RISK ASSESSMENT

Occupational Health (Impacts and Mitigation Measures)
Project proponent has concern and takes full responsibility for the protection of the workers against sickness, disease and injury arising out of their employment and have adopted certain principles with regard to occupational health services, like establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work.

Project proponent also adopts following occupational health measures
(a) Identification and assessment of the risks from health hazards in the workplace;
(b) Surveillance of the factors in the working environment and working practices which may affect workers' health, including sanitary installations, canteens and housing; and
(c) Advice on planning and organization of work, including the design of workplaces, on the choice, maintenance and condition of machinery and other equipment and on substances used in work.

Safety
Occupational health and safety is very closely related to productivity and good employer-employee relationship. The main factors of occupational health in mines are fugitive dust and noise. Safety of employees and maintenance of mining equipment is to be taken care of as per the Mine Regulations, 1961 and Circulars of DGMS. To avoid any adverse effects on the health of workers due to dust, heat, noise and vibration, sufficient measures have been proposed in the EMP. These include:
• Provision of rest shelters for mine workers with amenities like drinking water, rest shelter, toilets etc. ;
• Provision of personnel protection devices for the workers;
• Rotation of workers exposed to high noise areas;
• First-aid facilities.
Occupational Health Survey of the employees will be carried out at regular intervals.
Identification of Work Related Health Hazards

Details of the principle environmental and occupational risks that are likely to be created are given in **Table 1**.

**Table-1: Work Related Health Hazards**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Hazardous Activities</th>
<th>Type of Hazards</th>
<th>Severity of Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Loading</td>
<td>Struck by rolling big boulders</td>
<td>Serious injury, and equipment damage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Struck by fall of objects</td>
<td>Serious Physical injury</td>
</tr>
<tr>
<td>2</td>
<td>Transportation</td>
<td>Accidental runaway of vehicle</td>
<td>Serious injury, and equipment damage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fall of vehicle from height while reversing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exposed to high level noise</td>
<td>Hearing impairment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire in engine due to over heating</td>
<td>Serious Physical injury</td>
</tr>
<tr>
<td>3</td>
<td>Welding, gas cutting</td>
<td>Emission of gases &amp; fumes</td>
<td>Asphyxiation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Release of radiation &amp; light</td>
<td>Eye injury</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire</td>
<td>Burns,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Release of heat</td>
<td>Skin problem</td>
</tr>
<tr>
<td>4</td>
<td>Storage of oil, lubricant</td>
<td>Leaks and spills</td>
<td>Fire &amp; vigorous chemical reaction</td>
</tr>
<tr>
<td>5</td>
<td>Battery maintenance handling</td>
<td>Acid spillage</td>
<td>Acid burns</td>
</tr>
<tr>
<td>6</td>
<td>Use/repair of hydraulic</td>
<td>High pressure operation</td>
<td>Physical injury</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Hazardous Activities</td>
<td>Type of Hazards</td>
<td>Severity of Injury</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------</td>
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<td>----------------------------</td>
</tr>
<tr>
<td></td>
<td>jacks &amp; pumps</td>
<td>Oil spillage</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Rupture of hydraulic</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>hoses</td>
<td></td>
</tr>
</tbody>
</table>

**Ranking of Risks to Public Health**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust</td>
<td>Material Handling</td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>Machines</td>
<td></td>
</tr>
<tr>
<td>CO₂, NOₓ, SO₂, HC</td>
<td>Machines operation at mines</td>
<td></td>
</tr>
</tbody>
</table>

**Assessment of Risks**

Risks will be assessed through impact severity and probability studies. In addition to the air & water quality monitoring, soil analysis and vibration studies will be carried out.

**Measures to Communicate Risks for Prevention and Control**

Measures will be taken to communicate risks before starting of mining to general people. This will be done through proper training and conducting safety talks for awareness of risks involved and correct practices communication by ways of display boards and safety meets. Procedures and work instructions will be displayed and communicated to all on regular basis.

**Questionnaire for Assessment and Mitigation of Risks**

The adverse impacts and proposed mitigating steps to abate the likely impacts are given in Table-2.

**Table-2: Questionnaire for Impacts and Mitigating Measures of Risks**

<table>
<thead>
<tr>
<th>How would the health impact assessment undertaken.</th>
<th>1. Regular Health check up camps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Eye Check up camps</td>
</tr>
<tr>
<td></td>
<td>3. Sr. Citizen Camps</td>
</tr>
<tr>
<td></td>
<td>4. Dental Camps</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Does project provide for hiring a person with established credentials to be able to undertake such activities?</td>
<td>Doctors working in the assigned hospital are well experienced to carry out such activity</td>
</tr>
<tr>
<td>Would a safety committee be constituted?</td>
<td>Yes</td>
</tr>
<tr>
<td>Who will be the members of the safety committee?</td>
<td>Employees from all the activities including workers and supervisory level staffs.</td>
</tr>
<tr>
<td>What will be the function of the safety committee and who will head it.</td>
<td>To discuss the safety health and environment issues and awareness, the Manager (mines) will be the chairmen of the safety committee.</td>
</tr>
<tr>
<td>Is there a provision for induction training for workers on health and safety?</td>
<td>Yes</td>
</tr>
<tr>
<td>How workplace exposures will be assessed and how these will be communicated and explained to workers.</td>
<td>Safety rounds and safety inspections, tool box talk, maintain good housekeeping, organising training, checklist, sots (safety observations tours) etc.</td>
</tr>
<tr>
<td>Who will conduct training and education in occupational health and safety?</td>
<td>OH &amp; S and external agency</td>
</tr>
<tr>
<td>Where will health surveillance be undertaken includes test, e.g. X-rays, pulmonary function tests and tests for hearing and identifying Tuberculosis.</td>
<td>For specialised checkups other agencies are involved whose names have been suggested above.</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Who will pay for the tests and the treatment of non-occupational illnesses?</td>
<td>The proponent will provide tests and treatment facilities for employees at the works hospital</td>
</tr>
<tr>
<td>Who will compensate the workers for health impairment due to injury or illnesses?</td>
<td>By the employer</td>
</tr>
<tr>
<td>The amount of compensation: list the minimum and maximum amount stipulated.</td>
<td>As per workmen compensation act calculation</td>
</tr>
<tr>
<td>How will and how long the records of health checkups be maintained and what will happen to records when the project ends.</td>
<td>The records will be maintained by both Mines and Health services dept. Document retention is for 5 years and after project completion retention will be for 3 years</td>
</tr>
<tr>
<td>What measures are to be undertaken for following:-</td>
<td></td>
</tr>
</tbody>
</table>
| Preventing Heat stress | 1. Provision of cool drinking water  
2. Ventilation  
3. Showers  
4. Rest Shelters / Sheds  
5. Insulation of Heat emitting areas (Thermal barriers) |
| Preventing Noise exposure | 1. Engineering control of noise by barriers  
2. Ear plugs and muffs  
3. Noise level survey |
| Preventing injuries. | 1. Training & Education  
2. SOP  
3. Awareness  
4. Correction of unsafe conditions  
5. SOT  
6. PPE's |
| Providing ergonomic support | 1. Design safety improvement  
2. Optimal layout of work space |
| Who will undertake administration of personal protective equipments? | OH & S Department |

**disorders 7. Visual Disorders**
What, if any, action is proposed when the project ends, workers become exposed and have a latent disease which may appear in future.

Upon thorough investigation and finding the case to be true, Employer will bear the expenses.

With the proposed mitigating steps, the impacts can be minimized and the occupational health impacts are insignificant.

- All safety measures prescribed under mining laws will be followed strictly. All workers will be medically examined in pre placement phase.
- Medical exam for fitness before employment as per standards in Form P-1 of Mines Rules 1955.
- Periodical medical examination as per Mines Rule 1955- will be done every 5 years as per standards laid down in Form P.
- The persons working in dusty environment will be examined every year as per the DGMS circular No. 01 of 21.01.2010.
- All employees will undergo medical examination as per the recommendation of 10th National conference of safety in mines.

Besides that to avoid any adverse effect on the health of workers due to various pollutants, sufficient measures relating to safety and health will also be practiced:

- Provision of rest shelters for mine workers with amenities like drinking water etc.
- All safety measures like use of safety appliances, such as dust masks, helmets, shoes, safety awareness programs, awards, posters, slogans related to safety etc.
- Training of employees for use of safety appliances and first aid in vocational training center.
- Regular maintenance and testing of all equipment as per manufacturers’ guidelines.
- Periodical Medical Examination (PME) of all workers by a medical officer.
- First Aid facility is provided at the mine site.
- Close surveillance of the factors in working environment and work practices which may affect environment and worker’s health.
Working of mine as per approved mining plan and environmental plans.

**Public health implication**

White clay mining is a health hazard involves considerable exposure and significant exposure. Long term exposure to kaolin causes the development of radiologically diagnosed pneumoconiosis in an exposure related fashion. Reduced respiratory function and related symptoms been reported. Exposure to clay is casually related to silicosis and lung cancer. Silicosis is an occupational health hazard. Hence, the mine owner must monitor the health of the employees on regular basis and take measures as suggested below, in order to protect the mine workers from any health disaster.

In evaluating the potential health risks associated with inhalation exposure to White Clay, various uncertainties must be taken into consideration. Virtually all of the human health evidence is based on healthy, adult male workers; other, possibly more sensitive populations have not been adequately investigated.

**Mitigation measures for public health issues:**

The major health issues which will be anticipated are mainly due to air borne White clay dust. So, to minimize the health impact White clay will not be allowed to air borne for which following mitigation measures will be taken during the operation period.

- Regular water sprinkling on haul roads & loading points will be carried out.
- Development of green belt/plantation around the lease boundary, along the quarry boundary, roads, reclaimed area etc.
- Ambient Air Quality Monitoring will be conducted on regularly basis to assess the quality of ambient air.

The complete mining operation will be carried out under the management control and direction of a qualified mine manager holding a First Class Manager’s Certificate of competency granted by the Directorate General of Mines Safety (DGMS), Dhanbad. The DGMS have been regularly issuing standing orders, model standing orders and circulars to be followed by the mine management in case of disaster, if any. Moreover, mining staff will be sent to refresher courses from time to time to keep them alert. However, following natural/industrial hazards may occur during normal operation.
• Accident due to mining equipment

In order to take care of above hazard/disasters, the following control measures will be adopted:

• All safety precautions and provisions of Mine Act, 1955, Metalliferrous Mines Regulation, 1961 and Mines Rules, 1955 will be strictly followed during all mining operations;
• Entry of unauthorized persons will be prohibited;
• Fire fighting and first-aid provisions in the mines office complex and mining area;
• Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use;
• Training and refresher courses for all the employees working in hazardous premises; Under Mines rules all employees of mines shall have to undergo the training at a regular interval;
• Working of mine, as per approved plans and regularly updating the mine plans;
• Cleaning of mine faces will be regularly done;
• Regular maintenance and testing of all mining equipment as per manufacturer’s guidelines;
• Suppression of dust on the haulage roads;
• Increasing the awareness of safety and disaster through competitions, posters and other similar drives.

Possible Hazards in Open Cast Mine

There are various factors, which can cause disaster in the mine. The mining activity has several disaster prone areas. The hazards are discussed below:

**Overburden**

The overburden dumps/stack may cause landslides. High overburden dumps/stack created at the quarry edge may cause sliding of the overburden dumps/stack or may cause failure of the pit slope due to excessive loading, thereby causing loss of life and property. Siltation of surface water may also cause run-off from overburden dumps/stack.

**Machinery**
Most of the accidents during transport of dumpers, trucks, proclains and other heavy vehicles are often attributable to mechanical failures and human errors.

**Fuel Storage**

Most of the HEMM will operate on diesel. However, no major storage is envisaged at the ML area. A diesel bouser is provided for the HEMM operating in the mine.

**Safety Measures**

- **Safety Measures at the proposed Open Cast Mining Project**
  - The opencast mines have been planned for working with shovel dumper system which requires proper benching not only for slope stability but also for movement of dumper and other machinery. The inclination of the quarry sides at the final stage i.e. at the dip most point will not exceed $40^0$ to the horizontal. (This angle is measured between the line joining the toe of the bottom most bench to the crest of the top most bench and the horizontal line);
  - All mining operations both within the quarry and outside will be conducted as per the conditions laid down by DGMS and under the strict supervision of competent persons appointed under Mines Regulations, 1957.

- **Measures to Prevent Accidents due to Trucks and Tippers**
  - All transportation within the main working area should be carried out under the direct supervision and control of the management;
  - The vehicles must be maintained in good repairs and checked thoroughly at least once a week by a competent person authorized for this purpose by the management;
  - Broad signs should be provided at each and every turning point specially for the guidance of the drivers at night;
  - To avoid dangers while reversing the trackless vehicles, especially at the embankment and tripping points, all areas for reversing of lorries should, as far as possible, be made man free, and there should be a light and sound device to indicate reversing of trucks; and
  - A statutory provision of the fence, constant education, training etc. will go a long way in reducing the incidence of such accidents.
DISASTER MANAGEMENT PLAN

Objectives of Disaster Management Plan

The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the Disaster Management Plan, it should be widely circulated and personnel training through rehearsals/drills.

The objective of the Disaster Management Plan is to make use of the combined resources of the mine and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Identify any dead;
- Provide for the needs of relatives;
- Provide authoritative information to the news media;
- Secure the safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.

In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

Emergency Organization

It is recommended to setup an Emergency Organization. A senior executive (Mine Manager) who has control over the affairs of the mine would be heading the Emergency Organization. He would be designated as Site Controller. As per the General Organization chart, in the mines, the Mines Manager would be designated as the Incident Controller. The Incident Controller would be reporting to the Site Controller.

Each Incident Controller, for him, organizes a team responsible for controlling the incidence with the personnel under his control. Shift In-charge would be the reporting officer, who would bring the incidence to the notice of the Incidence Controller and Site Controller.

Emergency Co-coordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and provide essential and support services.
For this purposes, Security In-charge, Personnel Department, Essential services personnel would be engaged. All these personnel would be designated as key personnel.
In each shift, electrical supervisor, electrical fitters, pump house in-charge and other maintenance staff would be drafted for emergency operations. In the event of power or communication system failure, some of staff members in the mine offices would be drafted and their services would be utilized as messengers for quick passing of communications. All these personnel would be declared as essential personnel.

**Emergency Communication**

Whoever notices an emergency situation such as fire, growth of fire etc would inform his immediate superior and Emergency Control Center. The person on duty in the Emergency Control Center would appraise the Site Controller. Site Controller verifies the situation from the Incident Controller of that area or the Shift In-charge and takes a decision about an impending On Site Emergency. This would be communicated to all the Incident Controllers, Emergency Co-ordinators. Simultaneously, the emergency warning system would be activated on the instructions of the Site Controller.

**Emergency Facilities**

**Emergency Control Center (ECC)**

For the time being, Mine Office Block is identified as Emergency Control Center. It would have external Telephone, Fax facility. All the Site Controller/ Incident Controller Officers, Senior Personnel would be located here. Also, it would be an elevated place.

The following information and equipment are to be provided at the Emergency Control Center (ECC):

- Telephone;
- Safe contained breathing apparatus;
- Fire suit/gas tight goggles/gloves/helmets;
- Hand tools, wind direction/velocities indications;
- Public address megaphone, hand bell, telephone directories;
- Emergency lamp/torch light/batteries;
- Hazard chart;
- Nominal roll of employees;
• List of key personnel, list of essential employees, list of Emergency Co-ordinators;
• Duties of key personnel;
• Address with telephone numbers and key personnel, emergency coordinator, essential employees; and
• Important address and telephone numbers including Government agencies, neighboring industries and sources of help, outside experts, population details around the Mine.

**Assembly Point**
Number of assembly depending upon the mine location would be identified wherein employees who are not directly connected with the disaster management would be assembled for safety and rescue. Emergency breathing apparatus, minimum facilities like water etc. would be organized.

In view of the size of mine, different locations should be earmarked as assembly points. Depending upon the location of hazard, the assembly points are to be used.

**Fire Fighting Facilities**
First Aid Fire fighting equipment suitable for emergency should be maintained in each operation areas of the mine as per statutory requirements.

**Emergency Medical Facilities**
Stretchers, gas masks and general first aid materials for dealing with chemical burns, fire burns etc would be maintained in the medical center as well as in the emergency control room. Private medical practitioners help would be sought. Government hospital would be approached for emergency help.

First aid facilities would be augmented. Names of Medical Personnel, Medical facilities in the area would be prepared and updated. Necessary specific medicines for emergency treatment of Burns Patients and for those affected by toxicity would be maintained.
Breathing apparatus and other emergency medical equipment would be provided and maintained. The help of near by industrial management’s in this regard would be taken on mutual support basis.

**Ambulance**
An ambulance with driver availability in all the shifts, emergency shift vehicle would be ensured and maintained to transport injured or affected persons. Number of persons would be trained in first aid so that, in every shift first aid personnel would be available.

**Emergency Actions**

*Emergency Warning*

Communication of emergency would be made familiar to the personnel inside the mine and people outside. An emergency warning system would be established.

*Evacuation of Personnel*

In the event of an emergency, unconnected personnel have to escape to assembly point. Operators have to take emergency shutdown procedure and escape. Time Office maintains a copy of deployment of employees in each shift. If necessary, persons can be evacuated by rescue teams.

*All Clear Signal*

Also, at the end of an emergency, after discussing with Incident Controllers and Emergency Co-ordinators, the Site Controller orders an all clear signal. When it becomes essential, the Site Controller communicates to the District Emergency Authority, Police and Fire Service personnel regarding help required or development of the situation into an Off-Site Emergency.

**General**

*Employee Information*

During an emergency, employees would be warned by raising siren in specific pattern. Employees would be provided with information related to fire hazards, antidotes and first aid measures. Those who would designate as key personnel and essential employees should be given training to emergency response.

*Co-ordination with Local Authorities*

Keeping in view of the nature of emergency, two levels of coordination are proposed. In the case of an On Site Emergency, resources within the organization would be mobilized and in the event extreme emergency local authorities help should be sought.

In the event of an emergency developing into an off site emergency, local authority and District emergency Authority (normally the Collector) would be appraised and under his
supervision, the Off Site Disaster Management Plan would be exercised. For this purpose, the facilities that are available locally, i.e. medical, transport, personnel, rescue accommodation, voluntary organizations etc. would be mustered. Necessary rehearsals and training in the form of mock drills should be organized.

**Mutual Aid**

Mutual aid in the form of technical personnel, runners, helpers, special protective equipment, transport vehicles, communication facility etc should be sought from the neighboring industrial management’s.

**Mock Drills**

Emergency preparedness is an important aspect of planning in Disaster Management. Personnel would be trained suitably and prepared mentally and physically in emergency response through carefully planned, simulated procedures. Similarly, the key personnel and essential personnel should be trained in the operations.