

## **EXECUTIVE SUMMARY**

### **1.1 Preamble**

Steel Authority of India Limited (SAIL) is the leading steel-making company in India. It is a fully integrated iron and steel maker, producing both basic and special steels for domestic construction, engineering, power, railway, automotive and defense industries and for sale in export markets. The company is ranked amongst the top ten public sector companies in India in terms of turnover, SAIL manufactures and sells a broad range of steel products, including hot and cold rolled sheets and coils, galvanized sheets, electrical sheets, structural's, railway products, plates, bars and rods, stainless steel and other alloy steels. Bhilai Steel Plant (BSP) is India's sole producer of rails and heavy steel plates and major producer of structural has won Prime Minister's Trophy for best Integrated Steel Plant in the country for Nine -times. The growth of mining / industry significantly contribute towards economic progress of the country. However, any project progress brings along with it a number of environmental problems. Many of these problems can be avoided, if adequate environmental control considerations are thought of during conceptual stage of the project. In accordance with Mission and Objectives of M/s. Steel Authority of India Limited and National Steel Policy, SAIL proposes to develop Kalwar and Nagur villages with a rated production capacity of 1.0 Million Tone per annum. The Mining lease area under is 938.059 Ha.

### **1.2 Project Details**

#### **Location**

BSP proposes to develop Kalwar - Nagur Iron Ore Project, at Kalwar and Nagur villages, Bhanuprathappur taluk, Kanker district, Chhatisgarh state. The deposit is located in the Nos. 64 D/15 and 64 H/3 between longitude 80° 56' 44<sup>M</sup>to81°00'48" E and between latitude 20°25'00"to20°27'31" N. The Kalwar-Nagur lease area is well connected by road lying at a distance of 111 kms. South-West of Bhilai Steel Plant. The Iron ore produced from this mine is being transported by road to Dalli-Rajhara Iron ore Complex located at a

distance of 23km. The proposed mining block of Kalwar-Nagur lease can be approached from Mahamaya-Dulki mine towards south by a Kuccha road for a distance of another 3 kms.

### **Geological structure.**

The area under reference is Kalwar-Nagur lease which lies partly in Kalwar and partly in Dulki hills. The rock types exposed in this area belong to Dharwar Group, similar to Dalli-Rajhara and Mahamaya deposits. The iron ores traced here generally occupy the peaks and BHQ in intervening ridges. Both upper and lower shale/phyllites contacts with BHQ in hill sides. The intrusive bodies like thin quartz veins of younger age also occur within the area.

The soil, laterite capping and ferruginous shales etc. occurring above the orebody normally contain low iron and high alumina percentages and are considered as overburden. The iron ore body consists of lateritic ore, shaly ore, silicious ore, laminated ore, compact ore and soft friable / powdery type ores. Among these, the lateritic ore, shaly ore and silicious ore are generally low grade ores containing less than 55% Fe content and these ores are not considered for reserve calculation whereas the remaining three types of ores viz. Laminated, pre-compact Laminated ore and friable / powdery ore contain 55 % to 67 % Fe, of these three types of ores, the laminated ore constitute about 75 % of the total available reserves. The average grade of ore occurring in the area contains 63.87 % Fe, 3.61% SiO<sub>2</sub> and 2.50% Al<sub>2</sub>O<sub>3</sub>.

### **Manpower requirement**

The requirement of manpower at the rated capacity of 1.0 Mt of ore has been estimated as 37 numbers.

### 1.3 Description of Environment

#### Meteorology

**Summer`09:** Predominant wind was from South-west quadrant. Wind velocity was ranging from <1.0 to 18.0 Kmph. Temperature values were ranging from 24.5 °C to 46.0°C. The mean relative humidity value was found to be ranging from 37.9 - 70.3 %.Sky was clear during the study period. A total rainfall of 3.3 cm was recorded during the study period.

**Monsoon`09 :** A total rainfall of 80.2 cm was recorded during the study period.

**Post-monsoon`09:** Predominant wind was from North-east quadrant. Wind velocity was ranging from <1.0 to 14.7 Kmph. Temperature values were ranging from 24.5 °C to 46.0°C. The mean relative humidity value was found to be ranging from 37.9-70.3%.Sky was clear during the study period. A total rainfall of 3.3 cm was recorded during the study period.

**Winter`2010 :** Predominant wind was from East Northeast quadrant. Wind velocity was ranging from <1.0 to 17.7 Kmph. Temperature values were ranging from 10.0 °C to 39.0.0°C. The mean relative humidity value was found to be ranging from 52.8-75.5 %.Sky was clear during the study period. A total rainfall of 0.2 cm was recorded during the study period.

#### Air Environment

##### Summer Season (Apr.09-Jun.09)

**Core-zone :** SPM and RPM values were ranging between 94 and 127  $\mu\text{g}/\text{m}^3$  and 39 and 55  $\mu\text{g}/\text{m}^3$  respectively. The  $\text{SO}_2$  and  $\text{NO}_x$  values were ranging between 7.0 and 13.0  $\mu\text{g}/\text{m}^3$  and 7.8 and 14.6  $\mu\text{g}/\text{m}^3$  respectively.

**Bufferzone :** SPM and RPM values were ranging between 79 and 184  $\mu\text{g}/\text{m}^3$  and 30 and 83  $\mu\text{g}/\text{m}^3$  respectively. The  $\text{SO}_2$  and  $\text{NO}_x$  values were ranging between 5.1 and 8.7  $\mu\text{g}/\text{m}^3$  and 6.1 and 10.9  $\mu\text{g}/\text{m}^3$  respectively.

### **Post-monsoon Season (Oct-Dec.09)**

**Corezone :** SPM and RPM values were ranging between 84 and 117  $\mu\text{g}/\text{m}^3$  and 25 and 41  $\mu\text{g}/\text{m}^3$  respectively. The  $\text{SO}_2$  and  $\text{NO}_x$  values were ranging between 6.2 and 10.4  $\mu\text{g}/\text{m}^3$  and 6.7 and 13.5  $\mu\text{g}/\text{m}^3$  respectively.

**Bufferzone :** SPM and RPM values were ranging between 69 and 151  $\mu\text{g}/\text{m}^3$  and 25 and 57  $\mu\text{g}/\text{m}^3$  respectively. The  $\text{SO}_2$  and  $\text{NO}_x$  values were ranging between 5.7 - 8.7  $\mu\text{g}/\text{m}^3$  and 6.5 -10.6  $\mu\text{g}/\text{m}^3$  respectively.

### **Winter season (Jan - Mar.10)**

**Core-zone:** SPM and RPM values were ranging between 94-125  $\mu\text{g}/\text{m}^3$  and 34 - 49  $\mu\text{g}/\text{m}^3$  respectively. The  $\text{SO}_2$  and  $\text{NO}_x$  values were ranging between 5.6 - 9.8  $\mu\text{g}/\text{m}^3$  and 6.1-12.9  $\mu\text{g}/\text{m}^3$  respectively.

**Buffer-zone:** SPM and RPM values were ranging between 85 - 169  $\mu\text{g}/\text{m}^3$  and 29-61  $\mu\text{g}/\text{m}^3$  respectively. The  $\text{SO}_2$  and  $\text{NO}_x$  values were ranging between 5.0 - 8.6  $\mu\text{g}/\text{m}^3$  and 6.8 - 10.9  $\mu\text{g}/\text{m}^3$  respectively.

All CO & heavy metals values were found to be below the detectable limit. Based on the above discussions, it may be concluded that air quality of the area is less susceptible with respect to seasonal variations. The variation is mainly contributed by active mining.

### **Noise Levels**

**Summer:** The Day and night time Leq Noise levels were ranging from 37.9 dB(A) to 50.3 dB(A) and 29.6 dB(A) to 44.7 dB(A) respectively.

**Post-monsoon:** The day and night time Leq Noise levels were ranging from 38.8 dB(A) to 55.3 dB(A) and 29.8 dB(A) to 46.6 dB(A) respectively

**Winter:** The Day and night time Leq Noise levels were ranging from 38.8 dB(A) to 48.5 dB(A) and 31.6 dB(A) to 40.7 dB(A) respectively

*The Noise level values were found to be well within the CPCB limit prescribed by CPCB.*

## **Water Environment**

**Ground water :** While comparing with IS: 10500 - 1991 norms, all values except total coliforms were found to be well within the limits.

**Surface Water:** Low BOD/COD values and good D.O. content at these locations indicate that the natural restoration of water quality is maintained. While comparing with IS 2296 all values were found to be well within the norms for Surface water quality.

## **Hydrogeology**

The Hydrogeology study reveals that the pre-monsoon water levels vary from 3.20 m to 9.45 m with an average of 5.73m and the post-monsoon water levels vary from 1.15 m to 4.50 m with an average of 3.09 m. The average water fluctuation in the area was found to be 2.62 m. As per, CGWA norms, the trends reveal that the groundwater exploitation in the study area is well within the acceptable limits.

## **Land-use Pattern**

Remote sensing satellite Imageries were collected and interpreted for the 10 Km radius study area with project site as center. Based on the satellite data land -use / land cover maps have been prepared delineated in chapter III of EIA/EMP report .

## **Flora & Fauna**

The environment has not supported foreign visitor birds since the entire zone (core and buffer) is devoid of large water bodies. There are no ecologically sensitive/fragile areas such as Wild life Sanctuaries, National Parks, and adjoining National Monuments, areas of cultural heritage, ecologically fragile areas, areas rich in biological diversity, gene pool, etc located on the proposed stretch. There are no known rare, endangered or ecologically significant animal and plant species. Except for a few wild species of plants and grasses and a few animals that are very commonly spotted in any rural environment, the study area does not have any

endangered or endemic species of animals and plants. The conservation plan for Fauna is explained in Chapter - IX

### **Socio economic**

As per 2001 census, the study area consisted of 17538 persons inhabited in 37 villages. The configuration of male and females indicates that the males constitute to about 49.37% and females to about 50.63% of the study area population. The study area at an average has 1025.64 females per 1000 males. Majority of the people in the study area belong to Hindu religion. The study area also contains Scheduled Castes (SC) and Scheduled Tribes (ST).

In the study area 2.78% of the population belongs to Scheduled Castes (SC) while 77.55% to Scheduled Tribes (ST), thus indicating that about 80.33% of the population is formed by SC and ST population. Scheduled Caste and Scheduled Tribe sections are predominant in this area. The study area experiences a moderate literacy rate of 61.57%. The male literacy i.e. the percentage of literate males to the total males of the study area is observed as 70.07% while female literacy rate, which is an important indicator for social change, is observed as 53.29% in the study area.

## **1.4 Anticipated Environmental Impacts And Mitigation Measures**

### **Impact on Land use**

The topography within the mining area will have marked changes in the quarry area, the dump area and the mining equipment area. No appreciable change in the topography is anticipated outside mining area. Total scenario of landscape and land use pattern will undergoes a stark change within the mining area. There will be a stark change in surface drainage and new pattern drainage will be developed within the mining area.

### **Impact on Air Quality**

The major source of air pollution into the atmospheric environment are:

1. Removal and dumping of over burden

2. Drilling and blasting operations
3. Extraction of ore by machinery.
4. Loading of ore into trucks.
5. Dump yard waste material.

### Predicted Ambient Air Quality

The maximum predicted concentration was found during winter season in Core zone

Post project Scenario ( $\mu\text{g}/\text{m}^3$ )

Air Environment in Core zone - Post project Scenario ( $\mu\text{g}/\text{m}^3$ ) 24 hourly concentrations	Suspended Particulate matter (SPM) (max)
Baseline Scenario(max)	125
Predicted Ground level Concentration(max)	32.8
Resultant concentrations	157.5
NAAQ standards	500

It is cleared from the predicted values that the concentrations of SPM are below the limits of NAAQS (for mines and residential & rural area).

### Impact on Noise Level

Once the mine becomes operational, there would be various sources of noise in the area. These sources would be Drilling, Blasting, Operation of HEMM, Crusher and Workshop, Vehicular Movement and Belt Conveyor. Mining operations and the ore crusher would be the main sources of noise pollution. Noise due to vehicular movement will be intermittent, but will also add to the background noise level. It is being observed that at the mine site where heavy earth moving machinery is in operation, noise level is more than the stipulated 90 dB (A) per DGMS Circular, No 18 (Tech) of 1975. The noise level is within the tolerance limit at a distance of 15 to 20 m or so. The sound pressure level generated by a noise source decreases with increasing distance from the source due to wave divergence.

## **Socio economical impacts and infrastructural developments**

In terms of the major socio-economic impacts, the project will provide more direct and indirect job opportunities and better economic standards to the people and others, through improved infrastructural, community facilities etc. Development of residential colony, creation of civic and welfare amenities like primary health care, communications, educational institutes, recreational facilities, etc, that will develop along with the project will ensure better quality of life for the local population. The increase in income opportunities and -employment potentialities in this sector is anticipated as the mining activities increase, the other economic sectors starts gaining in momentum. With added educational, medical and communication facilities developed in the areas, the standard of living has improved. With ongoing of mining activities additional facilities for local population by way of better communication, postal services, educational facilities, advanced medical services etc. are on in the area. There is a marked change in social status of the area with opening of the project. State Government is benefited through financial revenues in crores of rupees by way of royalty, sales tax etc. from the -direct and indirect operations in the project area. Central exchequer is also getting financial revenues by way of Income tax, Central Sales Tax etc.

## **Impact on flora and fauna**

There will be positive impact on flora and fauna due to the proposed plantation activities and the conservation plan proposed for the forest and wild life. The negative impacts are mainly due to Mining activities such as excavation for quarry, erection & development of plants, service & allied structures, colony, roads, drains, culverts, etc. These activities will guide to forest degradation, lost of vegetation cover and ecological changes.



## **Mitigative measures**

### **Secondary Employment opportunities**

There will be spontaneous economic stimulus in the area with the commencement of opencast mine. Traders and private enterprises will grow in the area with this economic growth. Besides, the State exchequer will derive financial revenues through levy of royalty, sales tax etc. and Central Government will also be benefited by way of Central Sales Tax, Income Tax, Cess's etc.

### **Medical Facilities**

The project authorities have adopted following measures to prevent occupational diseases and health hazards.

- Pre-employment, pre-placement and periodic medical examination of employees.
- Regular monitoring of working environment and implementation of safety and control measures, to prevent hazards.
- Use of protective equipments, clothing, helmets, Gas mask, shoes, etc.
- Periodical medical examination-of every worker is done once in five years to detect preventable and curable diseases at an early stage.
- Cases suspected having Pneumoconiosis is examined by a Special Board constituted by the Chief Medical Officer. Established cases are suitably compensated and their job is changed if required.

### **Literacy Drive**

An action plan for achieving 100% literacy among workers to be implemented by establishing Educational Institutions / adoption with modern facilities.

### **Planning of OB dumps**

The waste will be in the form of overburden and it will, be of laterite capping, BHQ Shale etc. The waste generation during the next three years period will be 2,50,000 tonnes. This waste will be dumped in the northern part of the mining block. Geologically it appears that this area of dumping is shale bearing area. However B/H R-l is proposed to be drilled for confirming the area barren for dumping. The waste dumping during the first three years will be in two benches of 40 m. height. In the second year 100000 tonnes waste will be generated and dumped in the earmarked area of 0.73 hect. The height of the bench in the second year will be 20 m. In the third year the waste generated will be 1,50,000 tonnes dumped in the same area. The height in the third year will be 40 m. and waste generated during the fourth & fifth year will be 2,00,000 tonnes in each year respectively and same will be dumped in M-2 hill of Mahamaya Mine as Backfilling. Track dozers to be deployed for shaping the dumps overall slope is 28°

### **Control measures for air pollution**

Following air pollution control measures are being done and will be practiced within the mining area and at ore handling plants.

- Saplings planted on OB dump, road side and colony to arrest dust.
- Mobile water sprinklers deployed in mine.
- Stationary sprinkler installed in the mine haul road from mine entry.
- Overloading of trucks is strictly prohibited.
- Ore transportation through covered trucks
- Optimum blast hole geometry will be followed to reduce the dust during blasting.
- Regular monitoring of ambient air quality of the project area & its surroundings villages

### **Management of surface water drainage**

Garland drains will be made around the periphery of the quarry. These garland drains will be connected to the local nalla which is not likely to be disturbed by mining operation. In the workings, heavy duty pumps will be deployed in rainy season which will throw the accumulated water from the working face into these garland drains. As the extraction of the quarry advances, the position of garland drain will also advance. Thus these garland drains will drain of the rain water away from the workings.

### **Control measures for Noise**

- Innovative approaches of using improvised plant and machinery designs, with in-built mechanism to reduce sound emissions like improved silencers, mufflers and closed noise generating parts
- procurement of drill, loaders and dumpers and other equipment with noise proof system in operator's cabin
- confining the equipment with heavy noise emissions in soundproof cabins, so that noise is not transmitted to other areas
- regular and proper maintenance of noise generating machinery including the transport vehicles and belt conveyors, to maintain the noise levels
- blasting operations to be carried out only during daytime so as to avoid high noise intensity in night time
- siting of mine colony, buildings and other infrastructure away from the noise sources with the probability of sound waves being directed towards them being least
- provision should be made for noise absorbing pads at foundations of vibrating equipment to reduce noise emissions
- thick green belt should be provided at the mine periphery, within the mine lease area along the roads and all around the working areas, to screen the noise.

## **Blasting Vibration Control Plan**

- Peak particle velocity or ground vibrations for safety of nearby structures and residential buildings should be well within 12.5 mm/sec
- to contain fly rocks, stemming column should not be less than the burden of the hole, and the blasting area should be muffled
- short delay detonators should preferably be used in blasting rounds rather than detonating fuse as trunk line
- detonating fuse, if used, should be covered at least with 150 mm thick cover of sand or drill cuttings
- blasting should be carried out in the daytime, as during the night time the sound intensity becomes higher
- blasting should not be carried out when strong winds are blowing towards the inhabited areas
- each blast should be carefully planned, checked, and executed under the supervision of a responsible officer. Blasting data/observations should be recorded
- Bruggs mesh shall be provided as and when required for arresting any fly rocks and boulders from mining operation

## **Green Belt Development**

### **Green Belt around Mine**

In the directions where natural forest does not exist, there is need for creating green belt of adequate width as an effective dust and sight curtain in the periphery of mining area. The trees planted in the green belt area shall act as buffers and shock absorber against dusts, noise and stone flying. The trees in the green belt will be tall, wind firm, broad leaved and evergreen.

A green belt of adequate width on either side of the haul road will be raised and the existing vegetation will be protected. The plants will be raised at spacing of 2.0x2.0 metre.

Along the roads other than the haul roads also, dust resistant plants as mentioned above will be planted.

### **Mine closure plan**

The extent of impacts due to mine closure and mitigation measures to prevent or minimize them are classified under the following heads Viz Environmental Aspects, Technical Aspects, Social Aspects and , Safety Aspects which is explained in Chapter IV.

### **1.5 Environmental Monitoring Program**

The Environment Management Department (EMD) of BSP will be entrusted with this responsibility. The officers of EMD will assess the progress and analyze the data periodically. It will look after the following aspects of environmental management.

- Generation of environmental data bank.
- Evolving micro environmental management plan for the project in collaboration with other agencies and consultants. Monitoring project implementation along with environmental control measures.
- Co-ordinate with other project activities to ensure timely implementation of the project.
- Co-ordination with Ministry of Environment & Forest, Central/State Pollution Control Board for prevention and control of water and air pollution.

### **1.6 Risk Assessment**

Risk assessment were carried out by considering the following aspects

- To identify the potential hazardous areas so that necessary design safety measures can be adopted to minimize the probability of accidental events.

- To identify the potential areas of environmental disaster which can be prevented by proper design of the installations and its controlled operation.
- To manage the emergency situation or a disastrous event, if any, from the plant operation.

### **1.7 Project benefits**

The BSP authorities have adopted following measures to prevent occupational diseases and health hazards.

- Pre-employment, pre-placement and periodic, medical examination of employees.
- Regular monitoring of working environment and implementation of safety and control measures, to prevent hazards.
- Use of protective equipments, clothing, helmets, Gas mask, shoes, etc.
- Periodical medical examination of every worker is done once in five years to detect preventable and curable diseases at an early stage.
- Cases suspected having Pneumoconiosis are examined by a Special Board constituted by the Chief Medical Officer. Established cases are suitably compensated and their job is changed if required.

There will be infrastructure development in the near by village which are as follows.

- Construction of Pond/Deepening of existing pond.
- Construction of School Building
- Construction of Bore Wells for drinking water supply
- Construction of Dispensary Building/Panchayat Bhawan
- Construction of Children Park.
- Construction of Road, culverts and drains

The requirement of manpower at the rated capacity of 0.6 Mt of ore has been estimated as 37 numbers and secondary employment opportunities also expected.

### **1.8 Environmental Management plan**

The objectives of the proposed EMP are aimed for meeting five basic requirements

- To integrate comprehensive monitoring and control of impacts.
- To comply with the environment protection regulations.
- To ensure that adverse environmental impacts on the baseline are minimized, and
- To plan for ecologically sustainable development (ESD) within the frame work of existing legislation and environmental management policies.

The detailed EMP is delineated in chapter IX.

### **1.9 Consultant Credentials**

Environment Impact Assessment Study is carried by Richardson & Cruddas (1972) Ltd., Chennai, A Govt. of India undertaking under Ministry of Heavy Industry, one of the pioneers in the field of Environmental Engineering for the past three decades. R&C Laboratory is recognised as Environmental Laboratory by the Central Pollution Control Board (CPCB), Ministry of Environment & Forests (MoEF) under the Environmental Protection Act, 1986 and is, also, recognised by Tamil Nadu Pollution Control Board for carrying out air and waste water emissions monitoring as per Air (Prevention and Control of pollution) Act, 1981 and Water (Prevention and Control of Pollution) Act, 1974. We are also recognized by various other State Pollution Control Boards as Environmental Consultants for such studies.