M/s Orient Abrasive Limited

Environmental Impact Assessment and Environment Management Plan of 110.07 Ha Mine for production of 1,10,022 TPA of RoM Bauxite

Location: Survey No. 275(Part), Village Mota Balachor, Taluka Abdasa, District Kutchh, Gujarat

Terms of Reference

March 2014
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1. INTRODUCTION AND BACKGROUND

1.1 Purpose of the Document

The purpose of this document is to identify the information required by MoEF for an Environmental Impact Assessment (EIA) report. Orient Abrasive Limited (OAL) will prepare and submit an EIA report that examines the environmental Impacts of the opencast Bauxite mine.

1.2 Project Background

M/s Orient Abrasives Limited (OAL) was established in 1974 in technical collaboration with Karborundum, Bentueky, Czechoslovakia by the Rajgarhia group of industries as a venture to manufacture Calcined and Fused Alumina products. It is a multi divisional company with head office at New Delhi and manufacturing division at Porbandar (Gujarat) and Bhiwadi (Rajasthan) and has the distinction of being ISO - 9001 quality certified. The Company offers a wide range of Refractory and Monolithic products for the iron and steel industry and enjoys a large domestic and international clientele. An in-house R&D facility supports the division’s product development initiatives.

The subject bauxite mining lease was granted for periods of 20 years vide order no MCR-1571/(R-25) 5569 dated 14/9/1973. The lease deed was executed on 3.6.1974. The lessee has applied for renewal for 10 years vide their letter dated 10.03.1993 and again for second renewal up to 2.6.2014 vide their letter dated 2.6.2003.

The mining lease covers an area of 110.07 ha and is located at survey No 275 (Part) of Mota Balachor Village.

Easter part of the lease area is accessible by driving along S.H 49 along Bhuj - Nalia road and after crossing railway line and taking right turn at 54 km post near Ashapura Mataji Temple on road and driving about 500 m along kacha road.

1.3 Scope of Environmental Impact Assessment Report

The Environmental Impact Assessment report will be prepared for reporting the environmental status around the mine lease, assessing the environmental impact of the mining activities in the area and suggesting the mitigation measures.

The EIA report will:

- Assist in understanding the environmental and socio-economic consequences of the project;
- Address the project impacts, mitigation options, and discuss possible measures to prevent or mitigate impacts;
- Assist in the future monitoring of environmental protection measures as appropriate for the various types of impacts.

The scope of work includes collection of baseline data with respect to major environmental components viz. air, noise, water, land, biological and socio-economic components, impact assessment of proposed activities and preparation of environmental management plan.

The detailed scope of the study includes:
1.3.1 Environmental Monitoring

Air Environment

- Collection of surface meteorological data like wind speed, wind direction, dry bulb temperature, wet bulb temperature, relative humidity, rainfall, cloud cover in the study area during the period of survey.

- Measurement of 48 hourly average background concentration levels as per Ministry of Environment and Forest (MoEF) guidelines.

Noise Environment

- Monitoring of noise levels covering highways/residential/commercial/sensitive zones.

Water Environment

- Collection and analysis of surface and ground water samples within the study area.

Land Environment

- Determination of land-use pattern using satellite imagery.

- Sampling and analysis of soil quality at different locations within the study area.

Biological Environment

- Study of terrestrial and aquatic environment within study area

Socio-economic Environment

- Collection of baseline data including demographic details, infrastructure resource base, economic resource base, health, education, industries, aesthetic attributes (places of religious, archaeological and tourist importance)

1.4 Background of Agency Conducting Environmental Studies

Kadam Environmental Consultants, Vadodara, Gujarat have been entrusted by OAL for carrying out the above-mentioned study. Kadam Environmental Consultants (KEC) is one of the oldest and largest environmental consulting firms in Gujarat and India with about 150 personnel deployed in various activities. KEC has been active in this field of environment since 1981 and has carried out several assignments in India as well as abroad. KEC has a full-fledged division for environmental impact assessment and audits with chemical engineers, environmental planners, environmental engineers, civil engineers, microbiologists, zoologists, botanists, chemists and industrial chemists (including persons specializing in fieldwork pertaining to sampling). The company has its own air, water, biological and soil laboratories for analyzing physico-chemical and bacteriological parameters including heavy metals. The KEC laboratories are certified to ISO 9001-2000 and are inspected by the Gujarat Pollution Control Board (GPCB) as well as the Central Pollution Control Board (CPCB) Regional Office at Vadodara at regular intervals. KEC’s Vadodara Laboratory is registered by the MoEF under the Environment Protection Act, 1986.

KEC is registered as Consultant with the GPCB and also recognized as Environmental Auditors (under the Environmental Audit scheme propounded by the Hon. High Court of Gujarat) by...
the GPCB. KEC is the Indian partner of the CAT Alliance, an international alliance of 3 companies - COWI of Denmark, Enviros of the UK and Tauw of The Netherlands, and conducts several projects with these companies each year.
2. PROJECT DESCRIPTION

2.1 Details Covered

The details covered would include:

- Project profile
- Need of the project
- Location details
- Exploration Programme
- Reserves
- Mining Method
- Blasting
- Production
- Stacking of Mineral Rejects
- Water & waste water Management
- Air emissions- This would cover the details of emissions generated from the mining operations such as from excavation, vehicular movement & Dg sets
- Solid & Hazardous waste Management- This would cover quantity of waste generated and disposal of the same
- Utilities requirement
- Noise Generation – This would cover the source of noise generation such as vehicular movement, Mining Machinery & blasting.
- Site facilities
- Safety and Environment.
- Programme of Afforestation

2.2 Scope of the Proposed Activities

The primary purpose of describing the proposed activities is to establish the likely effect on the environment, human beings and local communities, the wildlife and aquatic life in the contract area and in the adjoining / neighboring areas in consequence of the mining activity. Besides identification of these impacts, evaluation of methods and measures for minimizing environmental damage and carrying out site restoration activities shall also be done.
3. ENVIRONMENTAL SETTING

3.1 Introduction

The environmental baseline survey included collection of primary and secondary data.

3.2 Methodology

The methodology for conducting the baseline environmental survey will consider the guidelines given in the EIA Manual of the MoEF and the scoping study. Baseline information with respect to air, noise, water and land quality in the study area will be collected by conducting primary sampling / field studies.

3.2.1 Primary Data Collection

- Site Specific Meteorological data
- Ambient air quality
- Noise
- Groundwater and surface water quality
- Soil quality
- Landuse pattern
- Flora and Fauna

3.2.2 Secondary Data Collection

- Meteorological data from nearest IMD station
- Flora and Fauna
- Socio-economic conditions
- Sensitive areas such as forests, sanctuaries, places of historical, archeological and tourist importance

3.3 Study Area Included in Environmental Setting

The study area considered will be the area within a radius of 10.0 kms from the project boundary.

3.4 Data Collection and Source

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Environmental Attribute</th>
<th>Source of Data Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Landuse</td>
<td>Recent satellite imagery for the study area will be collected from the Google Earth Pro and interpretation of satellite image will be done in terms of land-usage of the study area</td>
</tr>
<tr>
<td>2.</td>
<td>Important features within the study area</td>
<td>Distance of important features such as National Park/Wildlife Sanctuary, Tiger Reserve/Elephant Reserve / Turtle Nesting Ground, Core Zone of Biosphere Reserve, Habitat for migratory birds, Lakes/Reservoir/Dams, streams/rivers, estuary/sea, mangroves,</td>
</tr>
<tr>
<td>S.No.</td>
<td>Environmental Attribute</td>
<td>Source of Data Collection</td>
</tr>
<tr>
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<td>---------------------------</td>
</tr>
<tr>
<td>2.</td>
<td>Notified Archaeological sites, Defense Installation, airports, railway lines and national and state highways will be provided.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Climate of the Study Area</td>
<td>Interpretation of climate will be based on the long-term climatological tables available with IMD, and from the nearest IMD-observatory from the project site</td>
</tr>
</tbody>
</table>
| 4.    | Site Specific Meteorology | Site specific meteorological data for one season will be collected by carrying out site specific monitoring. The parameters for which data will be collected are:  
- Wind Speed  
- Wind direction  
- Temperature  
- Relative Humidity  
- Cloud Cover |
| 5.    | Ambient Air Quality | The ambient air monitoring will be carried out spread over the entire season. The criteria for selecting sampling stations will be in accordance with the Bureau of Indian Standards’ (BIS) IS: 5182 (part XIV).  
The frequency of monitoring will be 48 hrs per week at each station with samples being changed six times. (at 8-hour intervals).  
The parameters monitored will be based on the guidance given by the MoEF.  
The ambient air results will be compared with the value range indicators provided by CPCB. |
| 6.    | Noise | Hourly noise readings will be taken at all AAQM stations and compared with CPCB norms. |
| 6.    | Ground Water | Groundwater will be collected from suitable number of locations to cover the ground water in the study area. The groundwater will be analysed for pH, temperature, electrical conductivity, total suspended solids, total dissolved solids, hardness, chlorides, sulphates, sodium, potassium, nitrates, phosphates, alkalinity, ammonia, heavy metals, and total Coliform count.  
The groundwater analysis results will be compared with Indian Drinking Water Standards IS:10500. |
| 7.    | Surface Water | Surface water will collected from suitable number of locations to cover the surface water resources within the study area.  
The samples from pond will be analyzed for pH, temperature, Electrical conductivity, turbidity, color, total dissolved solids, total suspended solids, chlorides, sulphates, potassium, phosphates, nitrates, salinity, magnesium, BOD, COD, dissolved oxygen, oil and grease, alkalinity, residual chlorine, ammonia, heavy metals, coliform count, biotic environment. |
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Environmental Attribute</th>
<th>Source of Data Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>The surface water analysis results will be compared with Indian Drinking Water Standards IS:10500. The river water samples will be tested for pH, electrical conductivity, BOD, boron, free ammonia, SAR, DO and total coliform. The analysis results will be compared with minimum quality specified by CPCB for qualification of a particular river stretch to satisfy the use classification (classification of river water as per their intended use into Class A, B, C, D and E).</td>
</tr>
<tr>
<td>8.</td>
<td>Land</td>
<td>The soil samples will be collected from suitable number of locations to cover the various soil types. The soil samples will be tested for pH, texture, SAR, particle size, electrical conductivity, organic matter distribution, bulk density, water holding capacity, porosity, cat-ion exchange capacity and permeability. Data on terrain, geology and mineral resources will be collected from secondary sources.</td>
</tr>
</tbody>
</table>
| 9.   | Socio-economic profile  | This will include details on:  
- Demography  
- Education and Literacy rates  
- Occupation pattern  
- General Infrastructure, Utilities and Public Amenities (water supplies, educational and health facilities, power supply, roads and railways)  
- Places of Historic Importance  
- Places of Religious Interests |
| 10.  | Biological Environment  | Collection of data on flora and fauna from Primary & secondary sources |
4. ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Methodology of Impact Assessment

Matrix methodology will be adopted for the impact assessment of this project. This method incorporates a list of impacting activities and their likely environmental impacts, presented in a matrix format. Combining these lists as horizontal and vertical axes in the matrix allows the identification of cause-effect relationships, if any, between specific activities and impacts.

The matrix is prepared considering current as well as proposed mitigation measures.

Models will be used for predicting the impact of the activities on ambient air quality and noise quality. In cases where it is not possible to identify and validate a model for a particular situation, predictions will be arrived at based on logical reasoning / consultation / extrapolation.

4.2 Impact Prediction

<table>
<thead>
<tr>
<th>S.No</th>
<th>Environmental Attribute</th>
<th>Impact Assessment</th>
<th>Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ambient Air Quality</td>
<td>• Describe air quality in the Study Area</td>
<td>• Discuss the emission control technologies proposed for the Project for minimizing air emissions such as sulphur dioxide (SO2), oxides of nitrogen (NOX) and particulate matter</td>
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<tr>
<td></td>
<td></td>
<td>• Justification of models used, model assumptions, and any model shortcomings or constraints</td>
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<td></td>
<td></td>
<td>• Complete the air dispersion modeling</td>
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<td>• Estimates of ground-level concentrations of the appropriate air quality parameters:</td>
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<td></td>
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<td>• Compare predicted air quality concentrations with the appropriate air quality guidelines available.</td>
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<tr>
<td>2.</td>
<td>Noise</td>
<td>• Noise propagation modeling will be performed for noise generation due to operation of machinery, vehicles &amp; blasting.</td>
<td>• Discuss monitoring programs to assess the noise quality</td>
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<td></td>
<td></td>
<td>• Find out impact of noise on human settlement &amp; sensitive area</td>
<td>• Discuss the control technologies proposed for the Project for minimizing noise pollution</td>
</tr>
<tr>
<td>3.</td>
<td>Ground Water</td>
<td>• Operations require the use of water for domestic requirements as well as for dust suppression and green belt development</td>
<td>• Discuss monitoring programs to assess the ground water quality</td>
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<td></td>
<td></td>
<td>• Consumption of water during mining activity</td>
<td>• Disposal of domestic waste water will be discuss</td>
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<td>4.</td>
<td>Surface Water</td>
<td>• Identify project activities that may affect surface water</td>
<td>• Discuss drainage</td>
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<tr>
<td>S.No</td>
<td>Environmental Attribute</td>
<td>Impact Assessment</td>
<td>Mitigation Measures</td>
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<td></td>
<td>Describe the potential impacts of the Project on surface water quality within</td>
<td>pattern within the study area</td>
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<td></td>
<td>the Study Area;</td>
<td></td>
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<td></td>
<td>Discuss the significance of any impacts on water quality and implications to aquatic</td>
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<td></td>
<td>environmental pattern within the study area.</td>
<td></td>
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<tr>
<td>5.</td>
<td>Land</td>
<td>Disposal of OB &amp; mineral rejects</td>
<td>Discussion on Disposal of OB &amp; Mineral rejects</td>
</tr>
<tr>
<td>6.</td>
<td>Flora and fauna</td>
<td>Explain the significance of any anticipated environmental changes for ecosystem</td>
<td>Discussion on development of plantation</td>
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<td></td>
<td></td>
<td>integrity.</td>
<td>Discussion on blasting activity</td>
</tr>
<tr>
<td>7.</td>
<td>Socio-economic environment</td>
<td>Discuss the social impacts of the Project on the Study Area, including:</td>
<td>Discuss the businesses with regards to employment, training needs, and other</td>
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<td></td>
<td></td>
<td>local employment and training,</td>
<td>economic development opportunities arising from operation of the Project; and</td>
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<td></td>
<td>local procurement,</td>
<td>strategies to mitigate socio-economic concerns</td>
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<td></td>
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<td>population changes,</td>
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<td>demands on local infrastructure,</td>
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5. **ENVIRONMENTAL MANAGEMENT PLAN**

5.1 **Introduction**

5.1.1 **General**

The Environmental Management Plan (EMP) will describe both generic good practice measures and site specific measures, the implementation of which is aimed at mitigating potential impacts associated with the mining.

5.2 **Purpose of the Environmental Management Plan**

The EMP provides a delivery mechanism to address potential adverse impacts, to instruct contractors and to introduce standards of good practice to be adopted for all project works. For each stage of the programme, the EMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. For each impact or operation, which could otherwise give rise to impact, the following information is presented:

- A comprehensive listing of the mitigation measures (actions) that OAL shall implement;
- The parameters that shall be monitored to ensure effective implementation of the action;
- The timing for implementation of the action to ensure that the objectives of mitigation are fully met.

5.2.1 **Structure of the EMP**

The EMP will comprise direct mitigation and environmental monitoring and an outline waste management plan.

5.3 **Environment Management Cell**

Structure of Environment Management cell will be provided along with responsibility of all members.

5.4 **Mitigation and Environmental Monitoring**

5.4.1 **Environmental mitigation**

The mining activity shall be designed to avoid or minimise impacts to the environment and local communities wherever practicable. Where residual impacts remain, which may have moderate or significant effects on the environment, mitigation measures will be described in this EIA, which shall either reduce the impact to an acceptable level or adequately offset it.

5.4.2 **Environmental Monitoring**

Environmental Monitoring Program will be provided.
5.5 Projected Expenditure on Environment Matters

Expenditure to be incurred by OAL on environmental matters in terms of recurring cost & capital cost will be provided.
6. **Risk Assessment and Disaster Management Plan**


6.1 **Hazard Identification**

The hazards would be covered under two broad activities that are part of the proposed surface mining operations: winning the mineral, and transporting the mineral.

6.2 **Risk Assessment**

On the basis of the scoring format of DGMS, and after a perusal of the resultant scores, professional judgment would be exercised in selecting the following scale for assessing risk levels:

- Level 1: > 15; i.e., *requiring immediate action*
- Level 2: <15 but > 5; i.e., *requiring management action*
- Level 3: < 5; i.e., *low risks requiring periodic review*

In some cases personnel are only exposed to the hazard for part of the time. Hence, a more detailed analysis of the risk ranking can be carried out by taking *exposure* (% time personnel are present) and *probability* (chance that they will be harmed) into consideration. Thus:

- Risk Score = (Probability x Exposure) x Consequence

6.3 **Hazard Analysis**

The hazards cover explosive material management, working at heights, slope and bench stability, mineral transport, and force majeure conditions (rainfall & flooding).

6.4 **Controls and Action Plans**

To ensure that causes leading to the possible consequences are prevented from occurring, control and action plans will be developed and suggested.

6.5 **Disaster Management Plan**

- The DMP is supposed to be a dynamic, changing, document focusing on continual improvement of emergency response planning and arrangements. A structure working on a Plan, Do, Check & Review (PDCR) cycle would be suggested.
- The Environmental Health and Safety (EHS) policies are to be made accessible to all at site and to other stakeholders.
- Possible emergency situations can broadly be classified into unintended explosions, vehicle collision, and inundation.
- Responsibilities, resources and timeframes are allocated for implementing the objectives.
• Assembly points, liaison with state authorities, task force of essential staff, emergency control center, fire fighting etc.
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6.2 SCOPE OF WORK FOR RA & DMP STUDY
   6.2.1 Level 1: Hazard Identification
   6.2.2 Level 2: Risk Assessment & Ranking
   6.2.3 Level 3: Treatment Controls and Action Plan
   6.2.4 Level 4: Development of Disaster Management Plan

6.3 HAZARD IDENTIFICATION
   6.3.1 Hazards: Mineral Winning
   6.3.2 Hazards: Mineral Transport

6.4 RISK ASSESSMENT
   6.4.1 Consequences of Maximum Credible Loss Scenarios

6.5 HAZARD ANALYSIS
6.6 CONTROLS AND ACTION PLANS
6.7 DISASTER MANAGEMENT PLAN
   6.7.1 Disaster Management Plan: Structure
   6.7.2 Policy
   6.7.3 Planning
   6.7.4 Implementation
   6.7.5 DMP Audit, Non Conformance and Corrective Action and Preventive Action
   6.7.6 Review of Emergency Performance

7 CONCLUSIONS

7.1 SUMMARY OF ENVIRONMENTAL IMPACTS
   7.1.1 Topography and drainage
   7.1.2 Ambient Air
   7.1.3 Noise Levels
   7.1.4 Ground vibration due to blasting
   7.1.5 Water
   7.1.6 Flora and Fauna
   7.1.7 Land/Soil
   7.1.8 Socio-economic condition

7.2 CONCLUSIONS

8 DISCLOSURE OF CONSULTANTS

8.1 BACKGROUND OF AGENCY CONDUCTING ENVIRONMENTAL STUDIES
8.2 EIA TEAM MEMBERS