

ENVIRONMENTAL IMPACT ASSESSMENT

FOR THE PROPOSED EXPANSION OF SURKHA (NORTH) LIGNITE MINE PROJECT (3 MTPA TO 5 MTPA IN ML AREA OF 3672 HA) LOCATED AT TEHSIL GHOGHA, BHAVNAGAR DISTRICT, GUJARAT

Executive Summary



GUJARAT MINERAL DEVELOPMENT CORPORATION LIMITED
GUJARAT



ABC Techno Labs[®]
India Private Limited
(Formerly ABC Environ Solutions Pvt. Ltd.,)

(An ISO 9001, ISO 14001, OHSAS 18001 Certified Company)



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1.0 PROJECT DESCRIPTION

1.1 Purpose of the Report

Gujarat Mineral Development Corporation Limited (GMDC) is a public sector company of the Government of Gujarat, established in the year 1963 for extraction and development of mineral wealth in the State. GMDC is mining lignite since 1973. GMDC is involved in mining of lignite, bauxite, fluorspar, manganese, limestone, Thermal & Wind Power Generation, etc.

GMDC possesses a lignite mine lease with total lease area of 3672 ha in village Surkha, Taluka Ghogha, District Bhavnagar of Gujarat. The Lignite production in Surkha (North) Lignite Mine began on 14th December, 2008. GMDC has obtained Environmental clearance from Ministry of Environment and Forests, GoI, New Delhi for 3 Million Tonnes per Annum of lignite on 07th May 2007 vide letter no. J-11015/234/2006-IA II (M). GMDC has proposed to increase the production of above mine from its existing production capacity of 3.0 Million Tonnes per Annum to 5.0 Million Tonnes Per Annum without increasing the mine lease area.

The application for Environmental Clearance (Form-1) submitted by GMDC for the proposed expansion project was considered by the Expert Appraisal Committee (Thermal & Coal Mining Projects) in its 41st meeting held during 23rd - 24th January 2012 for issuing the Terms of Reference (ToR). The Committee has suggested specific Terms of Reference (TOR) for preparation of the EIA report and Environmental Management Plan vide its letter no. J-11015/274/2011-IA.II (M) dated March 2012.

1.2 Identification of Project

The proposed project involves the expansion of the production capacity of the existing Surkha (North) Lignite Mine lease belong to GMDC. The existing mine lease of 3672 ha is allotted by the Ministry of Coal, Government of India to GMDC. The proposed expansion of lignite production is required due to certain reasons which are listed below.

- Gujarat state government is setting up 500 MW lignite based Power Plant in Bhavnagar district in close vicinity of Surkha (N) mine of GMDC and has desired some lignite supplies to that proposed power plant from this mine.
- Due to downsizing of lignite production from Panandharo mine, it became necessary for the Company to enhance production from Surkha (North) lignite mine & its other mines.

- Moreover existing cement industries in Saurashtra has also started using GMDC lignite.
- The necessity is therefore felt to enhance lignite production from this mine from 3.0 Million Tonnes to 5.0 Million Tonnes Per Annum without increasing the lease area.

1.3 Life of Project and Cost of the Project

Mineable reserves of 73.51 million Tones have been estimated. The production capacity of the mine will be increased from 3 MTPA to 5 MTPA. So the life of the mine will be reduced from 25 years to 16 years. Total cost of the proposed expansion project is estimated as Rs. 250 Crores (including escrow & abandonment expenses)

1.4 Location of the Project

The details of environmental setting are given in **Table-1**. The study area map is presented in **Figure-1**.

TABLE - 1 : DETAILS OF ENVIRONMENTAL SETTING

Sr. No.	Particulars	Details
1	Location	
a	Villages	Surkha, Thordi, Rampar, Bhutesar, Bhumbhli, Old & New Ratanpar, Gundi, Koliyak, Tagdi, Malpar, Hoidad
b	Tehsil	Ghogha and Bhavnagar
c	District	Bhavnagar
d	State	Gujarat
e	Latitude	21° 26'43" to 21° 43'00" N
f	Longitude	72° 07' 30" to 72° 16' 30" E
2	Elevation	11.62 m – 38.85 m above MSL
3	Land use at the ML area	Mining lease area is applied for 3672 ha. Forest area – NIL Private Agricultural Land – 2941.68 (80.1%) Govt. Waste Land – 730.32 ha (19.9%)
4	Villages in Core zone	Rampar
5	Villages around ML area	Surkha, Thordi, Bhutesar, Bhumbhli, Old & New Ratanpar, Gundi, Koliyak, Tagdi, Malpar and Hoidad

Sr. No.	Particulars	Details
5	Nearest town	Bhavnagar - 11-km, NW
6	Nearest highway w.r.t. mine	SH 36 - 1.5 km, N CH6 (Old No. NH 8E) - 3.5 km, NW
7	Nearest railway station	Bhavnagar R.S. - 13.0 km, NNW
8	Nearest airport	Bhavnagar - 8.0 km, N
9	Nearest tourist places	Nil within 10-km radius
10	Defence installations	Nil within 10-km radius
11	Archaeologically listed important place	Nil within 10-km radius
12	Ecological sensitive zones	No National Parks, Wildlife Corridors, Bio-Spheres and Sanctuaries exist within 10 km radius
13	Reserved /Protected forest	Nil within 10-km radius
14	Other forests	Unclassified Forest at Thordi - 1.5 km, SSW Unclassified Forest at Koliyak - 3.0 km, SE
15	Nearest streams / Rivers	Malesari Rivulet - 1.6 km, SE
16	Lignite user locations	1. Proposed 500 MW Power plant by state government 2. Cement plants, textiles and other industries around Bhavnagar
17	Socio-economic factors	No Resettlement and Rehabilitation issues are involved
18	Seismic zone	Zone-III as per IS-1893 (Part-1)-2002

1.5 Size/Magnitude of Operation

The existing mine lease extends over an area of 3672-ha. The salient features of the project are given in **Table-2**.

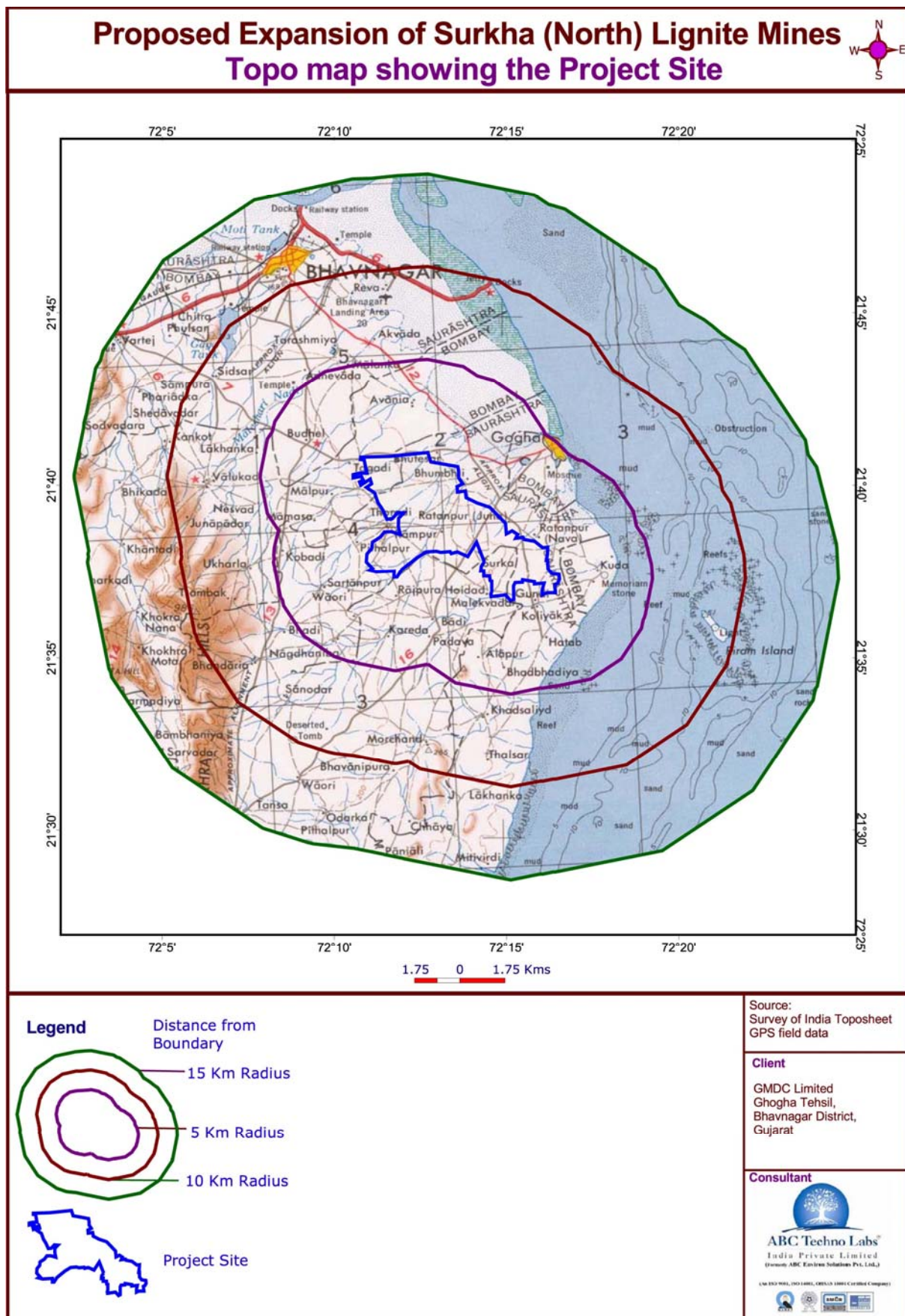


FIGURE - 1 : STUDY AREA MAP (10 KM RADIUS)

TABLE - 2: SALIENT FEATURES OF THE MINING PROJECT

Sr. No.	Description	Details	
		Before Expansion	After Expansion
1	Block area (Lignite Bearing area)	1729 ha	1747.53ha
2	Mine lease	3672 ha	3672 ha
3	Type of mine	Open Cast	Open Cast
4	Method of mining	Mechanized	Mechanized
5	Rated capacity of mine	3.0 MTPA	5.0 MTPA
6	Expected life of mine	25 years	16 years
7	Average stripping ratio	1 : 10.41	1 : 9.96
8	Geological reserves in Million Tonne	107.54	114.72
9	Recoverable reserves in Million Tonne	69.63	73.51
10	Average thickness of lignite	7.23m	7.23m
11	Average no. of working days	300 day/year	300 day/year
12	Number of shifts	3 shifts/day	3 shifts/day
13	Man power (Nos/day)	519	745
14	Ultimate depth of mine	156 m	156 m
15	Overburden to be generated during entire life of mine	725.40 million m ³	732.130 million m ³
16	Topsoil to be generated during initial 5 years	11.50 Lakhs m ³	11.90 Lakhs m ³
17	No. of waste dumps planned	5 Nos	5 Nos
18	Height of waste dumps	30 m	55 m
19	Area of waste dumps	Dump 1 (W-I) - 13.35 ha, Dump 2 (W-II) - 57.88 ha Dump 3 (W-III)-81.92 ha, Dump 4 (W-IV)-45.18 ha Dump 5 (E-I) - 95.67 ha (Total area - 294.00 ha)	
20	Pyrite removal plant	---	3.0 Million TPA
21	Power requirement	250 KVA	250 KVA
22	Water requirement	310 m ³ /day	1000-m ³ /day

23	Transport of OB	50 T dumpers	85 T dumpers
24	Transport of lignite from mine face	10- 15 T dumpers	20 – 25 T dumpers

2.0 DESCRIPTION OF THE ENVIRONMENT

2.1 Introduction

The mine lease area forms the core zone and the 10 kms radius around core zone forms buffer zone. These two together forms study area and map showing the same is shown in *Figure - 1*. The environment consisting of geology, micro-meteorology, ambient air quality, water quality, soil quality and noise levels and field investigations of ecology in the study area generated from 23rd April 2012 to 22nd July 2012 representing pre-monsoon season. Land use pattern and socio-economic profile of the study area is also presented.

2.2 Geology

A bird's eye view of the geology of Saurashtra peninsula shows that the peninsula is bounded by sea on all sides except northeast side where it is flanked by alluvium plains of main land Gujarat and is comprised of rocks, ranging from Juro-Cretaceous to recent coastal deposits. About 2/3rd portion of the plateau is comprised of basaltic lava flows (trap). The trap overlies the upper Mesozoic sediments in the northern part of the Peninsula (Dhrangadhra - Wadhwan area). At the coastal fringe, trap underlies tertiary-quaternary sediments. Out of these Geological formations, only three soil types are exposed within the existing mining block which is Alluvial Soil, Conglomeratic Ferruginous sandstone and Grey Bentonitic clays.

2.3 Topography & Drainage

Topographically the area has moderate relief, though the area is part of coastal plain extending from sea to inland. The minimum and maximum elevations of the collars of exploratory boreholes have RLs of 11.62 m and 38.85 m above MSL.

There are no perennial rivers or major surface water bodies within the allocated lignite block or the mining lease area. The only seasonal river of significance in near vicinity is Malesari River, which flows outside the south-east boundary of the mining lease area. There are four seasonal Nallahs, N1 to N4 flowing across the mining lease.

2.4 Meteorology

The predominant wind direction observed during the study period was West for 27.8% of the total time and followed by South West [22.3%] of the total time. The mean maximum and mean minimum temperatures recorded at site during study period were 45°C and 25°C. The Relative Humidity was observed to range from 32 - 97% during the study period at the site.

2.5 Ambient Air Quality

Ambient air quality monitoring was carried out at a frequency of two days per week at each location for three months. The concentrations of Particulate Matter <10 µm (PM₁₀), Particulate Matter <2.5 µm (PM_{2.5}), Sulphur Dioxide, Nitrogen Dioxide, Lead are observed to be well within the NAAQ standards prescribed by the Central Pollution Control Board (CPCB) for industrial and rural /residential zone. Whereas, the concentration heavy metals like Mercury, Cadmium, Chromium and Arsenic were observed below detection limits.

2.6 Noise Level Survey

The noise monitoring has been conducted for determination of ambient noise levels in the study area covering 14 locations. The day time and night time noise levels at all the locations are observed to be well within the NAAQ standards prescribed by the Central Pollution Control Board (CPCB).

2.7 Water Quality

12 no ground water, 1 surface water and 1 sea water sources covering 10 km radial distance were examined for physico-chemical, heavy metals and bacteriological parameters. The water in general is not fit for drinking as most of the parameters are above the standards prescribed under IS 10500 drinking water standards.

2.8 Soil Characteristics

Various locations within 10 km radius of the mine lease boundary were selected for soil sampling. It has been observed that the pH of the soil was ranging from 7.68 to 8.52. Texture of the soil sample is predominantly clay and sandy loam. The available nitrogen content ranges between 9 to 16 mg/kg in the locality. The value of phosphorus content varies between 27 to 42 mg/kg and the potassium content varies from 112 to 252 mg/kg which indicates that the soils have moderate quantities of potassium.

2.9 Flora and Fauna Studies

Field survey conducted during the study period revealed that total number of 77 species have been recorded of which maximum of 50 species are accounted for trees followed by shrubs-18, grasses-5 and climbers-4. None of the reserve or natural forests falls within the 10 km radius around the mine lease area.

No wild life sanctuaries or national parks or biosphere or hotspots in 10 km radius from the mine lease area. A total number of 58 species of fauna were identified during the survey under the study area. The common domestic animals viz. cow, buffalo, horse, camel, donkey, dog, cat and common mongoose were reported throughout the study area.

2.10 Land Use Studies

To demarcate different land use classes using the remote sensing data such as satellite imagery and application of GIS techniques for assessing the areal extent of the different classes that is interpreted. Considering the user defined scale of mapping, 1:50000 IRS-P6, LISS-III data on 1:50000 scale was used for Land use / Land cover mapping of 10 km radius for the expansion of mining project.

2.11 Demography and Socio-Economics

The methodology adopted for the study is primarily based on the review of secondary data, such as District Primary Census Statistical Handbook of Bhavnagar District, 2001 for the parameters of demography, occupational structure of people within the study area of 10-km radius around the mine lease area.

3.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

3.1 Topography and Drainage

3.1.1 Impact

Mining of lignite by opencast method causes changes in topography. Pre-mining R.L of Surkha (N) mines varies from 11.62 m to 38.85 m above M.S.L. Post-mining R.L will vary from 75 m to -120 m with respect to M.S.L. There are no perennial rivers or major surface water bodies within the allocated lignite block or the mining lease area. There are four seasonal Nallahs, N1 to N4 flowing across the mining lease. Considering the topographical conditions, diversion of these Nallah was

found feasible. It was, therefore, planned to divert these Nallah in phases as per need and recover the locked lignite.

3.1.2 Mitigation Measures

Land reclamation plan is implemented simultaneously with the mining activities. The mined out area will be back-filled by excavated OB in a systematic manner. As the space for backfill will be limited some dumping of OB will also continue in the external dumps.

3.2 **Climate**

3.2.1 Impact

The expansion of mining activities will not have any impact on climate condition. No major temperature variations will occur due to clearance of green cover as adequate additional green belt will be developed. Due to change in the topography of the project area negligible variations in wind speed is anticipated at local level.

3.2.2 Mitigation Measures

As there is no significant change expected on the climate due to expansion project, no major mitigation measures are required. Even though adequate area of green belt developed to maintain the temperate as well as observe the pollutants including green house gases which may increase the temperate.

3.3 **Land Use**

3.3.1 Impact

The proposed expansion of opencast mine will result in disturbance of the land use pattern of the ML area. The land degradation is expected during mining activities like excavation, overburden dumping, soil extraction etc. Land requirement for the project has been assessed considering functional needs. No forest land is involved in the current mining project.

3.3.2 Mitigation Measures

The reclamation of mined out land was proposed and taken up from the 3rd year of operations itself. The process will continue and the mined out area will be back-filled by freshly excavated OB in a systematic manner. As the space for backfill will be limited some dumping of overburden will also continue in the external dumps. Out of total excavated area of 1014.88 ha, about 878.88 ha will be backfilled and remaining area will be developed with ponds.

3.4 Air Quality

3.4.1 Impact

The source of emissions of mining are from active mine area mostly from mining pit, associated activities like blasting, hauling, loading and unloading. Once the expansion of existing lignite mining operation takes place to 5 MTPA, it is anticipated that marginal increase will occur in the Particulate Matter levels in the core and the buffer zones. Prediction of impacts on air environment has been carried out by employing a mathematical model. In the present case, USEPA Breeze Air Suite dispersion model has been used. Maximum incremental PM₁₀ concentration of 2.49 µg/m³ resulted in Juna Ratanpar village of mine lease for pre-monsoon season. The resultant concentrations in buffer zone have maximum value of 65.99 µg/m³ for PM₁₀ hence impact on the ambient levels of these pollutants due to the proposed mining operation will be minor.

3.4.2 Mitigation Measures

- Water spraying on haul roads, service roads and overburden dumps will help in reducing considerable dust pollution;
- Proper and regular maintenance of mining equipments have to be considered;
- Comprehensive green belt around overburden dumps has to be carried out to reduce to fugitive dust emissions in order to create clean and healthy environment;
- Land reclamation has to be carried out for dumps where mining activities have been completed.
- Dust generation will be reduced by using sharp teeth of shovels;
- Wet drilling will be carried out to contain the dust;
- Controlled blasting techniques will be adopted;
- Cabins for shovel and dumpers and dust masks to workmen will be provided;
- A good housekeeping and proper maintenance will be practiced which will help in controlling pollution.

3.5 Water Quality

3.5.1 Impact

The project requires water for the mines and associated activities which is estimated about 1000 cum/day after the proposed expansion. The treated mine water will be utilized for industrial purposes like sprinkling on haul roads, plantations, etc., which is reducing the use of surface / ground water for industrial use. The domestic sewage from the canteen and toilets are routed to

septic tanks followed by soak pits. The workshop effluent will be routed through oil & grease trap and treated to the discharge standards and reused in the workshop.

3.5.2 Mitigation Measures

- The sewage effluent generated from the mine site is handled through septic tank and Soak Pits.
- Garland drains around the mine overburden have to be provided to prevent seepage and drainage of surface water from overburden area.
- The acid mine water, if any, can be collected and stored inside mining area then it has to be pumped out to a storage pond for treatment.
- Neutralization of acid mine water shall be carried out using limestone before reusing the treated water for dust suppression and plantation.
- Maximum effort are made to adopt zero discharge concepts;
- Construction of settling sedimentation ponds will be made in the project premises as well as in the colony area for collection and effective utilization of surface runoff;

3.6 **Noise Levels**

3.6.1 Impact

Mining operations like drilling, blasting, operation of heavy machineries and vehicle movement are the main sources of noise pollution. Noise due to vehicular movement will be intermittent, but will also add to the background noise level. Noise modeling has been carried out to predict the impact of noise levels due to blasting and other mining operations. As a worst case instantaneous noise levels of around 135 dB(A) generated during blasting operations have been used for noise modeling. From the above modeling, it is clear that impact of noise generated from mining activities on nearby settlements will be insignificant as noise generated from mining activities will be mingled within short distance.

3.6.2 Mitigation Measures

- Secondary blasting will be totally avoided;
- Rock breakers will be used for sizing;
- Controlled blasting with proper spacing, burden and stemming will be maintained;
- The blasting will be carried out during favorable atmospheric condition;
- The prime movers/diesel engines will be of proper design and will be properly maintained;
- The operator's chamber will be safe guarded with proper enclosures to reduce noise;

- A thick green belt will be provided in phased manner around the periphery of the mine to attenuate noise;

3.7 Ground Vibrations

3.7.1 Impact

Due to blasting for removal of over burden and lignite, the ground vibrations will be generated. The proposed mining operations using deep hole drilling and blasting using delay detonators are bound to produce ground vibrations. For blasting operations, predicted ground vibrations as Vector Peak Particle Velocity have been calculated at different locations around the mine area. From the above calculations, the predicted ground vibrations at settlements around the mines are less than 1.73 mm/s, which is considered safe and is within the permissible safe limit of 2 mm/sec peak particle velocity.

3.8.4 Ground Vibration

- Proper quantity of explosive, suitable stemming materials and appropriate delay system are to be adopted to avoid overcharging and for safe blasting.
- A safe blasting zone is kept around the periphery of the quarry.
- Blasting will be performed strictly during day time as per the mine safety guidelines;
- The charge per delay will be minimized and preferably more number of delays will be used per blasts;
- Drilling parameters like overburden, depth, diameter and spacing will be properly designed to give proper blast.

3.8 Solid Waste

3.8.1 Impact

The solid waste generated will be non-hazardous in nature. Additional quantity of topsoil and overburden will be generated from the expansion of mining project which will be stacked in the existing OB dumps. During mining operations, for entire life of quarry of 16 years, around 7254 lakh m³ of overburden is likely to be generated after the modified production of the mines.

3.8.1 Mitigation measures

The OB will be disposed of by external dumping and by backfilling the decoaled voids. Partial backfilling of voids (in-pit dumping) is already commenced and shall proceed simultaneously. From the 4th year onwards, entire OB will be backfilled in the de-coaled area. Adequate cover of vegetation will be established to stabilize the site/area, which will prevent or control erosion to natural levels. External dump & internal dump will be technically & biologically reclaimed. The

high dump in backfill areas have been planned to minimize external Dumping as well to minimize degradation of fertile land. A garland drain is proposed all around the outside waste dumps of adequate size to arrest the run of water and to course it into settling pond and from there to the Nallah. The total topsoil generated will be stacked separately in a Dump designated as W1 and used for growing plants along the fringes of the site roads and reclamation of external dump and backfilled area.

3.9 Ecology

3.9.1 Impact

Open cast mining will result in the loss of natural vegetation and green cover which will have impact on ecology. Excavation of soil and lignite causes damage to its structure and composition. Loss of vegetation and dumping will affects of the certain species. Fauna which are dependent on the above vegetation will also affect.

3.9.1 Mitigation measures

The emission from the mines will be maintained well below the standards so that the surrounding environment is always clean and comfortable for wild life. It is also proposed to provide about 108000 no of trees in 52 ha of land in 1st Five years. Local species are preferred in the plantation in all along the roads, inside lease boundary, etc.

4.0 ENVIRONMENTAL MONITORING PROGRAMME

The Environmental monitoring for the mining operations will be conducted as follows:

- Air quality;
- Water and wastewater quality;
- Noise levels; and
- Greenbelt development.

To evaluate the effectiveness of environmental management programme, regular monitoring of important environmental parameters will be taken up.

5.0 ADDITIONAL STUDIES

The following additional studies/activities have been carried out for the proposed expansion of opencast mine on different aspects:

- Gujarat Mineral Development Corporation (GMDC) has carried out a detailed Mine Closure studies; and
- Risk assessment studies have been carried out including preparation of Disaster Management Plan;

6.0 PROJECT BENEFITS

The basic requirement of the community needs will be strengthened by extending health care and educational facilities developed to the community, besides providing drinking water to the villages and building/strengthening of existing roads in the area. GMDC is constructing no of check dams to increase the ground water level in this area. It is also constructing ponds, helping the schools and local students in getting educational equipments like computer, facilities for rural health centres, etc. The proposed expansion activities will provide employment to persons of different skills. The local population will have preference to get an employment. The employment potential will improve economic conditions of these families directly and provide employment to many other families indirectly who are involved in business and service oriented activities.

7.0 EMP - ADMINISTRATIVE ASPECTS

A separate Environment Department with qualified staff along with supervisors, helpers, water sprinklers and gardeners, etc is working in mining area. An Environment Engineer appointed at site is directly reporting to the head of the project for effective environmental management.

8.0 SUMMARY & CONCLUSION

The proposed expansion of opencast lignite mine project will have impacts on the local environment. With the effective implementation of the environment management measures as suggested in the EIA report, the negative impacts will be minimized. The development of this project has beneficial impact in terms growth in regional economy, transform the region's economy from predominantly agricultural to significantly industrial, increase government earnings and revenues and accelerate the pace of industrial development in the region including significant improvement in the quantity of life of people in the region.