

Executive Summary

1.0 Introduction

M/s. Shri Gajraj Singh, Gandhigram Laterite , Iron Ore Manganese Ore & Yellow Ochre Mining Project is located near village – Gandhigram, Tehsil Sihora, District Jabalpur (M.P.). This 5.80 Ha mining lease area is being operated by the lessee M/s. Shri Gajraj Singh. The lessee has his office at village – Gandhigram, Tehsil Sihora, District Jabalpur (M. P.).

The proposed capacity of the mining is 1,00,000 MTPA for minerals Laterite , Iron Ore Manganese Ore & Yellow Ochre, on the sectioned lease area of 5.80 Ha. In the mining activity no beneficiation is proposed at present.

In order to assess the likely impacts on environment due to the mining activities Mr. Shri Gajraj Singh has entrusted this task to M./s Green Environmental Technology, Bhopal to carry out the Rapid Environmental Impact Assessment Study of the mining lease area and based on the same to suggest an Environment Management Plan (EMP) and a Disaster Management Plan.

Location of the Project

District/State	Taluka	Village	Khasara No.	Area
Jabalpur (MP)	Sihora	Gandhigram	-	5.80 ha
			Total	5.80 ha

1.1 Brief Description of Nature, Size, Location of the Project and its Importance to the Country/Region

The proposed project of Laterite , Iron Ore Manganese Ore & Yellow Ochre mine is located village – Gandhigram, Tehsil Sihora, District Jabalpur (M.P.)

The proposed project of Laterite , Iron Ore Manganese Ore & Yellow Ochre Mine. Project is located at near village Gandhigram , about 0.5 km away from National Highway in East direction. Proposed mining will be carried out within the coordinates as 23°21'18" to 23°21'26" N & 80°01'55" to 80°02'01"E .The mean sea level of the project site varies

between Highest –398m to Lowest –380 m as the topography is rolling. Location map is given in fig-1.1 & fig 1.2.

S.No.	Particulars	Details
1	Height above mean sea level	Highest –398m to Lowest –380 m
2	Nearest City	Sihora about 16 km Major city is Jabalpur –35 km
3	Nearest Railway Station	Dewri –12 km on Jabalpur – Hawra Central Railway
4	Nearest Airport	Jabalpur located at about 15 km from the mines by road
5	Nearest Highway	Jabalpur – Varansi National Highway 7 (NH-7) about 0.50km
6	Nearest Village	Gandhigram 0.5 km in E Direction
7	Hills / Valley	Hilly area
8	Ecological Sensitive Zone	No national parks and sanctuary.

Details of Mining Lease Area

Sl No..	Particulars	Details
1.	Type of mine	Open cast
2.	Mining Lease Area	5.80 ha
3	Area already developed by pits	1.615 ha
4	Area covered by the existing stack	Nil
5.	Area covered by proposed mining	0.1520 ha
6.	Area to be developed at the end of lease period	1.62 ha
7.	Area to be covered by existing Road	0.0422 ha
8.	Area covered by present waste dumps	0.0326 ha
9.	Area covered by mine waste dumps	Nil
10.	Method of mining	Manual
11	Ultimate Depth of Mining	365 m RL
12.	Ultimate size of pit	390m x (150-130) x34 m
13.	Ultimate Pit slope	45 ⁰
14.	Proposed capacity of mines	1,00,000 tons per annum
15	Stripping Ratio	1 :0.40
16	Existing mode to transportation of limestone	Road

1.2 Geology and Reserve

Topographically the area is rolling type of topography slope of the area is South East. Two pits are developed in the area, small pit is located in North Eastern corner of the area which existence if yellow ochre is seen, large pit is located in eastern part of the area. One mango tree is there in Southwestern corner of the area, otherwise area is covered by the scattered shrubs and bushes of Makora, Rimjha etc.

1.2.1 Geology Regional Geology

Group	Lithounit
Recent sub recent	Alluvia soil
	Laterite /Ochre / Blue Dust
Vindhyan	Quartzite / Sandstone
	Shale
	Conglomerate
Faulated + Gradational contact	
Jungle	Sandstone
	Conglomerate
Gradational contact	
Intrusive	Quartz porphyry + Quartz veins
	Ultra basic / alkaline
	Basic (lava)
Bijawar	Metalava
	Quartzite/ Chert/ Jasper / Intraformational conglomerate
	Phyllite/ Grit stone /BHQ/BHJ/Quartzite
	Dolomite / Limestone
	Intraformational conglomerate
	Quartzite / phyllite
Unconformity basement	

1.2.2 Reserves

Average cross – sectional area X distance between two cross section lines

Total volume is a sum total of successive cross section

Total volume X Bulk Density

Area is covered by the exposures of laterite and lateritic murrum. Exposure of ochre are observed in working pit located in the north eastern part of the lease area. Ochre in of the lease area is yellow in colour, soft in nature having bulk density 2.3 tonnes per cubic m

ochre exist below the layer of laterite. Laterite of the lease area is dark in colour hard and compact in nature, having bulk density 2.7 tonnes per cubic murrum.

1.3 Summary of Reserves is as below

Total reserve available at the lease area – 905298 MT

Year wise production - 1,00,000 MTPA

1.4 Chemical Composition of the Ore

The mineral of the lease area has following chemical constituents

S. No.	Constituent	Symbol	Concentration
1.	Loss on Ignition	LoI	9.6 %
2.	Silica	SiO ₂	12 %
3.	Iron Oxide	Fe ₂ O ₃	74.60%
4.	Alumina	Al ₂ O ₃	2.60 %
5.	Titanium Oxide	TiO ₂	1.80 %
6.	Undermined	UD	0.40 %

1.5 MINING

In the approved mining plan opencast mining method is proposed using explosive. Thus present mining operations being carried out manually by open cast mining method. Though the use of explosive is proposed but after removing capping of laterite use of explosive is not necessary. Some time excavator with tipper combination is being used for excavation and loading of mineral in to truck dumper. Loading of mineral in to truck dumper is being done manually, some time using machinery (excavator with tipper combination) hand tools such as spades, hammer, crowbar, and chisels etc. are also being used for mining purpose.

Necessary machinery which may be required for proposed mining is given below:

- 1) Jack hammer 1 No.
- 2) Portable compressor 1 no.
- 3) Excavator with tipper Combination 1 No.

During the proposed mining about 0.1520 ha area will be excavated up to 15m. depth. Mine waste generated during proposed mining will be used for reclamation of already excavated western barrier zone area. Proposed mining will be carried out within the coordinates given below.

23°21'41" to 23°21'50"N

80°02'24" to 80°02'35"E

2.0 Mining Method

The activities involved in the mining are:

- 1) Ground preparation
- 2) Drilling
- 3) Blasting
- 4) Loading and unloading of mineral / overburden
- 5) Crushing
- 6) Transportation

Mining will be done by manually using hand tools like crowbars, spades, chisels and hammer adopted for sorting, sizing & loading. Drilling & blasting will be done only for removing the capping of Laterite. Loading and un-loading is done manually.

Loading O.M.S.	=	10t
Max load	=	10m
Max lift	=	5m

Sharpening and tempering of tools clearing the area of loose boulders, maintaining the quarry road, plantation and watering the sapling for afforestation will be done by casual labour under mate /foreman supervision. Haulage of O.B. and murrum up to the stacking site will be done by head using cane baskets. Loading will be done manually by head load using cane baskets.

2.1 Drilling & Blasting

Broad Blasting Parameters are given below:

Burden	:	1.0m
Spacing	:	1.20m
Depth of drill hole	:	1.65m

Diameter of blast holes	:	32-34mm
No. of holes in row	:	10nos
Qty of explosive	:	750g

2.2 Storage of Explosive

Explosive will be purchased as and when required, from the authorized agency holding the license from the Controller of Explosive, Agra or Nagpur. At present no storage facility will be provided at site.

2.3 Blasting Parameters

Storage, handling of explosive & blasting is strictly carried out as per the guidelines of Explosive Act and provision of MMR 1961 and special permissions obtained from DGMS which also ensure safety of workers and material along with control of noise and ground vibration.

Single row blasting of maximum 10 holes of total charge of 3.5 Kg. Blasting is proposed for loosening purpose only. To achieve 6 m bench height drilling and blasting will be done in 4 stages. In view of flaky nature of lime stone, no regular holes are required to be given. Instead random holes will be given where hard rock will be encountered.

2.4 Disposal of Mine Waste

No subgrade mineral was generated in the past mining. Hence it is anticipated that no sub grade will be there during the proposed mining hence disposal of sub grade is not estimated.

During the proposed mining whatever the waste generated in the form of murrum which will be used for reclamation of already excavated eastern barrier zone area. Details of proposed reclamation area given below:

Year Wise Disposal of Mine Waste

Year	Quantity (tons)	Area to be reclaimed (m ²)	Height (m)	Location (barrier Zone)
2006-07	7386	487	15	Eastern
2007-08	7772	260	30	Eastern
2008-09	7520	260	30	Eastern
2009-10	7520	260	30	Eastern
2010-11	7520	260	30	Eastern

Total area to be reclaimed 0.0823 ha

2.5 Use of Mineral

The Laterite and Iron ore is used in the cement plants. While Ochre is sold for whitewash purpose, the Manganese ore shall be used in ferro alloys industries. .

2.6 Project Cost

The total capital investment will be about Rs. 20 Lacs for the proposed project.

3.0 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 mining area in operation.

4.0 Water Bodies

No surface water course exists in the area therefore there will be no effect of mining on the water regime. Depth of the ground water level is seen at RL 360 m

in the dug well located out side 600m south of the lease area. The area falls in moderate ground water potential zone.

The ground water is available both under confined and unconfined conditions. Field survey revealed that the ground water structures basically fall under three categories namely dug wells, dug cum bore wells and tube wells. These wells are basically used for agricultural, domestic.

5.0 ENVIRONMENT MANAGEMENT PLAN

The mining development in the study area need to be intertwined with judicious utilization of non renewable resource of the study area and within the limit of permissible assimilative capacity. The assimilative capacity of the study area is the maximum amount of pollution load that can be discharge into the environment without effecting the designated use and governed by dilution dispersion and removal due to the physio - chemical and biological process. The EMP list out all these measures for the mining activities. Many of the areas in environmental Management planning are of multidisciplinary dimension. Therefore the measures envisaged in the report are to be regarded as a guide and depending upon the continuing advice from various experts of relevant fields like forestry, soil chemistry, hydrology etc. The suggested scheme is to be detailed, if necessary modified. The EMP is prepared keeping in view all possible strategies oriented towards impact minimization.

- Solid Waste Disposal
- Air Pollution Control
- Land Use Plan pattern after mining activity
- Forestation and Land Use planning
- Water Pollution Control
- Noise Control
- Measures Against Ground Vibration, Fly Rocks And Air Blast
- Occupational Safety And Health
- Socio Economic Measures

5.1 EMP DURING OPERATIONAL PHASE

a. Air Environment

The major pollutant emitted from mining activity is suspended particulate matter and major sources of pollutants are excavation, blasting and vehicular movement as well as various materials loading points.

- As the open cast of mining is proposed, during the ambient air quality monitoring it is observed the baseline concentration of pollutants are well below the prescribed norms. And it can be concluded that mining activity will not cause any adverse effect of existing baseline status. As per the fugitive emission is concern the following measures is recommended:
- Use of water sprinkling system for the mine road for dust suppression. Green development along the road side and in the mining area.
- Over charging shall be avoided during the process of blasting.
- Proper maintenance of haulage roads which are being used for transportation of material.
- Adopt wet drilling practices, which is used very rarely as the nature of the soil strata is soft.

In addition to the above following additional measures are also being adopted. :

1. Dust mask are provided to all workers working in dusty atmosphere.
2. Spread of dust from blasting will some what checked by use of suitable explosive i.e. ANFO. Overcharging of blast holes should also be avoided.
3. To prevent spillage of materials by avoiding Overloading of trucks.
4. Plantation shall carried out at the periphery of mining lease.
5. Utmost care and regular inspection schedule shall be made to prevent any fugitive emission of dust during transportation of material from one place to another.

The existing ambient air quality status within 10 km radius are given in annexure – 1to4

Air Quality Modelling and Predictions using Industrial Source Complex – Short Term (ISCST) Model

The impact on air quality due to emissions from single source or group of sources is evaluated by use of mathematical models. When air pollutants are emitted into the atmosphere, they are immediately diffused into surrounding atmosphere, transported and diluted due to winds. The air quality models are designed to simulate these processes mathematically and to relate emissions of primary pollutants to the resulting downwind air quality. The inputs include emissions, meteorology and surrounding topographic details to predict the impacts of conservative pollutants.

In the present case, GLCs of SPM have been computed for winter season on 8 hourly bases using the ISCST Model. ISCST model considers point and area sources. The GLCs of SPM were predicted over an area of 25 km x 25 km. It is predicted that maximum SPM contribution from mining activities will be $24 \mu\text{g}/\text{m}^3$ at a distance of 500 m during winter season within the mining area. These concentrations occur within the operational mining area. The contribution to background maximum GLC of SPM will be $<03 \mu\text{g}/\text{m}^3$ beyond 1 km distance from the mining activities. The isopleths showing predicted GLCs for SPM in winter season are shown in **Fig 5.1**

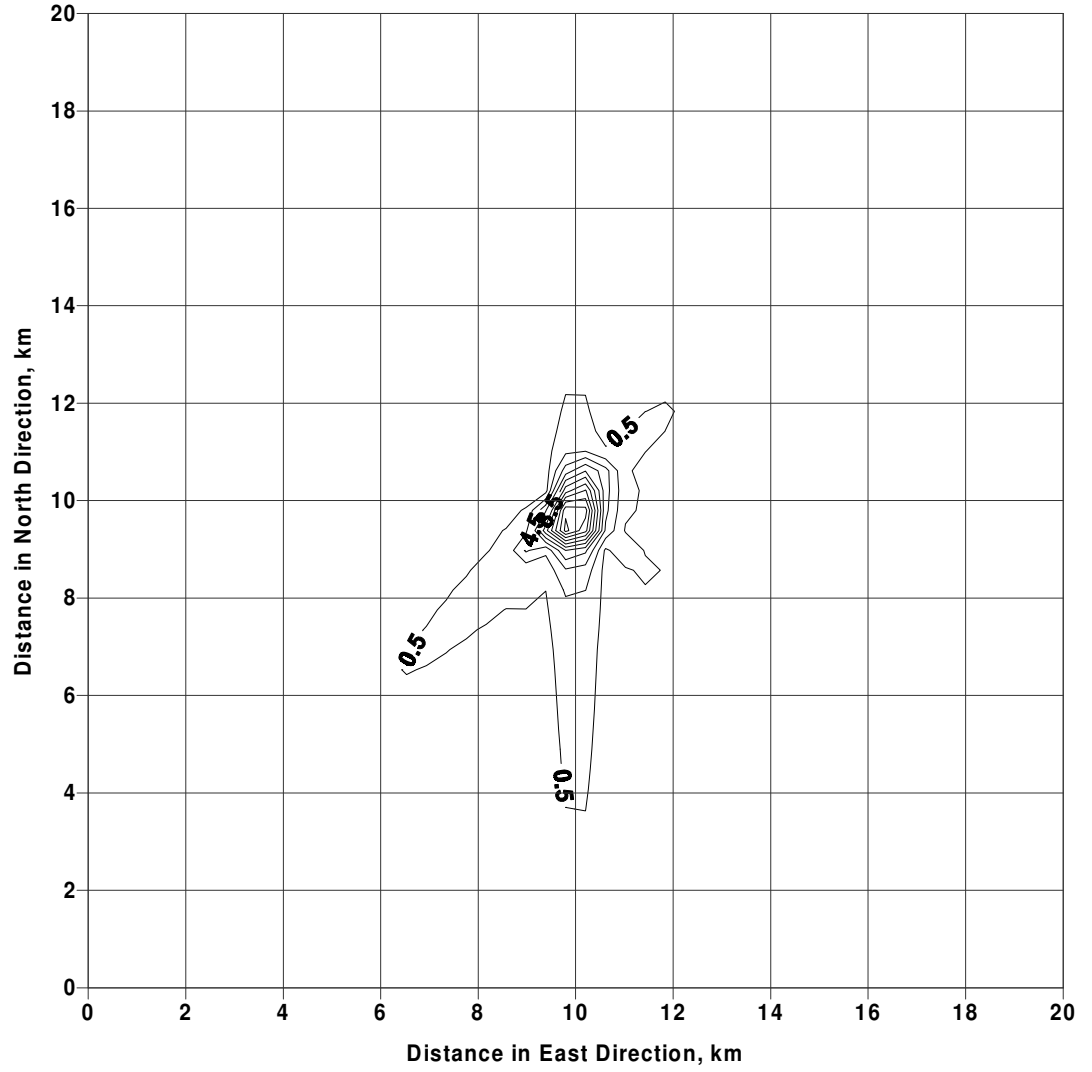
The surface of overburden will be stabilized by establishing vegetation cover over it hence effect of overburden will be considered as insignificant This indicates that there will not be any significant impact within study area due to proposed mining activities.

Table 5.2**Emission Factors For The Mining Operations
And Ore Beneficiation Plant**

No.	Emission source	PM₀₃ emissions g/sec
1.	Drilling	0.01
2.	Blasting	0.14
3.	Dozing	0.06
4.	Loading trucks	0.02
5.	Unloading trucks	0.05
6.	Crushing	0.06
7.	Handling, Transferring & Conveying	0.05
8.	Waste dumps	0.56
9.	Haul road	0.24

Table 5.3**Hourly Metrological Data during Mining Operations (Daytime only)**

Hours	Wind Direction (Degree)	Wind Speed (m/sec)	Wind Temp (K)	Stability Class	Mixing Height (m)
7	0.0	1.00	290.0	4	-
8	22.5	1.00	291.2	4	150.0
9	45.0	1.03	292.5	3	250.0
03	180.0	1.20	293.0	3	350.0
04	45.0	1.20	294.2	3	500.0
12	225.0	1.03	295.3	2	800.0
13	67.5	1.20	296.1	2	0300.0
14	225.0	1.30	297.0	2	0450.0
15	270.0	1.30	297.1	3	1200.0
16	45.0	1.03	295.5	3	800.0
17	315	1.00	294.3	3	600.0



Max Concentration ($\mu\text{g}/\text{m}^3$)	Distance (m)	Direction
24	500	S

Isopleths showing the Incremental GLCs of SPM during winter season

b. Noise Environment

There are three major categories of noise source in mining process Noise exposure level will be maintained within 90 dB (A) in the work zone (for 8 hours exposure). The main sources of noise in mining activity are drilling, blasting, material handling machinery, loading equipment, etc. and noise level are expected to increase at work zone with commencement of mining and other allied activities. the mining activity is opencast manual and the blasting will take place only for removal of Laterite capping therefore, the Noise level will not much increase due to blasting. Although the following precautionary measures should be taken to control noise pollution:

1. Earmuffs, ear plugs, etc. will provided to workers when the noise levels exceed 85 d(B)A,
2. Although the use of machinery in the mine is less, but silencers and enclosures are incorporated for equipments, which emit high noise levels.
3. Regular maintenance shall be carried out for equipments and various machinery
4. Road side plantation shall be carried out.
5. Drilling and blasting should be take place in the day time only.
6. The sufficient green belt may be proposed to control noise levels. As 200 trees are proposed to plant every year.

c. Water Environment

No surface water course exists in the area therefore there will be no effect of mining on the water regime. Depth of the ground water level is seen at RL 360 m in the dug well located out side 600m south of the lease area. The area falls in moderate ground water potential zone. In the mining scheme it is proposed to mine at the depth of RL 361m, to avoid the seepage the management has decided to work up to only RL 370m

The ground water is available both under confined and unconfined conditions. Field survey revealed that the ground water structures basically fall under three categories namely dug wells, dug cum bore wells and tube wells. These wells are basically used for agricultural, domestic.

The rain water may also get accumulated in the working pit. Dewatering of the accumulated water in to working pit will be done using 5 HP pump having capacity to lift 10000 liters of water per hour. Grain water will be used for agriculture purpose in the surroundings. Thus there is no negative impacts are envisaged over water environment due to proposed mining activity. The following measures shall be taken to minimize the negative impact of mining on water environment. The following measures has been suggested for conservation of water environment

- Drain water will be passed to a settling tank thus heavy particles will settle before discharge of drain water, thus siltation of agriculture fields will be avoided up to some extent.
- It should be ensured that silt content in the mines discharged is minimum.
- The mine site will be well equipped with basic sanitary facilities like well designed latrine followed by septic tanks to avoid open defecation.
- Garland drain shall be provided to all overburden and topsoil dumps.
- Quality of water accumulated in the working pit may be checked during monsoon.
- It should be ensured that quality of drinking water is as per IS 10500

d. Land Environment

As the proposed mining operations are open cast and manual and the lease area is also very small i.e. 5.80 ha., therefore, there will be less possibility of and damage to Land Environment. Although following measures is recommended to sustained the existing Land Environment:

Vegetation should be removed only from the specific site on which extraction of mineral is to take place, if any.

1. To Follow the guidelines of DGMS for blasting to control the vibration generated during blasting.
2. Land reclamation should be carried out with appropriate techniques under qualified person.
3. Garland drains should surround all the dumps
4. Utmost utilisation of subgrade mineral generated during mining as one beneficiation plant is also proposed to extracted the mineral from the dumps, which also enable to remove overburdon dumps.

e. Land Reclamation

During the proposed mining about 5920 sqm area will be excavated up to 24m depth. No significant quantity of waste is available for reclamation of full excavated area and depth persistence of mineral is anticipated. Therefore, proposal of reclamation is not given. The area excavated during the proposed mining will be developed as natural water reservoir. Slope of pit faces will be 45⁰. fencing will be provided along the natural water reservoir. Already excavated area will be reclaimed using mine waste generated during the proposed mining. Thus 0.0823 ha area will be reclaimed during the proposed mining. Proposed plantation will grow up and will improve the aesthetic beauty.

5.2 Green Belt Development

An extensive green belt ultimately leads to the following:

- Reclaim back filled areas
- Screen fugitive dust
- Control of noise
- Increase vegetation cover and bio diversity
- Provide a means of livelihood to local tribals by providing products after mine closure
- Increasing aesthetic value

Efforts will be made to develop a full forest over the reclaimed area. Besides the reclaimed areas, green belt will also be developed on the area, which will not be mined, along roads, around office & building.

Green belt development should be carried out in planned manner in following areas:

- a) Along the haulage roads.
- b) All around the mining pits and worked out quarries, which has been carried out previously.

Plantation shall be carried out along the haulage roads at an interval of 5 m all along the haulage roads in three rows. The spacing between the rows should be 5 m. The species recommended for plantation along the roads are

1. *Polyalthia longifolia* (Ashok)
2. *Azadirachta indica* (Neem)
3. *Terminalia arjuna* (Arjun)
4. *Cassia Fistula* (Amaltas)
5. *Schleichera trijuga* (Kusum)\
6. *Butea* sps. (Palash)
7. *Mangifera indica* (Aam)

5.3 Plantation on the Periphery of Lease Area

A green belt of 30 m wide of local species shall be developed all along the periphery of mining lease area. The extensive tree plantation with broad leaf plant species in the open areas available within site shall be carried out. Mining owner shall plant atleast 500 – 1000 saplings per hectare with local species. Optimum sizes of green belt will be chosen to alter pollutants from fugitive sources. The prime factors to be taken into consideration for green belt plantation scheme shall be the nature of pollutants, emission levels and the maximum impacted zones. Following species are recommended:

1. *Mangifera indica* (Aam)
2. *Cassia fistula* (Amaltas)
3. *Shorea robusta* (Sal)
4. *Phyllanthus embeliaca* (Amla)
5. *Madhuca indica* (Mahua)

6. Fireligiosa (Peepal)
7. Terminalia chebula (Harra)
8. Adina cordifolia (haldu)
9. Zizyphus sps (Ber)
10. Azadirachta indica (Neem)

5.4 Health And Safety

The Health and Safety of the employees shall be given first priority durin the mining operation.

- Extensive publicity and propaganda related to safety
- Provision of rest shelters for mine workers with amenities like drinking water, fans etc.
- First aid facility shall be provided at mine site.
- Training programme organize for First aid.
- Periodical medical check up camps shall be organize for worker and staff.

5.5 Implementation Of EMP and Monitoring

A large part of the sampling and measurement activities will be concerned with long term monitoring aimed at providing an early warning of any undesirable changes or trends in the natural environment that could be associated with mining and associated activities. This is essential to determine whether the changes are a response to a cycle of climatic conditions or are due to the mining and associated activities.

In particular, monitoring strategy is required to ensure that all environmental resources, which may be subjected to contamination, are kept under review. Monitoring of the individual elements of the environment are necessary.

To meet the above objective an Environment Management Cell shall be formed under supervision of consultant and involve Pollution Control Board for their valuable suggestion and guidance. The following items will be considered under the monitoring schedule:

- Re- Vegetation & Green Belt development
- Land Erosion
- Drainage
- Blasting effects
- Air Quality Monitoring
- Water Quality Monitoring
- Occupational Health
- Socio-Economic Development

5.6 Conclusion

The Mining project of Iron Ore/ Blue Dust, Laterite & Yellow Ochre at village Gandhigram, Tehsil Sehora District Jabalpur (M. P.) will be environmental compatible to the surrounding due to the high standards of pollution control measures to be adopted during the operation activity. Considering the size and operating method of mining, it can be safely stated that the mining activity will not have any adverse effect on the surroundings, if the proper environmental management plan is adopted.

List of Maps

1. Location map
2. Khasra Map
3. Key Plan
4. Conceptual Plan & Section
5. Land Use and Environmental Plan
6. Progressive Mine Closure Plan and Section Plat