

**EXECUTIVE SUMMARY OF
ENVIRONMENTAL IMPACT ASSESSMENT /
ENVIRONMENT MANAGEMENT PLAN**

(AS PER MoEF, NEW DELHI, EIA NOTIFICATION, S.O.1533, DATED 14TH SEPTEMBER 2006,)

KANDRI MANGANESE MINE

Tehsil-Ramtek, Dist-Nagpur, Maharashtra

(Area 83.0646 Ha)

Proposed Increase in Production
From 0.063 MTPA to 0.100 MTPA Manganese Ore



PROJECT PROPONENT



MOIL LIMITED

MOIL Bhavan, A-1, Katol Road, Nagpur. Maharashtra

January 2016

EXECUTIVE SUMMARY

1 INTRODUCTION

- This summary presents a brief summary of the Manganese Mine at village: Kandri, Tehsil: Ramtek, Dist: Nagpur, Maharashtra.
- Kandri Manganese Mine of **MOIL Limited** is situated 42 Km. N.E. in Ramtek Tahsil of Nagpur District in Maharashtra State and approached from Nagpur by National Highway No. 7. It falls between latitude 21° 24'45" and longitude 79° 16'00" within toposheet No. 55 O/7.
- Mining operations in this lease were started by MOIL in the year 1962. The production of manganese ore was commenced in the year 1898 under prospecting license by the then British company, the CPMO, and the first shipment was done in the year 1900 under Mining Lease.
- Kandri mine has been granted environment clearance of 0.063 MTPA. Now this mine propose to enhance the production from **0.063 MTPA to 0.1 MTPA** of clean ore. An application for seeking environmental clearance under the provisions of EIA Notification 2006 has been made for the proposed enhancement in production to MoEF, New Delhi. The project is categorized as Category A as per EIA Notification 2006. Environmental clearance for 0.063 MTPA has already been obtained which is enclosed as Annexure 1 with the Form 1.
- MOIL Limited has initiated all the necessary steps for increase production of Manganese mining project in village-Kandri, Tehsil-Ramtek, Dist-Nagpur, Maharashtra.
- The applied mining lease area covers 83.0646 hectares. It consists of Protected forest 24.82 Ha, Zudpi Jungle 13.00 Ha, Revenue Land 32.61 Ha, Private Land 12.63 Ha, Forest Clearance is obtained which is enclosed as Annexure 4 with the Form 1.
- The region has good deposits of Manganese and have major demand in Steel industry. Geographically the mine is located in the center of India with well connected networks of Roads and Rail. The location advantage of the mine makes it possible to dispatch the Manganese in all the directions giving easy accessibility to the market.
- The manganese produced from this mine is used for blending purpose with different ores of Manganese ore based Ferro Alloys.

2 PROJECT DETAILS

- The area with intermittent ridges arising from flat alluvial country in random fashion. The hills are seldom higher than 90 m from the general ground level with exception of Kandri ridge which rises to a height of 147 m. The country sides on north-south and east are generally flat. On the west, however, the mine is encircled by hills. The ore body runs along the crest of the hill in approximately NW-SE direction. The hillock is having almost NW-SE trend.
- Considering the scale of operation, geological setting and the nature of deposit, it is proposed to adopt opencast/underground method of mining involving ripping / dozing, drilling- blasting, manual sorting, sizing and stacking as well as mechanized loading and transportation. This will be substantiated with dump recovery.
- The Kandri Manganese Mine (83.0646 Ha) is having approved capacity 0.063 MTPA manganese ore. It is now proposed to increase production of manganese by opencast/underground mining and dump mining @ 0.10 MTPA by fully mechanized mine.
- The manganese of the lease area has been classified under four grades based on Mn percentage availability. These are Mn-46 to 48%, 35-46%, 30 to 35% and 14-30%. Average Mn% in dump is 25.35%. The Manganese is of Ferro grade as well as LGHS grade.
- The mine waste is in the form of mica schist, quartzite, bed rejects comprised of gondite manganese quartzite and rejects below threshold value of 10% Mn. It is proposed to carryout simultaneous backfilling of the OB/Schist of exhausted pits.
- About 300 m³/day water will be extracted during UG operations out of which 225 m³/day will be reused for sand stowing and wet drilling. Balance will be utilized for dust suppression (40 m³/day) and Plantation (35 m³/day). About 150 m³/day water will be required for drinking and domestic requirements which shall be source from existing tubewells/dugwells within the lease. 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. Necessary permissions shall be obtained from the competent authorities.
- The power requirement will be met from adjoining from State electricity board.
- Ground water table is expected to be at more than 2 to 11 m depth from surface level.
- The mining will be carried out as per the approved mining scheme. During Plan period, the mining operation will be done by development of mechanized opencast/underground

method. The plantation program will be taken up in the areas in future in a systematic manner and plantation will be carried out, starting with soil binding grasses and shrubs followed by larger trees species. Local varieties of plants shall be given predominance along with introduction of some exotic species.

3 BASELINE ENVIRONMENTAL STATUS

- The baseline environmental quality data for various components of environment, viz. Air, Noise, Water, Land and Socio-economic were generated during October 2014 to January 2015 in the study area covering 10 km around the Kandri Mine. Other environmental data on flora and fauna, land-use pattern, forest etc were also generated through field surveys and also collected from different State Govt. Departments.
- Air quality monitoring was carried out from 11 stations, consisting 2 sampling station from Core Zone (mining Lease) and 9 sampling station from Buffer Zone (10 Km around core zone). Twelve air pollutants viz. PM₁₀, PM_{2.5}, Sulphur dioxide (SO₂), Oxides of Nitrogen (NO_x), Ozone (O₃), Carbon Monoxide (CO), Ammonia (NH₃), Benzene (C₆H₆), Benzo α Pyrene (B- α -P), Lead (Pb), Arsenic (As) and Nickel (Ni) were monitored. Hence these were included for representing baseline status of ambient air quality within the study area.
- **Results & Discussion:** On the basis of observations the parameter wise result of monitored parameters are discussed below compared with **National Ambient Air Quality Standards.**
 - **PM₁₀ Particulate Matter :** The Maximum PM₁₀ concentration at all air quality monitoring stations A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9, A-10 and A-11 are 57.2, 56.2, 49.3, 46.7, 43.8, 42.0, 42.9, 44.7, 45.7, 48.6 and 42.9 $\mu\text{g}/\text{m}^3$ respectively. All monitored stations have PM₁₀ concentrations less than half of 24 hours average limit, 100 $\mu\text{g}/\text{m}^3$ as prescribed for industrial, residential, rural and other areas as in revised NAAQ Standards from MoEF. These values represent quite satisfactory condition regarding PM₁₀ concentration in ambient air.
 - **PM_{2.5} Particulate Matter :** The Maximum PM_{2.5} concentration at all air quality monitoring stations A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9, A-10, and A-11 are 29.5, 29.9, 25.2, 23.9, 23.1, 22.8, 22.9, 23.1, 24.8, 25.6, and 26.2 $\mu\text{g}/\text{m}^3$ respectively. All monitored stations have PM_{2.5} concentrations less than half of annual 24 hours limit, 60 $\mu\text{g}/\text{m}^3$ as prescribed for industrial, residential, rural and other areas as in revised NAAQ Standards from MoEF. These values represent quite satisfactory condition regarding PM_{2.5} concentration in ambient air.
 - **Sulphur Dioxide (SO₂) :** The Maximum SO₂ concentrations at all sampling stations A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9, A-10 and A-11 are 15.2, 14.7, 14.2, 13.6, 13.2, 10.2, 10.4, 12.3, 12.7, 13.9 and 13.6 $\mu\text{g}/\text{m}^3$ respectively. All monitored stations

- have SO₂ concentrations well within stipulated annual 24 hours limit, 80 µg/m³ as prescribed for industrial, residential, rural and other areas as in revised NAAQ Standards from MoEF.
- **Oxides Of Nitrogen (NO_x)** : The Maximum NO_x concentrations at all sampling stations A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9, A-10, and A-11 are 20.3, 19.5, 17.9, 18.7, 17.4, 13.8, 13.2, 15.1, 16.2, 19.2 and 21.4 µg/m³ respectively. All monitored stations have NO_x concentrations well within stipulated annual 24 hours limit, 80 µg/m³ as prescribed for industrial, residential, rural and other areas as in revised NAAQ Standards from MoEF.
 - **Carbon Monoxide (CO)** : Samples of air were collected and analyzed for CO content but CO concentration could not be detected. Hence, the concentration of Carbon mono oxide was found below detectable limit at all sampling stations.
 - Overall Ambient Air Quality of Kandri project area and its buffer zone is good during monitoring period and there are no any abnormal values recorded. Concentrations of all monitored parameters are within stipulated standards from MoEF AAQ Standards.
 - Noise levels have measured at hourly intervals at the 12 stations from the study area. Recorded Noise Levels in the Kandri lease buffer zone are in the range of **35.8 – 53.4** dB (A) at all twelve monitoring stations. Maximum levels of noise have recorded in day hours which are natural as our most of activities have done in day hours
 - Water quality monitoring was carried out from 6 ground water and 6 surface water monitoring stations located in the study area. Overall quality of water samples are showing that the water sources of the area are not polluted except the surface water samples getting contamination from surface run-off. The Coliforms values are exception otherwise all the water samples are indicating its characteristics within limit as given in relevant Indian Standards.
 - The drainage pattern of the area was studied in detailed manner particularly for the area covered around 2.5 Km radius and details are provided in the report. Similarly, A systematic hydrogeological survey has been carried out in and around mine area. The water level measurement in the existing dug wells was done to study the diurnal variation of the unconfined aquifer and their impact, due to nearby manganese mine.
 - Soil samples were collected at selected locations in the study area to assess the existing soil conditions around the Kandri lease area. Characteristic of forest land soil has sufficient nutrients. Whereas, two agricultural land soils are moderately suitable for cultivation of climatic crops and have good fertility.
 - As per census 2011 demographic characteristics of the study area are represented by a number of criteria, namely population composition, sex ratio, family structure, and age distribution pattern. Attempt has been made to compare the demographic features between the census data whenever corresponding data are available. The area selected for the study constitutes 52 inhabited villages.

- The floral and faunal assemblage in the study area is also provided in the report.
- A site of archeological importance exists b 10 Km Buffer Zone. In addition there are various places of worship/ tourist place and historical places exists in 15 Km radius of the project.
- There is no National Park, Wildlife sanctuary, defense installation or sensitive area located within 15 km radius of the mine.

4 ANTICIPATED IMPACT

- To predict the expected impacts of various activities on the different environmental parameters, a detailed survey of the factors are performed and identification of probable impacts are done by different techniques.
- In order to estimate the ground level concentrations due to the emission from the proposed increase in production, EPA approved Industrial Source Complex AERMOD View Model has been employed.
- Predicted 24 hourly Ground Level Incremental Concentrations of PM10 & PM2.5 are $4.46\mu\text{g}/\text{m}^3$ & $3.99\mu\text{g}/\text{m}^3$ respectively.
- The mining operations may cause surface water pollution due to Wash off from dumps (reject dump, sub-grade dump) and Soil erosion (from mine and roads). Proper control measures are essential to prevent the flow of suspended matter from the mine and dump.
- The increase in production at Kandri manganese mine is mainly achieved through underground mine. Due to underground mining there would not be any deformation of the land, surface, vegetation, roads, nalas & structures etc.
- The quantity used for blasting is unlikely to create any strong vibration. Impact due to strong vibration on the surface structures is not anticipated. In order to check underground vibration and to keep them within set limit, delay blasting is being undertaken. Delay detonators with 5 to 10 millisecond delay interval are used.
- At present most of the mining operations are confined to underground workings and excavation from old pits or recovery from dumps, therefore, question of removal of the top soil and its storage does not arise.
- The available road network is adequate to handle the additional transport road. Even considering 100% transport by road which works out to be 86 tonnes per day due to proposed increase in production, an additional of 5-6 dumpers of 20 tonnes capacity.
- The impact on socio economic of surrounding area will be positive, as mine will directly employ about 659 additional workers. There will be employment generation of double this number in secondary and tertiary sectors. There is no displacement of any

habitation or personnel and hence the rehabilitation and resettlement action plan is not required.

- There will be negligible impacts on bio diversity of the area beyond what is already present due to traffic on the State Highway. On the other hand there will be positive impact due to the plantation activities, which are proposed by management on areas surrounding surface infrastructure for underground mine.

5 ENVIRONMENTAL MITIGATION MEASURES

- Mitigation measures at the source level and an overall management plan at the study area level are elicited so as to improve the supportive capacity of the study area and also to preserve the assimilative capacity of the receiving bodies. The report provides detailed action plan for each pollutant viz, air, water, noise, socio economic, landuse and plantation activities.
- Since the mining operations are carried out at Kandri Manganese mine from a long period, various mitigative measures are already adopted and the same will be continued after the proposed expansion. The frequency and magnitude of the adopted measures will be improved during this expansion program. The adopted measures are briefly described below under various head.

5.1 Air Pollution Management :

- a) Haulage roads are frequently sprinkled with water for which truck mounted water tankers with sprinkler arrangement have been provided.
- b) Ore are covered by tarpaulins to prevent spread of dust from it during transportation.
- c) Regular maintenance of vehicles and machineries is carried out in order to control emissions.
- d) Green belt development has been taken up at various places.
- e) The dust respirators are provided to all the workers.
- f) Good housekeeping and proper maintenance is practiced which will help in controlling the pollution.

5.2 Water Pollution Management: The mining project will require continuous supply of water for various purposes during mining, plantation etc. apart from drinking water supply. The main source of water pollution in opencast mining is the surface run-off due to rainfall. There may be accumulation of rain water during monsoon season, which contains fine silt. This will be treated in settling tanks of adequate dimensions. The treated water (overflow) will be used for plantation and dust suppression.

There is no wastewater generation during opencast or underground mining operations. However, the mine water pumped from underground mine is collected in a tank at surface and part of it is utilized for water spraying in the mine, a part is utilized for the hydraulic sand stowing. The mine water is passed through sedimentation pond/tank for further filtration of suspended solid particles. The balance water will be discarded into

local Nalla. In respect of proper sewage disposal an arrangement has been envisaged to take care of the effluent from colony through ETP. The industrial water of workshop will pass through oil and grease trap followed by sedimentation tank and finally to local drainage. The action plan will be as under.

1. Mine water discharge → Settling tank → Reused for dust suppression/plantation/sand stowing and part discharge to local nalla/supply for irrigation.
2. Workshop water → Oil and grease trap → Sedimentation tank before use for dust suppression
3. Domestic use → Septic tank → Soak pit

In order to restrict the surface runoff from mines to control the soil erosion and washoff from dumps following measures are adopted;

- i) Garland drains will be provided around the mine wherever required to arrest any soil from the mine area being carried away by the rain water;
- ii) Gully formations, if any, on sides of the benches will be provided with check dams of local stone or sand filled bags. The inactive slopes will be planted with bushes, grass, shrubs and trees after applying top soil to prevent soil erosion;
- iii) Loose material slopes will be covered by plantation by making contour trenches at 2 m interval to check soil erosion both due to wind and rain;
- iv) Retaining walls (concrete or local stone) will be provided, around the dump or wherever required, to support the benches or any loose material as well as to arrest sliding of loose debris.

5.3 Noise & Vibration Management

- Noise is best abated at source by choosing machinery and equipment suitably, by proper mounting of equipment & ventilation systems and by providing noise insulating enclosures or padding where practicable.
- Proper maintenance of vehicles is being done which keeps the noise level within limits.
- At the boundary of mining lease green belt of local trees are planted which acts as acoustic barriers. Planting of bushy trees of rich canopy in and around the mine area to intercept noise transmission. A 7.5 m wide belt of trees of different heights are useful to act as noise attenuator in the mining areas.
- Mechanical ripping should be used, where possible, to avoid or minimize the use of explosives.
- Use of specific blasting plans, correct charging procedures and blasting ratios, delayed / microdelayed or electronic detonators, and specific in-situ blasting tests (the use of downhole initiation with short-delay detonators improves fragmentation and reduces ground vibrations).

- Implementation of ground vibration and overpressure control with appropriate drilling grids.
- Ground vibrations caused by blasting will be monitored in order to know their degree and to build safe guards.

5.4 Solid Waste Management :

The solid waste generated during mining operations is not hazardous in nature. During this mining operations simultaneous back filling of the OB will be done. After leveling the dumps, plantation will be carried out for stabilization of all the OB dumps in the mining lease area. Construction of parapet walls/bund is proposed at toe of dumps to avoid siltation towards sloping side of the ML area due to dumps. No toxic and hazardous element is present in the OB as well as in the ore body. Hence no toxic contamination is expected and protective measure is required. The non-active sides of the dump will be vegetated and stabilized by fast growing grasses.

5.5 Top Soil Preservation :

Top soil will not be excavated during the proposed increase. If such situation arises then the top soil will be temporarily stacked at earmarked dump site with adequate measures. It will be used for growing plants along the fringes of the site roads and reclamation of external dump and backfilled area. The top soil stockpiles will be low height not exceeding 2m and will be grassed to retain fertility. To prevent soil erosion and wash-off of dump-fines from freshly excavated benches and dumps following measures will be adopted:

5.6 Plantation: Conducting the new plantations is of paramount necessity of the area. In addition to augmenting present vegetation, it will also check soil erosion, make the ecosystem more diverse and functionally more stable, make the climate more conducive and improve water balance. It can also be employed to bring areas with special problems under vegetal cover and prevent further deterioration of land. It is proposed to plant 5000 trees per year. The type of species will be selected from the local tree, herbs, shrubs & grasses species of local abundance will be selected however, expert guidance of Forest Department shall be sought.

Proposed type of saplings/trees : Acacia, Casurina, cashew, Jambul, Amla, Peru, Jackfruit, Tamarind, Chikoo, Sitaphal, Gulmohar, Azadirachta indica, Melia azedarach, Pongamia pinnata, Bamboo, Neem, Aegel marmelos (Bael), Albizzia Sp., Anthocephalus chinensis (Kadamba), Callistemon citrinus (Bottle brush), Calotropis gigentia (rui), Citrus aurantium (nimbu), Dalbargia sisoo (sissu), Delonix regia (flame tree), Derris indica (karanja), Diospyros melanoxylon (tendu), Erythrina variegeta (mandar), Ficus religiosa (Pipal), Lantena camera, Lawsonia inermis (mehandi), Melia azadirch, Mimusops hexandra (Rajan), Morus alba (tuti), Nerium indicum (Kanher), Poinciana pulcherima (Shankasur), Prosopis cineraria (Shami), Ricinus communis (Erandi), Sapindus emarginatus (Ritha), Tectona grandis (Teak), Termanalia alata (Ain) Grass and herbs species will also be planted.

5.7 Monitoring and Implementation : The monitoring of various environmental parameters is necessary which is a part and parcel of the environment protection measures. Monitoring is as important as that of control of pollution since the efficacy of control measures can only be determined by monitoring. A comprehensive monitoring programme is suggested in the report.

- MOIL Limited has fully fledged environmental cell to supervise and implement the environmental related issues. The Environmental Monitoring Cell has manpower on regular basis.
- The mitigation measures suggested above shall be implemented so as to reduce the impact on environment due to operations of proposed mining activities. In order to facilitate easy implementation, mitigation measures are phased as per the priority implementation. A separate budgetary allocation of the funds is made for the environmental protection measures. The monitoring of the pollution to know the effectiveness of the applied control measures will be carried out at regular interval.
- Estimated project cost is Rs. 28.08 Crores. The capital budget for environmental protection measure is estimated to be Rs 1.84 Crores. The enhance production shall be carried out after obtaining all statutory permissions and shall be carried out as per approved mining scheme.

6. PROJECT BENEFITS

- Local population may be involved extensively in such development either by way of sub contracting or by way of employment.
- The socio-economic conditions in the study area indicate the quality of life of the people. The important indicators which decide the quality of life and require to be improved for better living conditions are literacy levels, improved occupational structure, industrial development, infrastructural facilities, transportation, communication linkages, land development and improvement in cropping pattern.
- The following health facilities will be provided and adequate funds will be allocated for the maintenance of them. These include regular medical camps and aid to the existing medical facilities of the nearby villages.
- Educational include adult education facilities, sponsorship to vocational / professional training institution, computer education camps, vacation training for students and aid to existing/proposed schools and colleges.
- Civic Amenities include support to community toilets, drinking water facilities like public stand posts, borewell/ handpump for drinking water, playgrounds for children and recreation facilities for all age groups. In addition to this participation and support to government efforts in extending communication of the region. Incidentally, all

parameters mentioned above are directly or indirectly controlled by various State and Central Government Departments.

- Employment is proposed to employ the local population wherever possible in the proposed project activities. The work of reclamation of the entire area that will be damaged in mining operations and afforestation through plantation of 2000 trees per ha with survival rate of 80% to 85% has been envisaged. In this, local people would be involved actively including employment and award of contracts for supply of materials and services.

AN EPILOGUE

In compliance with the environmental procedure the environmental clearance application is made. Necessary scientific studies have been undertaken as per the guidelines set by the Ministry of Environment and Forests (MoEF). 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 expansion in production from Kandri Manganese Mine. We at M/s. MOIL Limited are committed to implement the suggestions for the improvement of the environment and assure that every attempt will be made for the conservation and protection of the natural resources to the maximum extent.

**KHASRA WISE DETAILS FOR THE PROPOSED MANGANESE MINE (83.0646 Ha) Village
Kandri, Tahsil Ramtek, District Nagpur, Maharashtra**

Details of Khasra Nos		
Khasara No	Area in Acres	Area in Hectors
361	9.54	3.8606
381	4.66	1.8858
327	1.85	0.7437
325	15.53	6.2847
328	9.46	3.8283
332	3.7	1.4973
331	2.61	1.0562
330	1.77	0.7163
329	2.57	1.04
384	11.73	4.7469
383	5.42	2.1934
346	3.82	1.5459
345	0.14	0.0567
344	0.9	0.3642
347	2.6	1.0522
382	51.12	20.6872
358	4.72	1.91
358	15.12	6.1188
357	6.14	2.4847
348	9.44	3.8202
349	2.89	1.1695
343	2.58	1.0441
342	0.44	0.1781
Road	1.08	0.4371
350	6.47	2.6184
341	7.2	2.9137
338	0.7	0.2833
Road	0.2	0.0809
337	0.17	0.0688
336	0.37	0.1497
335	0.63	0.2512
334	1.14	0.4613
333	1.12	0.4537
324	12.96	5.2405
323	3.56	1.4407
Road	0.06	0.0243
Road	0.88	0.3561
Total	205.26	83.0646
Date - 01/07/2002		