

EXECUTIVE SUMMARY

INTRODUCTION

M/s Mysore Minerals Limited is a Government of Karnataka undertaking established in the year 1966 with main objective of systematic mining and planned development of mineral resources in the State. The main activities of the company are Exploration, Development of Mineral Resources, Exploitation and Marketing of Minerals and granites.

The existing production capacity at Thagadur Chromite Mine is only 0.26 Lakh tonnes per annum. As this mine has other mineral deposits i.e. Titani Ferrous Magnetite, Quartz, Dunite and Serpentinite, which is also has great demand; management has decided to increase the production from 0.26 Lakh tonnes per annum to 1.062 Lakh tonnes per annum at Thagadur Chromite Mine.

In order to evaluate the potential impacts that would arise due to increase of production from 0.26 Lakh tonnes per annum to 1.062 Lakh tonnes per annum at Thagadur Chromite Mines of MML, studies were carried out by M/s. Netel India Ltd. during December 2008 to February 2009 covering air, water, Noise, land, etc., as per the EIA guidelines laid by MoEF and various authorities. The findings of study carried out during summer season are presented in this report.

LOCATION

Site Details

District & State	Hassan District, Karnataka
Taluka	Chhanarayapatana
Village	Thagadur
Mine Lease Area	614.99 ha.
Type of the Area	Patta Land, Government land.
Survey of India Toposheet No.	57 C/8
Latitude	76 ⁰ 26' 40" N to 76 ⁰ 27' 30" N
Longitude	13 ⁰ 01' 50" E to 13 ⁰ 04' 30" E

PROJECT DISCRIPTION

Project Details

Sr. No.	Particulars	Existing Details	Proposed Details
1	Method of Mining	Manually open cast mining	Open cast mining with semi - mechanization
2	Mining leased area	614.99 ha.	614.99 ha.
3	Geological reserves	5.23 Chromite 4.53 Titani ferrous Magnetite 0.25 Quartz 0.88 Dunite / Surpenttinite	5.23 Chromite 4.53 Titani ferrous Magnetite 0.25 Quartz 0.88 Dunite / Surpenttinite
4	Mineable reserves	10.89 Lakh tonnes	10.89 Lakh tonnes
5	Pit slope angle	60 ⁰ to the horizontal	60 ⁰ to the horizontal
6	Annual Magnesite Production	0.26 Lakh tones per annum	0.478 Lakh tones per annum
7	Annual Dunite Production	Nil	0.52 Lakh tonnes per annum
8	Annual Quartz Production	Nil	0.022 Lakh tonnes per annum
9	Annual Dunite / Surpenttinite Production	Nil	0.042 Lakh tonnes per annum
10	Life of the Mine	20 Years	10 Years
11	Bench height	7 m	7 m
12	Bench Width	10 m	10 m
13	Land lease period	20 Years (w. e. f. 25/01/2005)	20 Years (w. e. f. 25/01/2005)
14	Water Requirement	55 m ³ /day	124 m ³ /day
15	Working hours	One shifts 8 hour	One shifts 8 hour
16	No. of employees	66	66

Geology

The Thagadur Chromite Mine is a part of Nuggehally Schist belt received considerable attention in view of the Chromite, Gold and Vanadiferrous Titano-Magnetite mineralization. Recently an interasting discovery Copper mineralization has been made

The foliation of the Schist is predominantly NNW-SSW with steep dip towards East. The belt has an average width over 3 kms as central bulge near Nuggehalli

The Tentative sequence as identified in the region / ML area is indicated below.

1. Dolerite dyke
2. Amphibolite
3. Quartz vein
4. Granitic Gneisses
5. Titano – Magnetite

6. Serpentine
7. Tonalitic Gneiss
8. Sepiolite
9. Talc – Tremolite Schist
10. Chromite Ore.

1 Dolerite Dyke :

It is exposed in the form of discontinuous bodies and runs both along as well as across the schist belt in the South and Northern Part of North block. The outcrops occur at surface in the form of small boulders which are highly weathered. The color of the Dolerite Dyke is light black with grain size varying from fine to medium.

2 Amphibolite :

Amphibolite are predominantly exposed and are closely associated with ultrabasics, trending North 30°W with a dip of 30-80° towards East and North Eastern direction. Amphibolite is highly schistose and exhibits foliation with greenish grey colour and semi-hard in nature.

3 Quartz vein :

Quartz outcrops are found exposed in the Central part of the lease area in the form of thin bands and also scattered boulders trending North South direction. It exhibits white to dull white in colour.

4 Granitic Gneisses :

Granitic Gneisses are exposed predominantly and have contact with Schist Belt in the Western part of the lease area, trending North 20° E direction. The Gneisses are banded in nature with gray to white in colour.

5 Titaniferrous Magnetite :

Titaniferrous Magnetite occurs in the form of continuous bands and is displaced at places due to faulting. The outcrops are well exposed towards Northern extension and North Western part of Ranganatha Betta. It occurs in the form of discontinuous bands in South and South Eastern part of the lease area. The formation is highly folded in the Ranganatha Betta area trending N 30° W and dipping Easterly at different angles. It exhibits metallic lustre and streak is Cherry red.

6 Ultra basics : (Serpentinite / Dunite) :

Among the Ultra basics, Serpentinites are will exposed in the lease area as well as in the working pits, having general trend of NNW-SSE direction generally dipping $60^{\circ} - 65^{\circ}$ towards North and North East direction. Dark green in colour and at places highly weathered, bleached and soft in nature.

7 Tonalitic gneiss :

Tonalitic Gneiss exposed towards eastern margin in South Block and Central block and has in contact with Schist belt trending NW-SE direction and dipping at an angle $60^{\circ} - 70^{\circ}$ easterly. Tonalitic Gneiss exposed in the pit is weathered and shows dull white colour.

8 Sepiolite :

Sepiolite is well exposed in the South & Central pit demarcating the low grade Chromite ore zone. The general trend of the ore body is NW-SE direction and dipping at an angle of $60^{\circ} - 65^{\circ}$ easterly. Sepiolite is Yellowish brown is colour and Schistose in nature.

9 Talc Tremolite Cshist :

The Serpentinite schist is well exposed in the lease area having a general trend NW-SE direction and dipping at an angle of 70° towards East. Talc Serpentinite is light green in colour, soft in soapy to touch.

10 Chromite :

Chromite ore body in the M.L. area is mainly associated with Serpentinite in the form of lenses, veins, bands, Pods and also occurs in the form of float ore at top with in the soil.

The foliation direction of the ultra basic as a whole is NNW-SSE. The ore body also follow the foliation direction and dipping at an angle of $65^{\circ} - 70^{\circ}$ easterly.

Reserves

The category wise reserves are tabled as below.

1. Chromite

The recoverable reserves of Chromite available for extraction is 5,28,710 tonnes. Out of which 1,88,895 tonnes is proved category and 3,39,815 tonnes are probable category. Details of category wise reserves are tabled below.

Sr. No.	Category of Reserves	Blockwise updated reserves in Tonnes			Total Reserves in Tonnes	Mineable Reserves in Tonnes
		South Block	Central Block	North Block		
1	Proved Reserves	1,10,842	44,967	33,086	1,88,895	1,79,450
2	Probable Reserves	1,88,195	79,040	72,580	3,39,815	3,22,825
GRAND TOTAL		2,99,037	1,24,007	1,05,666	5,28,710	5,02,275

2. Titaniferrous Magnetite Reserves

The updated Titaniferrous Magnetite reserves is about 4,52,725 tonnes. Out of which float ore is about 73,150 tonnes and proved and probable category is 2,52,050 tonnes and 1,26,525 tonnes respectively. The Tio₂ content varies from 6 % to 10 %.

The category wise reserves are detailed hereunder.

Sr. No.	Category of Reserves	Balance Reserves in Tonnes	Additional Reserves in Tonnes	Total Insitu Recoverable Reserves in Tonnes
1	Float Ore	--	73,150	73,150
2	Proved Reserves	51,746	2,01,304	2,53,050
3	Probable Reserves	31,750	94,775	1,26,525
Total		83,496	3,69,229	4,52,725

3. Serpentinite, Dunite, Talc and Quartz (Associated Minerals)

Apart from Chromite and Titano-Magnetite the other associated minerals noticed in the area are Quartz, Serpentinite, Dunite and Talc which are normally utilized in industries.

The Reserves are estimated by taking the effective length, width of exposures. Broadly considering the data obtained from the exploration of Chromite ore and from the pits is considering the depth persistence of these associated minerals.

The details of reserves of Associated minerals is hereunder

Sr. No.	Category of Reserves	Reserves of QUARTZ in Tonnes	Reserves of SERPENTINITE in Tonnes	Reserves of DUNITE in Tonnes	Reserves of TALC in Tonnes
1	Proved Reserves	16,640	22,125	36,880	10,620
2	Probable Reserves	8,320	11,063	18,440	5,310
Grand Total		24,960	33,188	55,320	15,930

Topography and drainage

The mining lease area is an undulating terrain having gentle slope both Eastly and Westerly. The general counter of lease hold area ranges from 911 to 973 mtrs. Above MSL. Few seasonal Nallahs are observed in the area towards North West, North East and Central part of the area and flow only during monsoon and remains dry during other seasons. The sorrundind area of the Mining lease block is using for cultivation of Coconut, Sugar cane and seasonal crops such as Ragi and Maize. The area receives a moderate rainfall ranging from 500-600 mm annually and under sub-tropical climate.

Details of Production

The details of development & production proposed during plan period is given below

Year wise Development ad Production Proposed

Sr.	Particulars	Quantity of OZW & O/B in tonnes	Quantity of Production in tonnes	Ore to O/B ratio
1	2007 – 08	1060906	84430	1:12.57
2	2008 - 09	1265979	94070	1:13.46
3	2009 – 10	794974	106290	1:07.48
4	2010 – 11	782628	113190	1:06.91
5	2011 – 12	2043705	132832	1:15.39
6	Total	5948192	530812	1:11.17

Equipment Details

The list of machinery to be deployed during the mining operation in the subject area is as follows

Requirement of Mining Machineries

Sr. No.	Equipment	Capacity	H.P.	Numbers of Equipments		
				Existing	Proposed	Total
1	J.C.B. 30x Loader	HM 72 – 21	107	01	--	01
2	BEML BE 300 Shovel	1.5 M3	197	01	02	03
3	Tata Tipper	10 tonnes	35	04	10	14
4	Wagon drill	100 mm	--	--	02	02
5	Compressor Atlas Capco X AH	--	--	--	02	02
6	Tractor Mounted Compressor	--	35	02	--	02
7	Welding Generator	--	--	01	--	01
8	Water Pump	--	16	01	01	02
9	Water Pump	--	5	01	01	02
10	Truck / Water Tanker	--	35	01	--	01
11	Crusher	--	--	--	02	02
12	Bolero	--	--	01	--	01
13	Tata Sumo	--	--	01	--	01
	Total	--	--	14	20	34

PRESENT ENVIRONMENT SCENARIO

For the description of the baseline environmental setting, the mining project area together with the mine lease area have been considered as the core zone, and the area falling within 10 km from the core zone has been considered as the buffer zone. Core and buffer zones, taken together, form the study area. Baseline data generation was collected for a period of 3 months, from December 2008 to February 2009 (winter season).

Climate

The study area is part of tropical climate with hot summer, moderately cool winter and moderate monsoon during June to August. The rains are scanty and average rainfall of the area is around 912 mm. hourly micrometeorological data was recorded at Mine site office for period of 3 months comprising one winter season from December 2008 to February 2009. The micrometeorological data is given in below.

Summary of Micro-Metrological Data

Particulars	Maximum	Minimum	Average
Temperature (°C)	32.9	13.4	22.3
Relative humidity	76.6	24.1	48.9
Wind speed (km/hr)	23.0	0.0	5.5
Predominant wind direction	ENE (East – North – East)		
Clam Wind	11.90 %		

Ambient air quality

Total seven Ambient Air Quality Monitoring Stations (2 in core zone and 5 in buffer zone) were identified and monitored as per the norms. The summary of pollutants results is as follows.

Results of Ambient Air Quality

Pollutants	Observed values range 24 hourly average ($\mu\text{g}/\text{m}^3$)		Standard laid down by CPCB 24 hourly average ($\mu\text{g}/\text{m}^3$)	
	Core zone	Buffer zone	For Residential	For Industrial
SPM	109.8 – 168.5	105.7 – 163.0	200	500
RPM	30.6 – 72.3	25.9 – 69.8	100	150
SO ₂	2.3 – 13.8	3.9 – 10.3	80	120
NO _x	7.2 – 22.1	8.1 – 17.9	80	120

Noise Environment

Noise levels were monitored at seven locations, two stations representing core zone activities and the remaining five stations representing buffer zone villages. The main sources of noise will be due to movement of heavy earthmoving machinery, blasting, movement of trucks engaged for transportation of Magnesite as well as ore zone waste. The results are shown in the following table.

Summary of the Noise Level

Zone	Location	Station Code	Noise level dB (A)		Activity
			Day	Night	
Core	Mine site	N1	58.2	46.9	Source mining activity and Temple
	Temple in lease area	N2	54.4	45.6	
Buffer	Bagur Village	N3	56.1	45.1	General, public transport
	Jambur Village	N4	54.7	45.6	
	Maskarhalli Village	N5	53.5	45.6	
	Sannenhalli Village	N6	53.1	45.5	
	Channenhalli Village	N7	54.2	46.6	

Water environment

A water resource available in the area is rain water. Medium and small dams/lakes are present in Study area. The ground water as well as lake water is the source of potable water in the study area.

Quality of water

Water samples from 5 ground water sources and three surface water sources were characterized. The quality of ground water in the study area varies widely. However, characteristics of water samples from locations are in conformity with the permissible limits for drinking water.

The analytical report of the water samples are found to be within the tolerance limits for water specified as per IS:10500 standards. Hence the water quality in the surrounding area is good.

Landuse pattern and soil quality

The land is almost plain and cultivated. The details of existing and proposed land use pattern of mining lease area are given below.

Land use pattern in Core Zone

Sr. No.	Particulars	Present Occupation	Proposed for		Total area in ha.
			1 st 5th year	End of Mine Life	
1	Mining	29.94	12.61	17.29	59.84
2	Roads	4.00	--	--	4.00
3	Dump Yard	31.07	9.08	35.19	75.34
4	Stock Yards	0.64	2.00	7.75	10.39
5	Afforestation	123.00	11.25	34.64	168.89
6	Structures/Colony	5.02	--	--	5.02
7	Area unutilised	421.32	386.38	291.51	291.51
8	Total	614.99	--	--	614.99

Land use pattern in Buffer Zone

Sr. No.	Land Use	Area in ha.	%
1	Forest land	00.00	00.00
2	Irrigated land	4661.72	15.07
3	Un-irrigated land	17057.53	55.16
4	Cultivable waste land	3272.74	10.58
5	Not available for cultivation	5934.19	19.19
6	Total	30926.18	100.00

The soil pH was observed in the range of 6.84 - 7.56. The soils are rich in nutrients like potash, phosphorous, nitrogen and organic matter. The soil appeared different colours such as light brown, Dark brown, Red and Black. Soil samples have clay slit structures.

Ecology

Density of trees is very less on mining lease area. Major activities within 5 kms radius of the buffer zone are mining and dry agriculture activities only during rainy season. However, under the green belt development and plantation programme, approximately 168.89 ha of ML has been brought under plantation. No wild life of any sort is found within the lease hold area. The fauna found in the area are of common variety and no endangered or threatened species are reported in the study area.

Socio-economic condition

There is no habitation within the project area. Hence, no rehabilitation will be required. In the study area, there are 109 inhabited revenue villages. All are fall within

Chhanaraypatana Tehsil. The total population in these 109 villages is 1,00,601. The distribution of population is given below

Population			SC		ST	
Male	Female	Total	Male	Female	Male	Female
36,006	36,900	72,906	4,346	4,403	164	157

59.23% of total population is literate out of 68.85% is male literate and 49.85% is female literate. The composition of SC and ST in the study area is 12.00% and 0.44% respectively. 69.69% of total populations are main cultivators, 13.69 % of total household industries workers, 8.02% of the total are total main other workers, 7.89% of total main agriculture laboures and total marginal workers are only 0.71 %.

ENVIRONMENTAL IMPACT ASSESSMENT

Air quality

The mining operation being open-cast, the dust generation due to excavation of land, movement of machinery on unpaved surfaces, blasting & handling of rejects, sub-grade ore & products is common. The impacts on air are mainly due to generation of dust during loading, unloading and transportation of Chromite, Titano ferrous Magnetite, Quartz, Serpentinite and Dunite and some emissions from the transporting trucks. The air pollutants are SPM/SO₂/NO_x emissions from the activity. The overall scenario after increase in production is given below.

Overall Scenario

Station	Predicted max. GLC	Direction	Worst background concentration	Total Concentration	Standards
	µg/m ³		µg/m ³	µg/m ³	µg/m ³
Core Zone (100 m)	23.72	--	168.50	192.22	500
Buffer Zone (500 m)	2.82	SW	163.00	165.82	200
Buffer Zone (1000 m)	1.08	S	149.50	150.58	200

Water resources

No change in drainage pattern will take place due to mining, as no major nullah is flowing from lease area. Since it is open cast mining the quarry pit will receive accumulation of rain water as direct precipitation. The water table in the area is rest at 30-45 m below the ground level. Therefore the water table will not be cut and no loss of ground water. Therefore, no adverse impact on ground water regime is expected.

Water quality

There will be no discharge of effluent from the mine. Sewage generated from labour colony & office will be very less & this will be treated in septic tank. Treated sewage will be discharged in soak pit. Ground water level at the site and its surrounding area is 30-45 m below the ground level. The likely chances of the contaminants reaching the ground water are very rare. Hence, no deterioration of ground water or surface water is anticipated.

Land degradation

It is envisaged that about 59.84 ha. area will be disturbed by mining activity during entire life.

Flora and Fauna

The core zone is agricultural land. The land acquired will need due compensation to owners as mitigation measure. The impact on flora and vegetation will be mitigated through a detailed afforestation plan. The fauna found in the area are of common variety and no endangered or threatened species are reported in the study area.

Noise level, traffic

The application of drilling, blasting, haulage/transportation is expected to raise noise level in ML area. The observed noise level will be well within the prescribed limits for surrounding population due to control measures proposed in management plan.

The 3.875 Lakh tonnes per annum Magnesite and Dunite production per year will contribute to the traffic density by adding about (50 loaded and 50 empty). 100 trucks, which is a marginal increase and will warrant control measures as spelt out in management plan.

Socio-economic conditions

The project will provide more direct and indirect job opportunities and better economic standard to the project affected people and others, through improved infrastructural, community facilities, etc.

ENVIRONMENTAL MANAGEMENT PLAN

In order to mitigate the environmental impact due to mining and its allied activities, a comprehensive environmental management plan (EMP) has been formulated. The management has already initiated the following steps to contain pollution and the same shall be continued vigorously in future also. All likely parameters that will be affected by mining have been addressed and these are briefly mentioned in the following paragraphs.

Land degradation control measures

The mining and associated operations will disturb about 12.29 ha. of area which is about 44.25% of the lease hold area at the end of life of mine. It is proposed to convert most of the land as water ponds and remaining land for agriculture out of the void left after the completion of excavation, since it is not possible to back-fill the area. This top soil will

be utilized for agriculture purposes, by adjacent patta land owners and remaining soil will be stacked in stock yard. Waste generation during course of mine will be 15.29 Lakh tonnes. Overburden will be stacked in dump yard located away from the workings. Waste dump will be protected by way of construction of retention wall all along the toe of the dump to prevent wash offs during rainy seasons.

Air pollution control measures

- Dust extraction systems to be used in drill machines; and
- Use of sharp drill bits for drilling holes and drills with water flushing systems (wet drilling) to reduce dust generation.
- Dense plantation of specific more efficient dust collector species
- OB waste dumps, if any, shall be sprayed with water, as they are the major source of air borne particulate matter/dust.
- Trucks will be covered with tarpaulin and over filling of tippers will be strictly avoided
- Maintenance of haulage road on regular basis
- Regular water spraying on haulage roads during transportation of Magnesite and Dunite and waste by water sprinklers;

Control measures for water pollution

- To prevent surface water contamination by oil/grease, leak proof containers shall be used for storage and transportation of oil/grease.
- During dewatering operations, the water pumped out will be used for fulfilling the needs of mine and plant related activities
- During excavation and drilling activities effort must be taken to avoid face collapse at these cracks and fissures.
- Construction of retaining wall to avoid sliding of loose material from dumps

Noise Control Measures

- 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;
- 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;

- Blasting operations to be carried out only during daytime so as to avoid high noise intensity in night time;
- 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

Ground Vibration

- Use of milli-second detonators,
- Good blasting design,
- Lesser quantity of charge per delay,
- Less frequency of blasting.

Measures to improve socio economic condition

People affected by the project will be paid due to compensation. Land affected persons of the area will be provided with direct or indirect employment. Communication, education facilities, health facilities and recreational facilities will be improved due to mining activity.

Environmental matrix

The modified Leopold matrix was applied to evaluate the impact before adopting control measures and after adopting control measures. It is observed that the total score which was originally -464.81 (without mitigative measures) has improved to -95.19 (with mitigative measures). The negative score of -464.81 at pre-mitigative stage indicates significant adverse and reversible impacts that can be managed by adopting appropriate pollution control measures (-95.19).

ENVIRONMENTAL CONTROL AND MONITORING ORGANIZATION

An appropriate team has been proposed to take care of pollution monitoring aspects and implementation of control measures. A schedule has been spelt out for periodical monitoring. The capital investment on environmental improvement works is envisaged as Rs 32.60 Lakhs and recurring expenditure is Rs 6.52 Lakhs per year.

DISASTER MANAGEMENT PLAN

- Entry of unauthorised persons shall be prohibited;
- Fire fighting and first aid provisions in the mines office complex and mining Area;
- Provision of all the safety appliances such as safety boots, helmets, goggles etc. would be made available to the employees and regular check to ensure the use;

- Training and refresher courses for all the employees working in the hazardous premises;
- Working of mine as per approved plan, related amendments and other regulatory provisions;
- Handling of explosives, charging and blasting shall be carried out by competent persons only;
- Provision of magazine at safe place with fencing and necessary security arrangement;
- Awareness of safety and disaster through competitions, posters and other similar drives;

CONCLUSION

Based on the EIA study it is observed that there will be a marginal increase in the dust pollution, which will be controlled by sprinkling of water and transportation of ore in closed trucks.

There will be insignificant impact on ambient environment and ecology due to the mining activities. On the other hand mining operation will lead to direct and indirect employment generation in the area.

Hence, it can be summarized that the development of Thagadur Chromite Mines of M/s Mysore Minerals Limited at Thagadur village will have a positive impact on the socio-economic of the area and lead to sustainable development of the region.