji-Gomgi. The plain land either side of ridges has an elevation of 300 mtrs above MSL. The highest point in Northern end of the property is about 400 mtrs above MSL. The Ore body out crops along the crest of eastern ridges, which contains beyond south of Baihar road to the adjoining old abandoned pit previously mined by M/s. BP Bayramji & Co..

3.5.2 Geology

Based on vast experience in mining and exploration carried out in the adjoining lease area behavior of the ore body has been established furnished as below

a) Ore Body: Straigraphically ore horizon of Awalajhari, Bharveli Manganese Deposit underlies the rocks of Munsar Formation & Overlies the Sitasongi Formation of Sausar Group.

The manganese ore deposit of Awalajhari, Bharveli ML area is Southern extension part of MOIL's existing lease and is the best and richest deposit in India. The ore body striking NE-SW with steep dip towards west. Dip varies from 60° to vertical. The thickness of the ore body in the area varies from 2m to 10 m.

Structure of Ore bed:

The manganese ore deposit of Awalajhari, Bharveli ML area is southern extension part of MOIL's existing lease and is the best and richest deposit in India. The ore body striking NE-SW with steep dip towards west. Dip varies from 60° to vertical. The thickness of ore body in the area varies from 2m to 10m . As the manganese ore deposit of Awalajhari, Bharveli ML area is southern extension part of MOIL's existing lease the structure of the existing lease ara can be correlate with the ML area of of Awalajhari, Bharveli to depict the actual structure in the ML area of Awalajhari, Bharveli. The structure of entire deposit is given below.

Folds:

There are two generations of folds encountered here:

- i. The older generation of the fold in which recumbent fold is existing is found in between Ch 800 and Ch 1200. The plunge of this fold is 15° towards NW causes local flatness of dip in various levels.
- ii. The younger generation of fold is drag fold, which occur all along the strike, but they have very little effect on the strata.

Faults:

There are three nos of minor faults which were encountered during the mining operations in different levels. Presently these are not traceable due to exploitation activities at open cast as well as in underground levels. They were minor dislocations and had no influence in any direction on the strata. Therefore they have not been considered in sections.

The details of these are as follows:

1. At Ch 5400 at 4th level undergrounds.

Head 180° (towards NNW throw 4.5 mtrs Towards West)

This fault was seen from 4th level to 5th level at Ch3500 but it was not encountered below 6th level at anywhere.

2nd fault encountered in 4th level underground at Ch 7400 ore drive

Head 15° (towards SSW)

Throw 3.5 mtrs towards West

3rd fault encountered in the opencast pit at Ch:8400

Head 65° towards NE

Throw 4 mtrs towards west

Joints:

The Ore bed in the mine is highly jointed. Different sets are developed in section of mines, this may be due to local structural disturbances.

In the North section where the Ore body is influenced by recumbent fold (Ch800 to Ch 4200). Four sets of joints along with the random joints are present. The dip of major sets of joint is 78° towards North 130° . But the trend of the joints seen along with the random joints. The dip of the major set of joint is 70° towards North 298° .

The Ore bed of this mine is stretching about 2.8 kms. In length is continuous along the dip & strike.

The ore bed is thick in the middle portion (Ch800 to Ch 4000) (Average thickness also reduces to a mtr, then suddenly it disappears in the North extremity of the mine).

Mineralogy of Ore:

The ore bed from various bore holes were studied under ore microscope and found that it contains about 11 minerals. The percentage of each mineral in ore is given below:

1. Braunite - 61.3%
2. Psilomelane - --
3. Cryptomalene --
4. Pyrolusite - 15.41%
5. Manganite -
6. Hollonodite - 14.90%
7. Bixlyite - 7.86%
8. Hematite - 0.40%
9. Pyrite - 0.10%
10. Sitaparite - NA
11. Apatite - NA

3.5.3 Exploration

MOIL. had placed 3 (three) Bore holes from M.L, area of 5.0342 hectare (12.44 Acres) Earlier held by MOIL. to ascertain the depth persistancy of its working ore zone- These three bore holes are falling under influence of applied area. Besides applied area is also coming under influence 3 bore holes drilled on existing ML of MOIL i.e. 182.3004 Ha. The results of exploration and underground working in different levels revealed that ore zone of Bharveli main lease of 76.409 hectare with constant behavior and grade

It is evident that the ore from hatched area of 76.409 hectare can be exploited by-extending present infrastructure of Bharveli Mine. Therefore the quantum of re falling under hatched area is considered under probable mineral reserves of 121 category of UNFC. However the quantum from remaining ore body need detail exploration and hence placed under inferred Mineral Resources 333 category of UNFC. The ore underneath hatch area is readily available for underground mining by extending present infrastructure from Bharveli Mine.

ORE RESERVE:

The present system of UNFC highlights is the economic and feasibility of extension of the mineral deposit, which gives fair knowledge about Techno-Economic viability of mining project.

Geological Axis- taking into consideration, the structure and the mineral disposition of the area exploration has diffentiated the mass of mineral body in 4 categories-

- G-4 is related to reconnaissance
 G-3 is related to prospecting
 G-2 is related to general exploration
 G-1 is related to detail exploration.

The mineral in lease area 76.409 ha is categorized under G-1 and G-3 formations of Geological axis. The app. 3 hectare falling within section no. AA and BB measuring to 200 mtrs strike length, has been explored to the depth of 400 mts by Bore holes as indicated in enclosed sections. The eastern part of the applied area, underground working is under operation is lease area of 182.3004 Ha and the drive can be extended in the area immediately after receiving all clearances is considered under G-1 category of UNFC. The rest of the area of hanging wall is distrubed under G-3 of UNFC

Details of Reserves/Resource Calculation of Bharveli, Awalajhari Mangases Deposit ML area 76.409 Ha

Section Line	Area-a	Area - b	Total	Avg Area	Length	Volume	T.F.	Reserves/Resource in T	Category
II-HH	920	1240	2160	1180	200	216000	3.5	756000	333
HH-GG	1240	980	2220	1110	200	222000	3.5	777000	333
GG-FF	980	870	1850	925	200	185000	3.5	647500	333
FF-EE	870	700	1570	785	200	157000	3.5	549500	333
EE-DD	700	705	1405	702.5	560	393400	3.5	1376900	333
DD-CC	705	305	1010	505	200	101000	3.5	353500	333
CC-BB	305	1500	1805	902.5	200	180500	3.5	631750	221
BB-AA	1500	300	1800	900	200	180000	3.5	113750	121
Total								57,22,150	

Tonnages as per UNFC :

Classification	Code	Quantity in Tonnes	Grade
A. Mineral Reserves		5,16,250	25-48% Mn
(i) Proved Mineral Reserves	111		
(ii) Probable Mineral Reserves	121		
(iii) Probable Mineral Reserve	122		
TOTAL - A		5,16,250	
B. Remaining Resources			
(1) Feasibility Mineral resource	211		
(2) Prefeasibility Mineral Resource	221	1,13,750	25-

(3)Prefeasibility Mineral Resource	222	50,92,150	48%Mn
(4)Measured Mineral Resource	331		25-48%Mn
(5)Indicated Mineral Resource	332		
(6)Inferred Mineral Resource	333		
(7)Reconnaissance Mineral Resource	334		
TOTAL-B		52,05,900	
GRAND TOTAL A+B		57,22,150	27-48

Future Exploration Programme:

The ore body has been proved up to 15th level by exploration. While proposing exploration for next 5 years period, above have been taken into consideration. During this period 30 boreholes will be drilled detail of which is given table appended below. Out of these 30 boreholes 10 boreholes will intersect ore bed at 15th level, which could not be drilled earlier. Remaining 20 boreholes will intersect ore bed at different levels. Location, inclination and probable length of these boreholes will be finalized considering topography of the area and availability of land for installation of drill machine at the time of actual commencement of drilling

Proposed Exploration for next 5 years Period

Year	No of bore holes by core drilling	Grid Interval	Total meter age	No of Pits, dimensions ; and volumes	No. of trenches, dimensions and volume
I	6	50mx50m	1500 m	NIL	NIL
II	6	50mx50m	1500 m	NIL	NIL
III	6	50mx50m	1500 m	NIL	NIL
IV	6	50mx50m	1500m	NIL	NIL
V	6	50mx50m	1500m	NIL	NIL
Total	30		7500m		

3.6 PROJECT DESCRIPTION WITH PROCESS DETAILS

3.6.1 Method of Mining

Currently at Balaghat the deposits is being worked by underground cut & fill method of mining. Ore is exploited with multilevel workings. The deepest is 12th level. Program for opening lower levels is underway. The developmental activates are in operation at 12th, 13.5 & 15th level. The sinking & equipping of Holmes's shaft is in process. The levels below 15th upto 21st will be opened with sinking high speed shaft located in main lease ch 37, In past second and third levels were worked. 4th level was worked by Hardy's shaft and 5th level was

worked by Edward's shaft. The old Hardy's shaft and 5th level has been widened and deepens upto 15th level and renamed as Production shaft. Under modernization program, the level interval is increased to 45 mts. Pre-mining support system with cable bolt & rock bolt is introduced. Mining operations are executed with SDL in underground slopes. Gran ye car is introduced for transposition of Ore.

Presently the existing shafts of 182.3004 ha lease will be used for mining in 76.409 ha lease

Level interval:

The level difference is 30 mts, which is in consonance with manual system of ore handling fill packing and square set system of roof support. Now with gradual improvisation and mechanized system of all the above activities, the level interval has been planned from 30 mts, which will not only facilitate further mechanization of stoping operations but also add to profitability of the mine in the way of comparatively lesser development and conserving the mineral by avoiding the blockage of ore in the barrier pillars. Accordingly, the lower levels are planned to be opened at 13^{1/2} L 15th L and so on

The sizes of main entries, haulage roads, ore drives, winzes etc are given below:

S.No.	Items	Size
1	Holmes Shaft	6.60x3.70m
2	Edwards Shaft	4.35x1.86m
3	Production Shaft	4.50 m dia
4	Haulage Roads	3.66x2.44m
5	Ore drives	2.44x2.13m
6	Crosscuts	2.44x2.13m
7	Winzes	2.44x1.83m

Underground layout:

Size of the stope block: 45 mtrs

Level interval: 30 m (vertical) till 12th level afterwards level interval is 45m

Winzes/ raise: 2.5m x 2.5m

Cable bolting: 1.5 m x 1.5 m of sufficient length with min 2 m inside the hang wall contact zone

Roof bolt: Roof bolt of 1.5 m length will be put at the center of 4 cable bolts

Barrier: 5m thickness in entire stope block for safety of upper level

Rib Pillar: 6m wide from hanging wall to foot wall for stabilization of cross cut. Ore drive of 2.4x3.0m will be driven through this rib pillar for orientation of the ore body

System of drilling and blasting:

Drilling in the drivage for haulage road, cross cut and ore drive will be done by pneumatically operated jack hammer of 33 mm dia of the length of 1.5 m. Generally wedge cut and parallel cut will be carried out due to soft strata of country rock.

Drilling pattern in ore	20 to 24 holes of 1.2 m length
Drilling pattern in rock	26 to 34 holes of 1.2 m length
Drilling pattern in Stopes	Length of hole 1.2 m, spacing 0.6 m and burden 0.50 m
Maximum number of holes blasted in a round	Max 34
Charge per round (kg)	10.2 kg/round
Charge per hole (kg)	0.3kg/hole
Type of explosive	Slurry of 60% 7 80% strength
Powder factor (Norms)	
Rock development-	5 kg/mtr
Ore development-	11 t/kg
Stope-	10-12 t/kg
Powder factor (Actual)	
Rock development-	-
Ore development-	-
Stope-	-

Method and sequence of stoping:

Method of mining is horizontal cut and fill with post filling. Shaft inset is developed in rock at Ch.63. Thereafter, haulage drive will be developed in footwall rock which will be around 10 m away from the footwall. Stope will be prepared at 80 mtrs instrike direction and one centralized winze/raise will be developed for interconnection with lower level to upper level.

Manways and ore pass will be extended by steel segments and will allow air to pass for comfort of employees in underground. The strata will be supported by long cable bolts and roof bolts. Temporally support by wooden props and chocks will be provided. After mining of 40 in strike length, sand will be filled hydraulically by sand stowing operations. Scientific study reports are enclosed.

S.No	Stoping Parameters	
1	Number of working stopes	At a time 12 stopes (when fully developed)
2	Size of the panel	80 m
3	Level interval	30 m vertical upto 12 th level and below level 12 th level it is 45 m
4	Thickness of crown Pillar	5 m
5	Thickness of Sill pillar	No sill pillar
6	Thickness of Rib pillar	6 m
7	Size and interval of Stopes pillar	No stope pillar
8	Size/shape of manway	Steel manway of 1.5 m dia circular
9	Size/shape of ore pass	Steel chute of 1.2 m dia circular
10	Method of stowing/ back filling	Back filling of sand hydraulically from surface to stope by HDPE pipes
11	Method of drainage of stowed water	Poke holes in concrete walls of cross cuts at lower levels. Stowed water will go to drains and drains it will go to sump. From sumps it will be circulated to surface.

System of underground transportation:

From face to pit bottom or loading point	u-tub of 24 eft will be transported by battery operated locomotives
From pit bottom to surface	By cage of vertical shaft by U-tub of 24 eft
From surface to end use plant	By trucks
Safety features provided on trucks	It will be transported with cover, rear camera and power brake.

Details of Vertical shaft at Balaghat Mine:

The finished diameter of the vertical shaft is 6.7 x 3.048m. It is located at Ch 4000 in lease over an area of 182.3004 ha. The shaft has been sunk upto 390.50m from the surface. At present it is upto 07 meter below 15L. Hoisting capacity of the present shaft is 5,00,000 Tonnes ROM per year. There are 2 vertical shafts namely product shaft and Holmes Shaft. The details of the vertical shafts are as below.

Details of Holmes Shaft located at Ch 4000

S.No.	Description of Work	Details
1	Shape of Shaft	Rectangular
2	Size of Shaft	6.731x3.048m

3	Depth of Shaft	392 M below 15 th L
4	No. of Levels	6 th to 15 th Level
5	Winding	Cage winding with Tub
6	Tub loading arrangement	At each level
7	Hoisting capacity	360000 ROM/TPA
8	Total depth of Shaft from Surface	333.58 MRL to 56 MRL (390.50 Mtrs)
9	Pit top arrangement	O.H. Bunker of 100 T with Tub tippler
10	Pit Bottom arrangement	For Movement of Tubs
11	Planned production from U/G through vertical shaft	360000 TPA of ROM

Details of Production Shaft located at Ch 3800

S.No.	Description of Work	Details
1	Shape of Shaft	Circular
2	Size of Shaft	4.5m
3	Depth of Shaft	390m
4	No. of Levels	8 th to 15 th Level
5	Winding	Cage winding with Tub
6	Tub loading arrangement	At each level
7	Hoisting capacity	240000 ROM/TPA
8	Total depth of Shaft from Surface	333.58 MRL to 56.92 MRL (390.50 Mtrs)
9	Pit top arrangement	O.H. Bunker of 100 T with Tub tippler
10	Pit Bottom arrangement	For Movement of Tubs
11	Planned production from U/G through vertical shaft	240000 TPA of ROM

Production :

According to the proposed development and stoping will be carried out initially at 12th L and 13th L. Thereafter, at 15th L upto Ch,75. After sinking of ventilation shaft from surface to 12thL at Ch.112.5, future development and stoping operations beyond Ch 75 will be carried out. Details of the proposed stopes blocks available after development are given below

Year Wise Production Schedule

Year	Level	CH. To Ch.	No of Stopes			
	From Stope+ Winze	O.D.	Total	Clean Ore with Recovery (80%)	Recovery of Ferro Grade	Fines/Hutch
1 st Year	0	0	0	0	0	0
2 nd Year	0	0	0	0	0	0
3 rd Year	0	3780	3780	3024	2419	605
4 th Year	7092	7560	14652	11724	9377	2344
5 th Year	33462	12285	45747	36598	29278	7320
	40,554	23,625	64,179	51,344	41074	10269

Proposed R.O.M. Production from lease hold area of 76.409 ha :

ROM Production First 5 years in Tonnes

Year	1st	2nd	3rd	4th	5th	Total
ROM in Tonnes	-	-	3780	14652	45747	64179

Year	1 st -5 th	6 th -10 th	11 th -20 th	20 th - 30 th		Total
Production ROM in Tonnes/Year	64179	120000	150000	150000	150000	150000

As stated, the production from this lease is envisage through the underground operation only and after 10th year around 12 stopes of 240 m length in strike direction in the west and east side will be available for production. This will generate around 120000 Tonnes of ROM at the end of 10th Year and 150000 T ROM at the end of 20th Year. Mineral rejects will stacked separately as per the prevailing market condition at the time.

Mineable reserves and anticipated life of mine:

Available Insitu Reserves: 5722150 T

Mineable Reserves: 5092713 T

(As per the scientific reports, barrier pillar, rib pillar is considered. Around 11% loss (Locked) in pillars is considered for mineable reserves).

Anticipated Average Yearly production for first 5 year is 21393 T and for next 5year is 82260 T and Hence after 150000 T per year.

Average Production is anticipated for 50 years is 150000 T per year.

Life of mine: 5092713 T/ 150000 T will be around 33.95 years say 34 years (up to 15L)

3.7 Raw Material Required Along With Estimated Quantity, Likely Source, Marketing Area of Final Product/S, Mode of Transport of Raw Material and Finished Product

No raw material will be required in the proposed project. The operation involves the extraction of material and dumping in stock yard. From OCF the ore is brought to siding by tubs pushed manually from siding the ore. It is transported to its final destination by trucks depending upon the convenience and choice of buyers.

3.7.1 Use of Mineral

The ore will be sold to Ferro/ Silico Industries. MOIL has its own specifications, which are derived as per buyers demands & available quality. MOIL sales its ore to various Ferro/Silico producers as per demand. It is to be mentioned here that MOIL has set up its own lab, for chemical analysis the analytical results of the lab are expectable to all concerns.

Ferro Grade requirement: Mn%- 38-48
Silico Grade: MN% 2.5-30%

3.7.2 Processing

Mineral drawn on surface is sent to OCF for appropriate sizing and grading. This is a manual process. The -25 mm fraction is screen for +10 mm fraction. With change in demand for lower fractions, a screen has been installed for recovery of fines + 3 mm. The mineral dumps will be re-cleaned for + 3 mm. + 10 mm and + 25 mm fractions through double deck screen.

3.8 Resource Optimization/ Recycling and Reuse

Not envisaged.

3.9 Availability of Water Its Source, Energy/ Power Requirement and Source

The water requirement of the project is estimated to be 100 m³/day of the water is required for sand stowing, wet drilling, cooling of plants & machinery, dust suppression and beneficiation of ore. Water requirement for dust suppression (within the lease and outside the lease in nearby villages), plantation and vehicle washing will be met from mine water and from rainwater collected in mining pit.

Drinking water is supplied from five wells, (outside of the applied area). Most of water is supplied from tube wells through overhead tanks and network of pipeline. These tube wells are located in lease area and are utilized by villagers.

The Madhya Pradesh Electricity Board grid will supply electric power and the company will provide generator to the lease.

3.10 Quantity of Wastes to be Generated (Liquid and Solid) And Scheme for their Management/ Disposal

3.10.1 Solid Waste Generation& its Disposal

80% of the waste generated will be utilized for filling the stope during stoping operation of lower lift. 9203 m³ will be generated during first 5 year period of mining plan. The total quantum estimated in the 76.409 ha area is given below.

Year	Waste in Cu.m	Utilised in stope in Cum.	Hoisted to surface Cu.m
1st	1116	893	223
2nd	1246	997	249
3rd	1410	1134	204
4th	2888	2310	578
5th	2535	2028	507
Total	9203	7362	1841

Waste Dump :

The waste will be stored in an area of 2000 Sq.m with 30⁰ slope at 5 meters height. The dump area will be stabilized after reaching its capacity.

3.10.2 Liquid Effluent

Sorting and cleaning of ore will be done at existing beneficiation plant at Balaghat Mine. The tailing will be captured with tailing ponds. Water from tailing ponds will be recycled. The domestic wastewater generated will be sent to septic tanks followed by soak pits.

4.0 SITE ANALYSIS

4.1 Connectivity

Awalajhari, Bharveli mine is located in Balaghat Tahsil of Balaghat District, Madhya Pradesh. It is 2 km from Balaghat town. Balaghat is connected by all weather roads to important places like Nagpur, Gondia, and Raipur etc.

4.1.1 Nearest Railway Station

Balaghat Railway Station is about 4.89 Kms from mine site.

4.1.2 Nearest Airport

Nagpur Airport is about 148 km distance from mine site.

4.2 Landform, Landuse And Land Ownership

Awalajhari, Bharveli mine lease area is 43.737 ha of Govt land and 32.672 ha of private land. The existing land use pattern is given below.

S.No	Description	Area in ha
1	Waste Land	0.566
2	Grazing Land	33.10
3	Agriculture Land	28.044
4	Others	-
5	Residential Area	14.33
6	Nallah	0.364
Total		76.409 ha

4.3 Topography

Awalajhari, Bharveli Manganese Deposit lease area is located near the Southern side of Baihar Plateau. There are almost two parallel ridges striking NNE to SSE. The distance between the crests of two ridges is about 400 mtrs. To the North about 2500 mts (PWI). road. two ridges merge to form to high hill (570 mtrs) known as Somji-Gomgi. The plain land either side of ridges has an elevation of 300 mtrs above MSL. Thge highest point in Nothern end of the propoerty is about 400 mtrs above MSL. The Ore body out crops along the crest of

eastern ridges, which contains beyond south of Baihar road to the adjoining old abandoned pit previously mined by M/s. BP Bayramji & Co.. The Pit is now completely water logged.

4.4 Climatic data from secondary sources

The climate of the region is somewhat varied due to difference in elevation. On the plateau the summer is never uncomfortably hot although winter is pretty cold. At times, frosty conditions prevail in winter nights. Summer commences from end of March and continues up to June with May as the hottest month. Maximum temperature rises upto 40° C. Winter starts from November occasionally, temperature during December January drops to around 5° C. Intermittent rains do occur during winter months. The area receives rain from southwest monsoon which normally breaks around early to mid-part of June and lasts up to September, Maximum rain fall is in July and August. The average rainfall is 1562 mm.

5.0 PLANNING BRIEF

5.1 Planning Concept

The mining will be carried out as per the approved mining plan. During Mining Plan period, the mining operation will be done by mechanized underground mining method. The statutory provisions for the development of mine shall be followed to ensure safe mining practices and conservation of mineral. During the course of mining protection and conservation of natural resources and protection of environment will be ensured.

5.2 Population projection

The mine will provide direct employment to 50 workers. The local persons will be given preference in employment for mine and Manganese plant as per their eligibility. Necessary training will be given to train the unemployed youths of the nearby villages. The indirect employment opportunities will automatically create with the Manganese plants and mining industries establishment in the region.

5.3 Land use planning

The project site is a 43.737 ha of Govt land & 32.672 ha of private land. The landuse for the mining lease will be strictly followed as per the approved mining plan.

5.4 Assessment of Infrastructure Demand (Physical & Social)

On the basis of the preliminary site visit, the infrastructure demand in the villages was assessed on the basis of need and priority. The existing infrastructure is satisfactory but the approach road has to be maintained regularly.

5.5 Amenities/Facilities

Site Services like Workers shed, First Aid, Drinking water, canteen will be provided within the leased area.

6.0 PROPOSED INFRASTRUCTURE

6.1 Industrial Area (Processing Area)

No processing area of manganese is proposed at Awalajhari Manganese mine. Existing processing area at Balaghat will be used.

6.2 Residential Area (Non Processing Area)

As the local persons will be given employment, no residential area/ housing is proposed within the mining lease area. Balaghat mine area has residential quarters for employees

6.3 Green Belt

Green belt will be developed along the boundaries of mine lease area. MOIL will be undertaken afforestation work over 0.58 ha since 1st year by planting 2000 plant species.

YEAR	AREA (ha)	TOTAL PLANTATION
1 st Year	0.94	2000
2 nd Year	1.04	2000
3 rd Year	0.70	1500
4 th Year	1.00	2000
5 th Year	1.12	2200
6 th Year	1.35	2500
Total	6.15	12200

Area Under Plantation

YEAR	AREA (ha)	TOTAL PLANTATION
1 st – 5 th Year	4.80	9700
Total	4.80	9700

6.4 Water Management

Water will be pumped and stored in sumps while working underground.

6.5 Sewerage System

The domestic wastewater generated will be sent to septic tanks followed by soak pits.

6.6 Industrial Waste Management

Not applicable.

6.7 Solid Waste management

The waste will be stored in an area of 2000 Sq.m with 30° slope at 5 meters height. The dump area will be stabilized after reaching its capacity

6.8 CSR Activities

Under Corporate Social Responsibility (CSR) the felt needs of the nearby villages are identified and accordingly social infrastructures are developed as per the CSR policy of the MOIL Ltd.

7.0 REHABILITATION AND RESETTLEMENT (R&R) PLAN

Not Applicable.

8.0 PROJECT SCHEDULE & COST ESTIMATES

The mining operations will be carried out after obtaining all statutory permissions and will be carried out as per approved mining plan.

The project cost is given below;

S. No.	Investment Head	Estimated Capital Investment (in Lakhs)
1	Land	20.0
2	Buildings & Structures	5.0
3	Additional Exploration/Investigation	36.0
4	Departmental Plant & Machinery	2.0
5	Office Furniture & Fixtures	1.0

6	Office Vehicles	7.0
7	Quality Control & Environment Protection	6.0
Total		77.0

The production of Manganese will be by underground mechanized method. The cost of production for Manganese mining is Rs. 77.0 Lakhs.

9.0 ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS)

9.1 Financial and Social Benefits with Special Emphasis on the Benefit to the Local People Including Tribal Population, If Any, In the Area.

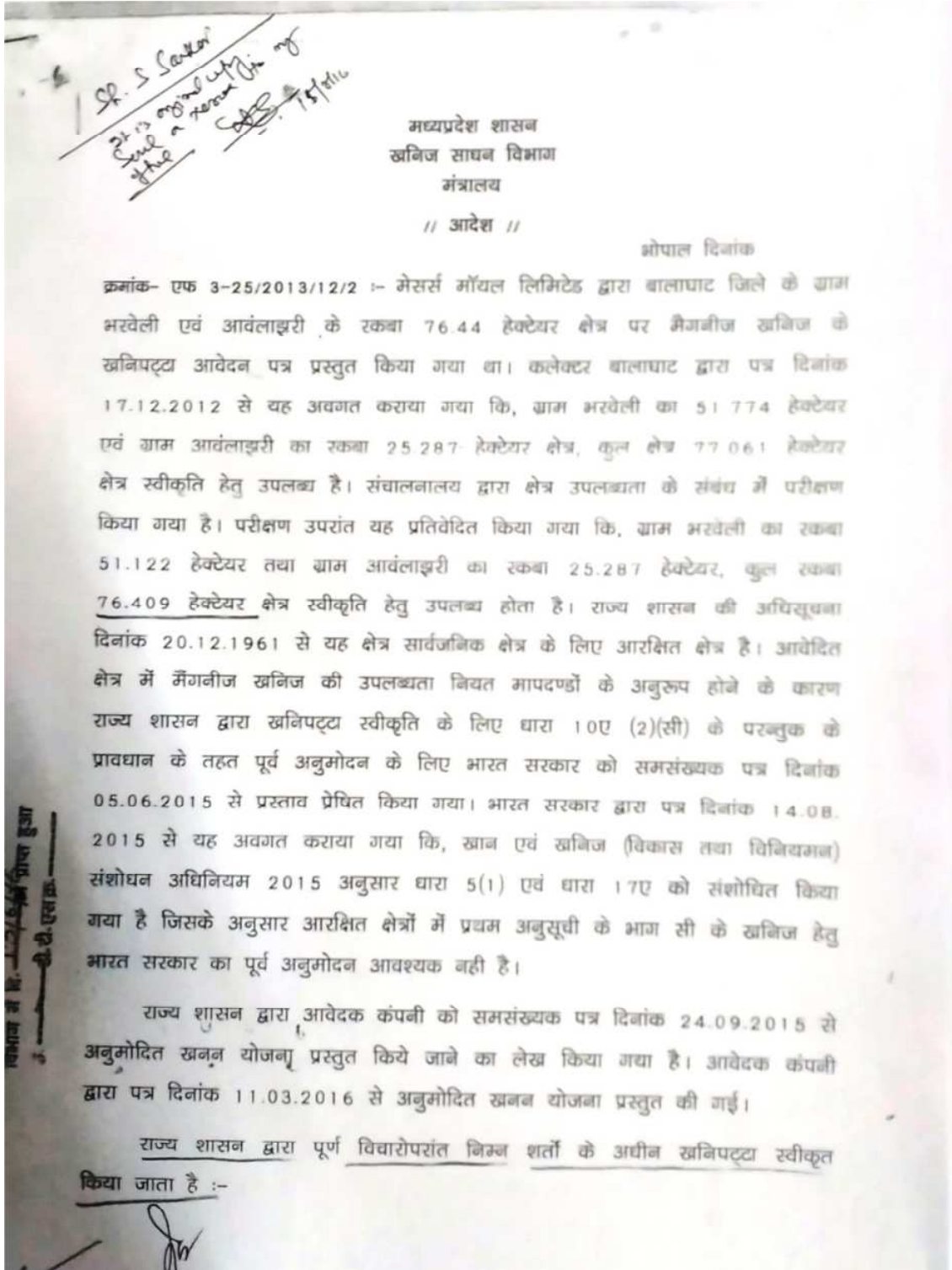
The liberalization of the Indian economy has catapulted the Indian industry into new realms of development through global thinking and related progress. The policies of Government on economic development have given various subsidies like slashing import duties and provisions for the Indian industry to grow indigenously, also there are clearly spelled guidelines for environmental management. The project under consideration aims to contribute in the national objective of economy and ecology developing hand in hand. The region, where the project is situated is mostly dependent on agriculture forest and mineral resources where Manganese has a major share. The development of mining in the area is directly and indirectly going to contribute in increasing employment, infrastructure, communication, and socioeconomic infrastructure. It is proposed to employ the local population wherever possible in the proposed project activities directly or indirectly. The proposed Manganese mine would naturally have implications on the neighborhood with reference to socio-economic aspects of society, environmental attributes such as land, water, air, aesthetics, flora and fauna. In assessing the environmental impact, collection, collation and interpretation of baseline data is of prime importance. Environmental impact analysis and assessment, which is required for every industrial project, should preferably be carried out at the planning stage itself.

In compliance with the environmental procedure the environmental clearance application is made. Necessary scientific studies will be undertaken as per the guidelines set by the Ministry of Environment, Forests and Climate Change (MoEF&CC) and prescribed Terms of Reference.

The suggestions/recommendations of all the experts, competent authorities, and government officials are being sought for the impacts of the proposed project. Views and guidance of the local residents, community based organizations, social organizations are extremely important in order to devise a full proof Environment Management Plan for the proposed mining project and also mitigate the damages caused due to the project. Allocation

of necessary funds, manpower and machinery will be made to for the protection and conservation of all the components of environment. It is ensured that all mandatory clearances will be sought from respective competent authorities before operating the proposed Manganese Mine.

Annexure -I



1	आवेदक का नाम -	मॉयल लिमिटेड
2	खनिज का नाम -	मैंगनीज।
3	स्वीकृत किये गये क्षेत्र का विवरण -	जिला बालाघाट - ग्राम भरवेली - रकबा 51.122 हेक्टेयर, ग्राम आवंलाझरी - रकबा 25.287 हेक्टेयर, कुल रकबा 76.409 हेक्टेयर। (संलग्न मानचित्र अनुसार)
4	स्वीकृत की गई अवधि -	50 वर्ष। (खनिज (सरकारी कंपनी द्वारा खनन) नियम 2015 के नियम 4(1) के तहत)
5.	आवेदक अनुमानित संसाधनों के मूल्य के 0.50 प्रतिशत के बराबर राशि की खनिज (परमाणु और हाइड्रोकार्बन उर्जा खनिजों से भिन्न) रियायत नियम 2016 की अनुसूची 04 में विनिर्दिष्ट रूप विधान में बैंक प्रत्याभूति के रूप में अथवा प्रतिभूति निक्षेप के रूप में कार्यपालन प्रतिभूति कलेक्टर के पक्ष में उपलब्ध करायेगा। इस कार्यपालन प्रतिभूति खान विकास और उत्पादन करार में निहित शर्तों और खनन पट्टा विलेख के निबंधनों और शर्तों के अनुसार राज्य सरकार द्वारा उपयोग किया जा सकेगा। कार्यपालन प्रतिभूति को प्रत्येक 05 वर्ष में समायोजित किया जायेगा, जिससे कि यह अनुमानित संसाधनों के पुनः निर्धारित मूल्य के 0.50 प्रतिशत के सदृश बनी रहे।	
6.	खान एवं खनिज (विकास तथा विनियमन) अधिनियम 1957 की धारा 5 की उपधारा 2 के खण्ड ख में विनिर्दिष्ट खनन योजना के संबंध में शर्तों को पूरा करेगा।	
7.	उपरोक्त शर्त की पूर्ति उपरांत आवेदक को केन्द्रीय सरकार द्वारा विनिर्दिष्ट रूप विधान में खान विकास और उत्पादन करार किया जाना होगा।	
8.	आवेदक खनन संक्रियाएं प्रारंभ किये जाने हेतु लागू विधियों के अधीन सभी सम्मति, अनुमोदन, अनुज्ञा पत्र, निक्षेप पत्र, अगिप्राप्त करेगा।	
9.	उपरोक्तानुसार विनिर्दिष्ट शर्तों के पूरा होने के 90 दिन के भीतर आवेदक को खनिज (परमाणु और हाइड्रोकार्बन उर्जा खनिजों से भिन्न) रियायत नियम 2016 की अनुसूची 7 में विनिर्दिष्ट रूप विधान में खनिजपट्टा निष्पादित	

किया जाना होगा। यदि आवेदक की ओर से किसी चूक के कारण उक्त अवधि के भीतर ऐसी कोई विलेख निष्पादित नहीं की जाती है तो राज्य सरकार पट्टा अनुदत्त करने के आदेश को वापस ले सकेगी एवं जमा फीस राज्य सरकार को समपह्यत हो जायेगी।

10. खनिज (सरकारी कंपनी द्वारा खनन) नियम 2015 के नियम 5 के अंतर्गत देय राशि का भुगतान किया जाना होगा।
11. अनुबंध निष्पादन के पूर्व यह सुनिश्चित कर लिया जाये कि, आवेदक के ऊपर खनिज राजस्व बकाया तो नहीं है।
12. यह सुनिश्चित कर लिया जावे कि, आवेदक के पक्ष में स्वीकृत क्षेत्र वन संरक्षण अधिनियम 1980 के तहत प्रभावित तो नहीं है।
13. यदि प्रश्नाधीन क्षेत्र प्रदेश के पांचवी अनुसूची क्षेत्र के अंतर्गत आता है तो यह प्रस्ताव संबंधित केन्द्रीय विधान/राज्य के विधि/नियम/नियमन, न्यायालयीन निर्णय आदि (Central Legislation / State Law / Rules / Regulation Court case etc) के अनुवर्ती (Compliant) रहेगा।
14. किसी भी न्यायालय के ऐसे कोई आदेश न हो जो प्रश्नाधीन खनि रियायत ग्रांट को प्रभावित करते हो।
15. निष्पादित अनुबंध की प्रति इस विभाग को प्रेषित की जाये।

मध्यप्रदेश के राज्यपाल के नाम से

तथा आदेशानुसार

(जे०पी० श्रीवास्तव)

अवर सचिव

म०प्र० शासन, खनिज साधन विभाग
भोपाल, दिनांक - 26.5.16

पृ.क. एफ 3-25/2013/12/2

प्रतिलिपि :-

1. कलेक्टर जिला - बालाघाट, म०प्र०।
2. संचालक भौमिकी तथा खनिकर्म, म०प्र०, भोपाल।
3. कन्ट्रोलर जनरल इंडियन ब्यूरो ऑफ माइन्स, इन्द्रा भवन, सिविल लाइंस, नागपुर, (महाराष्ट्र)।