

EXECUTIVE SUMMARY

1. PREAMBLE

M/S Balasore Alloys Ltd. is a Public Limited Company and is in the business of producing Ferro-Alloys with manganese ore as a basic raw material. The concern is proposed to have mining activity of Manganese at Village Hathoda, Tehsil- Katangi, and District Balaghat in the state of Madhya Pradesh.

The project envisages forward mining activity for Manganese ore at mine area of 11.67 hectare at Village Hathoda at district Balaghat, MP for the anticipated production of ore by 10000 tonnes per annum..

In order to assess the likely impacts on environment due to ongoing mining activity and to have a tool of environment management, M/s Balasore Alloys Ltd. has submitted the Rapid Environment Impact Assessment study report for mining project.

2. LOCATION

The mining area is located in village Hathoda at district Balaghat, Madhya Pradesh located on Toposheet no. 55 0/14 (Scale 1:50,000) by the following coordinates:

| | |
|-----------|-----------------------|
| Latitude | 21°37'45"- 21°38'10"N |
| Longitude | 79°48'05"- 79°48'45"E |

3. TRANSPORT

The applied area is about 35 kms from Waraseoni in East direction and 60 kms from distt headquarter Balaghat via Waraseoni-Katangi. Katangi is the main township in Katangi Tehsil situated on Waraseoni Tirori State Highway. From Katangi, the applied area is 16 kms on Katangi – Tumsar PWD road and by taking a bifurcation from Garra Chowki to village Hathoda (5km). The nearest railway station is Katangi (N.G.) situated at a distance of about 21 kms from the applied area.

4. REASON FOR ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

The impact of mine on the environment depends to a large extent on its location with respect to Human settlements, meteorological conditions, ambient air quality, water bodies, agricultural and forest land etc.

Most of the adverse impacts of mines are amenable to technological control by providing necessary preventive and control measures and finally through effective environmental management of the operating mines. Keeping in view the likely impacts of mines on environment, this Rapid environment impact assessment report has been prepared for submission to State Pollution Control Board and Ministry for Environment and Forests (MoEF) for clearance of the proposed additional mining area.

5. PROJECT DESCRIPTION

5.1 Topography

The area is a plain ground gently slopping towards south. The topography has been changed considerably due to old working pits and dumps, some of the old pits are water-logged. MRL of the area is 340 to 330. The area lies at the cross section of 21°37'45"- 21°38'10"N and 79°48'05" - 79°48'45"E and is covered under Toposheet no 55 O/14.

5.2 RESERVES

The area is divided into two blocks: Block-I eastern portion of the lease area and Block - II is the western portion. They are separated from each other.

The reserves of Mn-ore available in the lease area are classified into Proved, Probable and Possible categories.

The method of estimation of reserves is as under:

(1) Reserves in Proved category are estimated upto 305 MRL, Probable category upto 304 MRL and Possible category upto 303 MRL.

(2) Bulk Density (Tonnage Factor) has taken as 3 T/cu m.

(3) Between two cross-sections, the volume of Mn-ore in bedded deposit is calculated as under:

Cross-sectional area × cross-section's influence distance (i.e. Length of the mineralized ore) = Total volume

Reserves = Total volume × 3 (Bulk Density)

(Total volume is the sum total of successive cross-section volume)

In the approved Mining Plan the depth of mineralization is based on the following consideration:-

- (i) Depth of various old pits present in the lease area as well as outside the lease area in the same ore bed extension.
- (ii) Consistency of occurrence of Mn-ore over a length of more than 1.5 km.
- (iii) The positive results obtained by drilling done in adjacent M.L. of M/S Pacific Mineral (P) Ltd, Balaghat.
- (iv) In the western end of the area, there is an mine (known as Garra chowki Mine) of mn-ore which is reported to have gone more than 50 m in depth.

On the basis of latest surface plan (survey date 12/03/08) prepared by lessee's competent surveyor, the revised M.L. area has been marked and fresh six No. of cross-section are drawn in Block-II (western block) and category-wise reserves have been reassessed on the basis of cross-sectional area. It is a working mine and production is concentrated in western block (Block-II) of the mining lease area.

The reserves of manganese ore in the area for Primary Bedded deposit are worked out for:

Summary of Geological Reserves is as below

| | M. Tonnes |
|--------------------|-----------|
| Proved Category: | 49680.00 |
| Probable Category: | 2619.00 |
| Possible Category: | 2619.00 |
| Total | 54918.00 |

Mineable reserves = 30031.00 T

5.2 Anticipated Life of the Mine

Anticipated life of the mine will be obtained by computing the life of the mine by considering the proposed rate of production when the mine is fully developed and production for next years. It is estimated that 10000 tonnes per annum production will be taken after complete development of mine. Considering the above factors anticipated life of the mine would be around 3 years for extracting mineable reserve in proved category reserves as per the present information available for block II.

5.3 Mining Method

Opencast manual method of mining will be adopted. There will be ore bench in overburden rock (mica-schists) with 1 m depth in virgin area; this bench will be 5/6 m in advance to avoid slipping of mica schist into the pit. Other benches will be 5 m width and 3 m height. Mining will be done by machineries like Excavator and tippers. The blast holes will be drilled by Jack hammers with Compressor. Height of bench proposed is 3 m. This will be achieved by doing split benching by giving drill holes of 0.75 m length in stages, by drilling with Jack hammers and blasting with special gelatin, detonators and safety fuse. The blasted ROM will be transported by tippers to the crusher installed in Block I of the lease area.

The development and production will be done side by side simultaneously. The development and production has been proposed at one place for better supervision, control and conservation of mineral.

The mining machinery & equipment required for development consists of JCB of 0.3 cu. m. capacity, few tractors with pneumatic trailers, compressors, and drill machines etc, water pump. (One number of J.C.B. & Three/Four numbers of tractor trolleys, one number of compressor & Two Jack hammers & two pumps). All excavations will be done manually with hand tools like crowbars, Spades, chisels and hammer. Sorting will be done manually. Development i.e. removal of overburden will also be done manually.

5.4 Proposed Rate of Production

It will be about 10000 tonnes per year of saleable ore for full year after complete development of the mines.

5.5 Loading

Loading of ore will be done manually to the trolley/trucks and will be sending to the end users. The overburden will be removed and stacked in a place in the surface. Subsequently it will be manually loaded to the tipper for onward dumping to the predetermined space in the lease boundary.

5.6 Hauling/Transport

The ore will be transported to the sorting yards by means of tubs on tracks.

5.7 Mine Drainage

The ground water table in the lease area varies from 328 m to 327mRL (2-3m bgl) during post monsoon and 322-320mRL (8-10m bgl) during pre monsoon and mining will be done upto 304m RL (26m bgl) hence it is expected that ground water seepage will be there when mining cross the ground water table. The accumulated water in the developed pit during the rainy season will be used for green belt development.

5.8 Solid Waste Management

Proposed mining is being carried out by open cast manual method using explosive in the mining lease area. The area proposed to be excavated in at the end of lease period is about 3.1143Ha for block-II. Presently the area covered by pits and queries is 0.6756 ha While, the Area covered by the top soil and waste dumps are about 1.4784 ha. Considering the rate of production, it has been estimated that almost 1739 cum of overburden will be generated average on monthly basis. The generation of waste material will be dumped in 7.5 m non-mining zone along the northern boundary of lease area marked as waste dump of Block II, which is on the foot wall side of the ore body (the dip of the ore-body is in southern direction) and it is a non-mineralized area.

A separate stacking space for sub-grade mineral as and when produced will be near the new storage yard, already created and shown in Block I. At about 64724 cum of solid waste has been generated till date and it is expected that at about 41739 cum of waste will be generated in the first two year. No reclamation has been proposed during next two year in view of insufficient space at pit bottom which will hamper the extension of haul road to bottom as mineralization is still continue in depth.

The dumps will be stablised with fast growing grasses and various mulches and bark. The sides will be sloped to 36⁰. Garland drain will be provided along the sloping side to protect wash off and run off.

Excavated area, where backfilling is not feasible, that area will be left as it is for collection of rainwater. Proposed activity is carried out at shallow depth. Post mining land use envisaged for following purposes:

- (1) Area to be covered by dumps - 3.2652 Ha
- (2) Area to be reclaimed - Nil
- (3) Area to be rehabilitated by way of afforestation - 0.2576 Ha

5.9 Resource Requirement

The present proposal is to carry out mining for Manganese at Village Hathoda, Tehsil Katangi, Dist Balaghat, (MP) for efficient operation of the Mines all necessary utilities will be made available, a brief description of the same is given below.

5.9.1 Storage facility

It is proposed to provide adequate storage facilities for the excavated mineral, explosives and waste dumps, which is generated/used during mining process. Proposed excavated minerals and waste dumps will be kept in the existing mining lease area.

5.9.2 Project Cost

| Project | Estimated Cost in Lac of Rupees |
|-------------------------|---------------------------------|
| Mining of Manganese ore | Rs. 20 Lacs |

5.9.3 Electric System

The power requirement for the project has been met by M P State Electricity Board, which is available at village Hathoda.

5.9.4 Water Supply

The total fresh water needs to be pumped is about 6 KL per day for consumption of domestic and mining purpose. This quantity of water will be taken from the ground water. The details of water balance of existing /proposed mining project are given below:

WATER BALANCE OF MINING PROJECT

| Process | | Total |
|-----------------------------|------------------|------------------|
| a) Mine Site | | |
| Dust suppression | 6000 lit | 6000 lit |
| Green Belt | 2000 lit | 2000 lit |
| b) Domestic | | |
| Drinking & Washing | 2000 lit | 2000 lit |
| Total (A + B) | 10000 lit | 10000 lit |
| Domestic waste water | 1200lit | 1200lit |

6. EXISTING ENVIRONMENT SCENARIO

6.1 Climate

The climatic condition of this area is semi arid. The maximum temperature goes upto 47.5°C during summer in the month of May and the minimum temperature goes down to 9.0°C during winter in the month of January. The average annual rainfall is observed to be 1600-1800 mm. The winds in the area are light to moderate during summer and winter. However, the speed of the wind increases during the end of the summer season and monsoon season.

The brief discussion over the meteorological condition of the area is as below:

- **Temperature:** The winter season starts from December and continues till the end of February. January is the coolest month with the mean daily maximum temperature at 29°C and the mean daily minimum temperature

at 10°C. Both the night and day temperatures increase rapidly during the onset of the pre-monsoon season from March to May. During pre-monsoon season, the mean maximum temperature (May) was observed to be 47.5°C with the mean minimum temperature (March) at 20°C. The mean maximum temperature in the monsoon season (Sep.) observed to be 37°C whereas the mean minimum temperature was observed to be 19°C. By the end of September with the onset of post-monsoon, the day temperatures decrease slightly, with the mean maximum temperature at 34°C and the mean minimum temperature at 17.3°C.

- **Relative Humidity:** The air is generally humid in this region during the monsoon when the average relative humidity at 0830 hr. was observed to be with a maximum of 96% and a minimum of 65%. Similarly, at 1730 hr., the average value was observed to be with a maximum of 98% and a minimum of 64%. Generally, the weather during Post monsoon seasons was observed to be with a maximum of 83% and a minimum of 48%.
- **Rainfall:** Monsoon in the area comes from south-westerly winds. The average annual rainfall based on the last 10-year IMD data, was observed to be 1600-1800 mm. The monsoon sets in the month of June and continues till mid observed in the evenings, with clear mornings. During the monsoon season, both in the mornings and evenings, the skies were found to be clouded.
- **Cloud:** 30 years average data reveal that maximum cloud cover was observed around 7.1 oktas in the month of July, August. Whereas cloud cover was observed around 2 (in oktas) in the month of November, December, January, February and March.
- **Wind Pattern**
Generally light to moderate winds prevail throughout the year. Winds were light and moderate particularly during the morning hours. While during the afternoon hours the winds were stronger. A review of the wind rose diagram shows that predominant winds are mostly from **NE, NNE, SW, NW, NNW and SSW**

6.2 AIR QUALITY

To establish the ambient air quality, sampling and testing were conducted. Air sampling stations were established at eight (8) locations around the proposed mining area to assess the background air pollution levels.

COMPARISON OF AIR SAMPLING RESULTS WITH CPCB NORMS

| | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | CPCB Norms | |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------------|--------------------------|
| | | | | | | | | | Indl. & Mixed used area | Residential & Rural Area |
| March-May 2008 | | | | | | | | | | |
| SPM Concentration | | | | | | | | | | |
| Minimum | 142 | 120 | 120 | 144 | 130 | 102 | 144 | 134 | 500 | 200 |
| Maximum | 198 | 190 | 188 | 196 | 195 | 190 | 196 | 250 | | |
| Average | 177.2 | 160.6 | 162 | 176.3 | 169.2 | 161.4 | 175.5 | 192.9 | | |
| RPM Concentration | | | | | | | | | | |
| Minimum | 54 | 50 | 38 | 54 | 48 | 54 | 52 | 42 | 150 | 100 |
| Maximum | 98 | 104 | 86 | 94 | 94 | 88 | 90 | 130 | | |
| Average | 74.4 | 73 | 68.3 | 76.7 | 68.7 | 69.3 | 72.3 | 92.8 | | |
| SO2 Concentration | | | | | | | | | | |
| Minimum | 11.1 | 10.9 | 8.6 | 9.6 | 8.6 | 9.1 | 10.8 | 9.9 | 120 | 80 |
| Maximum | 15.5 | 15.6 | 13.9 | 17.9 | 14.4 | 13.8 | 16.9 | 17.8 | | |
| Average | 12.97 | 12.2 | 10.8 | 14.8 | 12.07 | 11.2 | 13.09 | 13.3 | | |
| NOX Concentration | | | | | | | | | | |
| Minimum | 13.8 | 12.8 | 12.6 | 15.2 | 12.9 | 12.9 | 13.0 | 13.2 | 120 | 80 |
| Maximum | 18.5 | 16.8 | 17.3 | 19.8 | 18.2 | 17.3 | 18.8 | 19.2 | | |
| Average | 15.15 | 16.8 | 15.07 | 17.74 | 15.5 | 14.7 | 15.82 | 16.06 | | |

6.3 NOISE LEVEL

Ambient noise levels were measured at different locations (same as ambient air monitoring locations for two days on hourly basis) to establish present scenario which shall be described as follows.

- All the values are well within the norms prescribed by CPCB for industrial and commercial area.
- Main source of noise are traffic movements.

6.4 WATER QUALITY

Surface Water

The Surface water bodies in the study area mainly located SW direction at about 7km Bawanthari River. The water from Bawanthari River is used for

domestic as well as drinking purpose. The water from abandoned mine is a collection of run off water and used for domestic purpose. The data conform to the water quality standards for most of the parameters. The dissolved oxygen levels range between 4.7 to 6.2 mg/l, Total Hardness ranges from 240 to 268 mg/l; BOD levels are as low as 3.1 to 3.9 mg/l. The heavy metal content has been observed within the limit. The analysis of the sample indicates that the organic pollution of River is insignificant. The physico-chemical and biological analysis revealed that all the parameters are well within the prescribed limits of IS: 2296.

Ground Water

Water supply in the most of the villages depends on ground water resources. Well water is used for domestic as well as irrigation purposes. Ground Water quality analysis was carried out at 4 locations and the frequency of sampling was once /month/station. Ground water samples were examined for physico-chemical, heavy metals and bacteriological parameters in order to assess the effect of industrial and other activities on ground water. The samples were collected and analysed as per the procedures specified in "standard Methods for the examination of water & Wastewater" published by American Public Health association (APHA). pH in ground water sample was observed to be in the range 7.32 to 7.65 while conductivity was observed in the range of 1045-1246 umohos/cm. The value of alkalinity and hardness were observed in the range of 88 – 110mg/l and 208 to 240 mg/l respectively. Whereas heavy metal was found to be within the limit.

The physico-chemical and biological analysis revealed that all the parameters were well within the prescribed limits of IS: 10500.

6.5 SOIL QUALITY

Five locations within 10 km radius of the project site were selected for soil sampling. At each location, soil samples were collected from three different depths viz. 30 cm, 60 cm and 90 cm below the surface and homogenized. The homogenized samples were analyzed for physical and

chemical characteristics. For general characterisation of soil a few random samples from the study area to the depth of about 15 cm were collected. Soil samples so collected were brought to the laboratory for analysis. It has been observed that the texture of the soil was observed to be sandy and clay. The organic carbon was found to be in the range of 1.16% to 1.32% The nitrogen and phosphorus were observed to be in the ranges of 572 to 605Kg/ha and 24 to 28.65kg/ha respectively the pH range at the soil vary in between 5.89 to 6.12. The soil has high percentage of iron, zinc and chloride.

6.6 FLORA AND FAUNA

The climate, rainfall and vegetation type contribute to decide the type of faunal community in the area. In the region the flat hilltops, varying degree of slopes and Rolling Meadows in the valley create diverse type of habitats and form ideal niches for varied forms of animals. There are more than 250 species of birds, 36 species of mammals and several reptiles, orthopods etc. occupying respective structure and function.

LIST OF FLORA & FAUNA OF THE STUDY AREA

| NATURALLY OCCURRING SPECIES | |
|---|--|
| Kohu (<i>Terminalia arjuna</i>) | Karanji (<i>Pongamia pinnata</i>) |
| Sisham (<i>Dalbergia sissoo</i>) | Babul (<i>Acacia arabica</i>) |
| Neem (<i>Azadirachta indica</i>) | Kachnar (<i>Bauhinia variegata</i>) |
| Akasneem (<i>Millingtonia hertonsia</i>) | Bargad (<i>Ficus bengalensis</i>) |
| Gular (<i>Ficus glomerata</i>) | Jamun (<i>Syzygium cumini</i>) |
| Aam (<i>Mangifera indica</i>) | Palas (<i>Butea monosperma</i>) |
| Mahua (<i>Madhuca latifolia</i>) | Ber (<i>Zizyphus mauritiana</i>) |
| Bel (<i>Aegle mermelos</i>) | Saj (<i>Terminalia tomentosa</i>) |
| Kanker (<i>Flacorita indica</i>) | Tendu (<i>Diospyros melanoxylon</i>) |
| | Reunjha (<i>Acacia leucophloea</i>) |
| CULTIVATED TREES GROWING IN THE VILLAGES | |
| Bargad (<i>Ficus bengalensis</i>) | Gular (<i>Ficus glomerata</i>) |
| Pipal (<i>Ficus religiosa</i>) | Imli (<i>Tamarindus indica</i>) |

| | |
|--|--|
| Aam (<i>Mangifera indica</i>) | Jamun (<i>Syzigium cumini</i>) |
| Munga (<i>Moringa olderfera</i>) | Ber (<i>Zizyphus mauritiana</i>) |
| Bel (<i>Aegle marmelos</i>) | Lasora (<i>Cordia dichotoma</i>) |
| Neem (<i>Azadirachta indica</i>) | Mahua (<i>Madhuca latifolia</i>) |
| Sitaphal (<i>Anona squamosa</i>) | |
| LIST OF FAUNA OF THE STUDY AREA | |
| Bengal Monkey (<i>Macacus rhesus</i>) | Jungle cat (<i>Felis chaus</i>) |
| Mongoose (<i>Herpestes mingo</i>) | Sambhar (<i>Cervus unicolor</i>) |
| Kalmuha monkey (<i>Semnaptheacus on lellccs</i>) | Common hawcuckoo (<i>Cuculus micropterces</i>) |
| House sparrow (<i>Passer domesticus</i>) | House crow (<i>carvus splendens</i>) |
| Common maina (<i>Acrida tehras tristis</i>) | |

6.7 LAND USE PATTERN

The study area covers about 5683 ha. For computation of the land use pattern in the study area based on the village-wise land-use data given in the census records, the geographical area of all settlements covered within the study area, though many villages in the peripheries of the circular study area are partially covered. Perfect delineation and quantification of land uses for the partially covered parts of villages of the study area is not possible, hence the entire village area is considered for the study, irrespective of its coverage within the village boundary.

The land use is classified into four types – viz. forests, area under cultivation, culturable waste and the area not available for cultivation. The land under cultivation is further sub-divided into two types viz. irrigated and un-irrigated.

Land-use Pattern in the Study Area

| S. N. | Particulars | Study Area (ha) | Percentage Coverage |
|-------|------------------------|-----------------|---------------------|
| 1. | Forest Land | 1556 | 18.53 |
| 2. | Land under Cultivation | | |
| | a) Irrigated Land | 1944 | 23.5 |

| | | | |
|----|------------------------------------|-------------|------------|
| | b) Un irrigated Land | 3604 | 40.57 |
| 3. | Culturable Waste Land | 869 | 10.35 |
| 4. | Area not available for cultivation | 620 | 7.38 |
| | Total Area | 8395 | 100 |

6.8 SOCIO-ECONOMIC CONDITIONS

The study area falls in Katangi Development Block of Balaghat district. The district is dominated by rural population (about 90% of the total population).

Scheduled cast account for about 12.53% of the total population. Scheduled tribes account for about 7.98% of the total population. Total work force of Katangi is reported to be about 49% of the total population. An examination of the occupational pattern reveals that about 46% of the total main workers are engaged in farming or in associated activities either as cultivators or as agricultural laborers. Thus, it can be inferred that a major portion of the population derives their livelihood from agricultural sector.

ESTIMATED BASIC STATISTICS OF THE STUDY AREA

| | |
|--|--------|
| 1. Households | 5022 |
| 2. Population | 23297 |
| Male | 11480 |
| Female | 11817 |
| 3. Schedule Tribe | 1860 |
| 4. Schedule Cast | 2921 |
| 5. Literacy Rate | 64.2% |
| 6. Occupational Pattern : | |
| (A) Main workers | 49% |
| (% of total population) | |
| i) Cultivators (% of main worker) | 46.66% |
| ii) Agricultural Labors (% of main worker) | 38.35% |
| iii) Other Workers (% of main worker) | 15.99% |
| (B) Marginal Workers | 19.04% |
| (% of total population) | |

DIFFERENT AMENITIES IN KATANGI BLOCK

| | | |
|----|-----------------------|----|
| 1. | Total No. of villages | 21 |
| 2. | <u>EDUCATION</u> | |

| | | |
|----|--------------------------|----|
| | Primary Schools | 25 |
| | Middle Schools | 7 |
| | Higher Secondary Schools | 3 |
| | Sr Secondary School | 3 |
| | Degree College | 0 |
| 3. | <u>HEALTH FACILITIES</u> | |
| | Hospitals | 1 |
| | P.H.Cs & Adl. P.H.Cs | 33 |
| 4. | <u>POLICE STATIONS</u> | 2 |
| 5. | <u>POSTAL FACILITIES</u> | |
| | Post Offices | 35 |
| | Telegraph Offices | 0 |

7. **IMPACT ASSESSMENT**

Mining activities is bound to have an adverse impact on existent environment. An understanding of the nature and extent of various impacts is essential in devising the methods and advance planning to mitigate the impacts and ultimately restore the land to useful conditions.

8. **IMPACT EVALUATION**

An attempt has been made to evaluate the impact of project in terms of both quality and quantity by using modified matrix method for crucial environmental parameters. The environmental impact evaluation of possible effects as a result of proposed mining area is primarily based on study of objectives, process, surrounding environment etc. The aspects such as water, air, land and related issues have been assessed on the basis of mining operations for similar activity. The environmental impacts identify the possible relationship of proposed mining operations with respect to environmental parameters. Their relationship can be beneficial or adverse and can be further classified as short term, long term, reversible, irreversible, local or regional. The evaluation of the impact of proposed activity are presented in Table below

| Parameters | Weight PIU | Baseline EIU (a) | Without EMP EIU (b) | With EMP EIU (c) | Change EIU (c-b) | Change EIU (c-a) |
|-------------------------|-----------------------|---------------------------------|------------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Biological Environment | 300 | 205 | 184 | 202 | 18 | -3 |
| Environmental Pollution | 450 | 344 | 315 | 345 | 30 | 1 |
| Aesthetic | 100 | 77 | 64 | 75 | 11 | -2 |
| Human Interest | 150 | 119 | 111 | 129 | 18 | 10 |
| Grand Total | 1000 | 745 | 674 | 751 | 77 | +6 |

9. ENVIRONMENT MANAGEMENT PLAN

9.1 Reclamation of Land

The land reclamation of the worked out area will be done by the backfilling of the overburden. The Overburden will be dumped properly and it will be levelled in a fashion that the dump height remains be uniform in all sides and subsequently it will be used for back filling the degraded land as far as possible.

The area proposed to be excavated in at the end of lease period is about 3.1143 Ha. Presently the area covered by pits and queries is 0.6756ha. While, the Area covered by the top soil and waste dumps are about 1.4784 ha. Considering the rate of production, it has been estimated that almost 1739 cum of overburden will be generated average on monthly basis. The generation of waste material will be dumped in 7.5 m non-mining zone along the northern boundary of lease area marked as waste dump of Block II, which is on the foot wall side of the ore body (the dip of the ore-body is in southern direction) and it is a non-mineralized area.

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The dumps will be stabilised with fast growing grasses and various mulches and bark. The sides will be sloped to 36°. Garland drain will be provided along the sloping side to protect wash off and run off.

Excavated area, where backfilling is not feasible, that area will be left as it is for collection of rainwater. Proposed activity is carried out at shallow depth. Post mining land use envisaged for following purposes:

- (1) Area to be covered by dumps - 3.2652 Ha
- (2) Area to be reclaimed - Nil
- (3) Area to be rehabilitated by way of afforestation - 0.2576 Ha

9.2 Green Belt Development

The massive afforestation planned for the project shall generate a forest having greater tree density (about 40 trees for first two year per 400m²). The proposed extensive will enhance the vegetation quality as well as aesthetic quality of the area. Thus there is no adverse impact is envisaged over biological environment due to proposed mining activity.

Below is showing 5 yearly stage wise forest land development In order to show the backfilling rate and afforestation rate (on backfilled land) cumulative available broken land, back filled area generation and Overall, the project will have a very strong positive effect on flora.

| Year | No. of Trees | Area Covered in m ² | Survival rate |
|-----------------|--------------|--------------------------------|---------------|
| 1 st | 20 | 100 | 80% |
| 2 nd | 20 | 100 | 80% |
| 3 rd | 20 | 100 | 80% |
| 4 th | 20 | 100 | 80% |
| 5 th | 20 | 100 | 80% |

9.3 Measures to Improve Socio-Economic Conditions

The impacts of the project would be felt in an integrated manner on the socio-economic environment in the study area. There is no village in core zone and further no displacement is required for the proposed project and therefore impact will be positive side rather negative. The impacts on the different components viz employment, housing, educational, and medical

and transport facilities, fuel availability, economics, status, health agriculture is not significant because size of project is very **small**. However, it would definitely increase the employment opportunity (primary as well as secondary) in the project area. Some of these impacts would be beneficial.

- i) The project will have a strong positive employment and income effect, both direct as well as indirect.
- ii) Migrant-Non migrant ratio shall shift towards migrant side. This will happen because of (i) better employment opportunities due to this project and (ii) relatively low agricultural yield through traditional agricultural practice with monocrops.
- iii) The project shall speed up the growing view on importance of education among people in study area.
- iv) The project is going to bring about changes in the pattern of demand from food to non-food items if sufficient income is generated.
- v) The project is not going to influence the existing traditional agricultural situation significantly. It may help to improve agricultural production by way of providing additional income to the farms from supplementary sources.

People perceive that the project will bring handful gains by way of creating significant job opportunities along with development of social infrastructure.

9.4 Air Pollution Control Measures

Following measures shall be taken to mitigate the effect of mining operation over ambient air environment:

1. Regular spraying of water by water sprinkling system over haulage roads.
2. To reduce dust generation during loading operation water shall be sprayed over the muck pile to the loaded;
3. To reduce dust generation during plying of dumpers on the haul road. Water sprinkling is done at frequent intervals. Water sprinklers shall be installed at the mine haulage road;

4. To reduce spread of dust, plantation along the mining lease boundary and plantation shall be also done along haul roads.
5. Periodic maintenance of haulage roads.
6. All over burden dumps shall be stabilized with legumes and grass to prevent the erosion of soil and arrest the dust emission during windy days. In addition to the above following additional mitigation measures shall be adopted and it is expected to continue in future also:
 1. Dust due to drilling shall be minimised by using wet drilling method like water injection system.
 2. Dust mask shall be provided to all workers working in dusty atmosphere.
 3. Tree Saplings shall be planted at the periphery of mining lease
 4. Regular maintenance of vehicles and machinery's shall be carried out in order to control emissions;
 5. A good house keeping and proper maintenance shall be practiced which will help in controlling pollution.

9.5 Noise Pollution Control Measures

The main sources of noise in mining activity are drilling, blasting, material handling machinery, loading equipment, etc. Following mitigation measures should be taken to control noise pollution:

1. Wherever the noise levels exceed 85 dBA, workers should be provided with earmuffs, ear plugs etc.
2. Hydraulic drills shall be used for drilling;
3. All moving parts of machine shall be properly lubricated;
4. Non-moving parts of machine shall be properly fastened;
5. Blasting shall be well designed and arranged in such a way that only one or two holes are blasted at a time with the use of short delay detonators in combination with sequential blasting machine;
6. No trunk like of detonating fuse shall be used on surface (Even if detonating fuse is used as trunk line with cord relays, then it shall be covered with clay properly);

7. No blasting shall be done when the sky is cloudy because cloud cover can cause reflection of pressure wave back to the ground at some distance from blast
8. Electric detonators shall be used instead of the detonating fuse as trunk line.
9. Blast shall be designed in such a way that fragmentation will be proper and over size boulder generation will be minimum. So secondary blasting is avoided;
10. Blasting shall be done between 12 noon to 4 pm when temperature inversions are not likely to be there and air density is less;
11. A barrier of overburden at mine boundaries shall be made and three rows of trees are proposed to be planted to reduce propagation of noise;
12. Secondary blasting is not required and hydraulic rock breaker is used.
13. Noise barriers, silencers and enclosures shall be incorporated for equipments, which emit high noise levels.
14. All the basic equipments and various machinery shall be kept well maintained.
15. Thick green belt around the mining pit and along the haulage roads.
16. As far as possible heavy and noisy workers shall be avoided during nighttime.
17. Unnecessary use of horns by the drivers of the vehicles shall be avoided.

9.5 Water Pollution Control measures

Following measures have been taken to avoid accumulation of water:

1. Pump having required capacity shall be installed to lift accumulated rain water from working pit.
2. There shall not be no over flow on wash off from dumps nor is there any beneficiation plant. Only rainwater is pumped out of the mine;
3. There is no toxic constituent in water and soil so water collected in sump is free from any toxic substances.
4. A silt-settling tank shall be constructed in northern barrier zone area to settle heavy particle before discharging water into drain.

5. Quality of water accumulated in the working pit may be checked during monsoon.
6. It shall be ensured that silt content in the mines discharged is minimum.
7. It shall be ensured that quality of drinking water for the worker is hygienic and good sanitation system is available.

10.0 Conclusion

The Manganese mining project of M/s Balasore Alloys Ltd., village – Hathoda, Tehsil Katangi, Balaghat District (MP) will be environmental compatible to the surrounding due to the high standards of pollution control measures to be adopted during the operation activity. Thus it can be safely stated that the mining activities will not have any adverse effect on the surroundings, if the proper environmental management plan is adopted.