وزارة الطاقة والمعادن
Ministry of Energy and Minerals

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Occupational Health, Safety And Environment Guidelines For Mineral Exploration In Sultanate Of Oman

2023

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Ministry of Energy and Minerals

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“We are pleased to present this Guidelines to improve Health, Safety and Environmental practices in Mining Projects in the Sultanate of Oman, which provides simplified guidelines and standards for the key principles of mining safety. We aim to create a strong commitment from mining companies, operators and service providers to comply with local laws and regulations, promote safety leadership and a culture of health, safety and environment through the application of high HSE standards, the use of advanced systems and new technologies to enhance safety, improve worker welfare and provide quality training”

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INTRODUCTION

Mining includes exploration for minerals, extraction of minerals, and preparation, including crushing, grinding, concentration or washing of the extracted material. In Oman, mining operations can be grouped into five major categories in terms of their respective products: metal ore mining, nonmetallic mineral mining and quarrying and support activities for mining.

Promotion of safe working practices is the responsibility of all workers, management, and contractors in the mineral exploration industry. Employers and supervisors must provide information, instruction, supervision, and enforcement, when necessary, to protect employees' health and safety. It is also the responsibility of each and every employee to do their work in a safe manner and watch out for the safety of co-workers. It is in the best interests of all individuals to become as knowledgeable and self-reliant as possible regarding safety awareness.

This guide considers aspect of the influence that mining operations can have on local communities i.e. environment and occupational health and safety. This includes the traumatic injury risks and diseases that people may incur due to mining activity. Traumatic injury risks include trips, slips and falls and being hit by moving objects. Examples of occupation related diseases include mental disorders, noise 'induced hearing loss', infectious and parasitic diseases and respiratory disease.

Mining is a high-risk industry with operating hazards that can have serious health and safety consequences. Those primarily at risk are mine workers, but some mining hazards can also present health and safety risks to people living in the vicinity of the mining lease. A list of mine operational hazards is shown in Table-1-1 and over half of them could affect people living in the vicinity of the mine. A mine fire, for instance, could put at risk the health and safety of both workers and people living near to the mine. In contrast, an underground inrush event causing a sudden inflow of water into mine workings would generally only affect the safety of mine workers.

Table 1-1: Examples of mine-generated risk to mine worker and community

Mining Hazard	Mine Worker	Community
Mine fire	✓	✓
Fall of ground—surface or underground	✓	
Tyre explosion/fire/loss	✓	
Loss of control of vehicles	✓	✓
Loss of control of explosives	✓	✓
Underground explosion	✓	
Manual tasks, slips, trips or falls	✓	
Inrush event	✓	
Outburst event	✓	
Loss of control of tailings dams (if any)	✓	✓
Health issues		
Dust in atmosphere	✓	✓
Diesel exhaust emissions	✓	
Hazardous substances—gases, vapours, solids or liquids	✓	✓
Noise	✓	✓
Thermal environment	✓	
Ionizing & non-ionizing radiation	✓	
Vibration	✓	✓
Asbestos and synthetic mineral fiber	✓	
Waterborne contaminants	✓	✓
Fatigue	✓	✓
Misuse of drugs and alcohol	✓	✓
Physical illness, disease or condition	✓	✓
Mental ill-health	✓	✓

While the direction of the risk is largely from the mine to the community, the lives of workers outside the mine site have the capacity to influence the health and safety of workers on the mining lease. A worker presenting for work under the influence of or impaired by alcohol, for example, can potentially compromise workplace safety.

Integration of organizational policies, programs and practices, including those relevant to the control of hazards and exposures, the organization of work, compensation and benefits, built environment supports, leadership, changing workforce demographics, policy issues, and community supports, will contribute to worker safety, health and wellbeing.

Workplace policies, procedures and interventions that focus on advancing the safety, occupational health, environment and wellbeing of the workforce are helpful for individuals, and the benefits spread to their families, communities and employers and to the economy as a whole.

OHSE Legal Framework

The regulatory framework expected to govern the OHSE performance of the mining site comprises the following:

- Royal Decree 19/2019 Mineral Resources Law.
- Royal Decree 8/2011 The Oil and Gas Law.
- Omani Occupational Health, Safety & Environmental Regulations.
- International and Regional Conventions/Protocols ratified by the Sultanate of Oman.

2.1 OMANI REGULATIONS

The Environmental matters in the Sultanate of Oman are regulated through a system of Royal Decrees (RD) and Ministry Decisions (MD). The Royal Decrees of relevance are listed below in Table 2-1. and the relevant Ministry Decisions are detailed in Table 2-2.

Table 2-1: Relevant Royal Decrees for Health, Safety and Environmental Protection

Royal Decree No.	Description of Royal Decree
RD 114/2001	Law on Conservation of the Environment and Prevention of Pollution
RD 115/2001	Law on Protection of Source of Potable Water from Pollution
RD 29/2000	Law of Protection of Water Resources
RD 46/1995	Law of Handling and Use of Chemicals
RD 24/2002	Regulations for Waste Management
RD 35/2003	promulgating the Oman Labour Law

Table 2-2: Ministerial Decisions for Health, Safety and Environmental Protection

Ministerial Decree No.	Description of Ministerial Decree
18/2004	Air Pollution from Stationary Sources
45/1993	Regulation for Wastewater Re-Uses and Discharge
7/1993	Management of Solid Non-Hazardous Waste
8/1993	Management of Hazardous Waste
87/2001	Issuance of Environmental Approvals and Final Environmental Permit
48/1997	Registration of Chemical Substances and Relevant Permits
5/2009	Issuing the Regulation for Organization of Handing and Use of Chemicals
17/2001	Regulation for Packing and Labelling of Hazardous Chemicals
21/1998	Regulation for Septic Tank, Soak way Pits and Holding Tanks
9/1994	Noise Pollution Control in Public Environment
0/1994	Noise Pollution Control in Working Environment
286/2008	The Regulation Of Occupational Safety And Health For The Establishments

2.2 INTERNATIONAL REGULATIONS AND BEST PRACTICES

The Sultanate of Oman is a party to various international treaties regarding environmental protection. The mining sites in Oman shall comply with the environmental requirements of the following international and regional treaties and conventions to which the Oman is a signatory:

- Basel Convention on the Control of Trans-Boundary Movements of Hazardous Wastes and their Disposal, Basel, 1989 (Entry into force 1995).
- United Nations Framework Convention on Climate Change (UNFCCC) (1992) (Ratified 1995).
- Kyoto Protocol to the UN Framework on Climate Change (1997) (Ratified 2005).
- Convention on biological diversity, 1992 (ratified 1995).

2.3 RIGHT OF WAY REQUIREMENT

The Mining companies shall comply with the right of way requirement stated under the Oil and Gas Law and concession agreement and ban operations within critical restricted red zones unless permit is granted from the concerned authorities.

3 HEALTH AND SAFETY FOR THE MINING INDUSTRY

The health and safety of all people on the mining lease is covered by the occupational or workplace health and safety laws of Sultanate of Oman. The primary legislation governing the health of people in the broader community is environmental legislation, and other legislation can also have an impact.

Considering the Royals decrees and ministerial decisions MEM will ensure that all contractors and subcontractors' work force abide by all the applicable legislations in terms of hazards management.

3.1 DUTY OF CARE

Considering the compliance with local and international legislations, it is required from companies and workers to exercise a 'Duty of Care', which means that:

- Employers are required to provide and maintain a working environment where, as far as is reasonably practicable, employees are not exposed to hazards.
- All employees have a general duty of care to ensure their own safety and health at work. They also have a general duty of care towards others, to ensure that their actions or inaction do not put others' safety or health at risk.
- Self-employed people must ensure, so far as is reasonably practicable, that no-one will be adversely affected by any of the work done at the mine, or hazards that may arise from it.
- Employers are obliged to register their employees with insurance companies for life and health coverage.

The duty of care is shared between employer and employee. However, primary responsibility rests with the employer, as they largely have control over the workplace and working conditions. The duty owed by the employer may be higher to an employee who is inexperienced than to one who has experience, reflecting this level of control. Similarly, a high duty of care exists in hazardous environments.

The employer has a duty of care to employees and others to provide:

- Reasonably Competent Staff.
- Sufficient Workers To Carry Out Work Safely.
- Safe Working Environment.
- Proper Equipment.
- Safe Systems Of Work.

3.2 OHSE PLAN AND PROCEDURE

All mining companies are required to develop OHSE plan for the mining facility. The mine operator must ensure that OHSE procedure is prepared to demonstrate that the safe operation of the mining site in accordance with the national and international best practices. The implementation of the OHSE plan will further assess the risks to which persons at the mine are exposed. The OHSE plan shall addresses the Occupational Health, Safety and Environmental Management to implement the mining activity in safe way. The OHSE plan shall include following contents at minimum.

1 **Scope of Work**	2 **Objectives**	3 **Commitments**	4 **Occupational Risk**	5 **Organizational chart**
6 **Communication**	7 **Housekeeping**	8 **Safe System of Work**	9 **Audit and inspection**	10 **Emergency Management**
11 **Health Care Facility and Ambulance (medical services)**	12 **Accident and Incident Reporting**	13 **OHSE legislative and other regulatory**	14 **Roles and responsibility**	15 **OHSE Training and Orientation**

Based on the OHSE plan, all mining companies shall develop OHSE procedures to ensure the workplace safety and safety of their workers.

3.3 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Is an equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, physical, electrical, mechanical, or other workplace hazards. The mining companies shall provide its employees adequate supply of minimum Personal Protective Equipment (PPE) required based on the nature of the task. The type of the PPE shall be based on the risk evaluation of the mining activity.

Personal protective equipment shall include the following minimum items:

Hard Hat	Safety shoes/Boots with protective toe caps and anti-slip soles	Hand Gloves - Hand Protection for sharp/ rough materials and chemical contact	Eye and Face Protection
Coverall- Protective clothing covering arms and legs	Earmuffs ear plugs where noise levels exceed recommended levels	Respiratory protection as identified by the Risk assessment or Job Safety Analysis.	Other Special PPE as identified by the Risk assessment or Job safety analysis

Cooling vests can be provided to workers on the mining site to reduce heat exposure, depending on the results of a risk assessment.

All Personnel wearing PPE or using safety equipment shall be given appropriate information and adequate training to ensure they understand:

- The risk and reasons for the need to use PPE
- Selection of appropriate PPE for the task
- The correct method of wearing and using the PPE
- The level of protection afforded by the PPE and any limitations and conditions
- The correct care and maintenance of the PPE

3.4 OPERATIONAL SAFETY

3.4.1 ELECTRICAL SAFETY

All electrical systems have the potential to cause harm. Staff and workers on site may get injured when they become part of the electrical circuit. Below are examples of ways in which injuries can happen.

Direct contact with exposed energized conductors or circuit parts. When electrical current travels through our bodies, it can interfere with the normal electrical signals between the brain and our muscles (e.g., heart may stop beating properly, breathing may stop, or muscles may spasm).

When the electricity arcs (jumps, or “arcs”) from an exposed energized conductor or circuit part (e.g., overhead power lines) through a gas (such as air) to a person who is grounded (that would provide an alternative route to the ground for the electrical current).

Thermal burns including burns from heat generated by an electric arc, and flame burns from materials that catch on fire from heating or ignition by electrical currents or an electric arc flash. Contact burns from being shocked can burn internal tissues while leaving only very small injuries on the outside of the skin.

Thermal burns from the heat radiated from an electric arc flash. Ultraviolet (UV) and infrared (IR) light emitted from the arc flash can also cause damage to the eyes.

The severity and effects of an electrical shock depend on a number of factors, such as the pathway through the body, the amount of current, the length of time of the exposure, and whether the skin is wet or dry. Water is a great conductor of electricity, allowing current to flow more easily in wet conditions and through wet skin. The effect of the shock may range from a slight tingle to severe burns to cardiac arrest. Table 3-1 shows the general relationship between the degree of injury and amount of current for a 60- cycle hand-to-foot path of one second’s duration of shock. While reading this chart, keep in mind that most electrical circuits can provide, under normal conditions, up to 20,000 milliamperes of current flow.

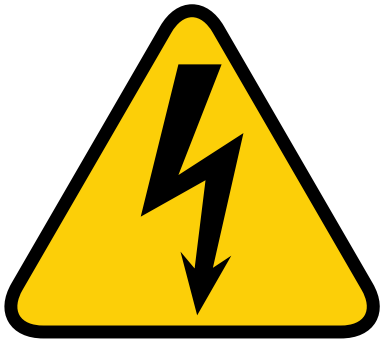
Table 3-1: Body Reactions Under Effect of Electrical Current

Current level	Reaction
1 Milliampere	Perception level
5 Milliamperes	Slight shock felt; not painful but disturbing
6-30 Milliamperes	Painful shock; “let-go” range
50-150 Milliamperes	Extreme pain, respiratory arrest, severe muscular contraction
1000-4,300 Milliamperes	Ventricular fibrillation
10,000+ Milliamperes	Cardiac arrest, severe burns and probable death

In addition to the electrical shock hazards, sparks from electrical equipment can serve as an ignition source for flammable or explosive vapors or combustible materials.

Electrical hazards can be fatal. It is important to follow the same systematic approach used for other health and safety issues when dealing with electrical safety. It is imperative to know how to work safely with or within the vicinity of electricity because electrical current in regular businesses has enough power that, if exposed to, can be fatal.

Following are the basic Safety Rules Every Employee must follow to prevent electrical hazards,



- Never use faulty equipment.
- Clearly label equipment that must not be used due to a suspected fault.
- Disconnect power supply and remove from service until repairs have been done.
- Switch off equipment and power sockets before removing the plug from the power source.
- Switch off equipment before adjusting or cleaning it.
- Any equipment that can be switched off when not in use, must be switched off.
- Repairs and alterations must only be attempted by a qualified person, following proper energy isolation procedures.
- Never use equipment outdoors that is labeled for use only in dry, indoor locations.
- Do not use non-grounded, two-prong adapter plugs to three-prong cords and tools.
- Always be aware of where the breakers and fuse boxes are located.
- Prevent all potential contact with live electrical current and unqualified personnel must not interact or come close to electrical currents greater than 50V. If you must work in the same area or room as an electrical hazard or equipment operating on more than 50V, maintain a safe distance.
- De-energize equipment and use of Lockout/Tagout system.
- Exposed, live electrical parts must be de-energized before work on or near them is permitted. Prevent accidents and isolate electrical energy by locking and tagging out the electrical system or parts of the system according to your company's Lockout/Tagout policy.
- Ensure safe use of Electrical Equipment.

Properly using all electrical equipment can go a long way to ensure everyone's safety in the workplace. Employees must take care to handle electrical cords properly:

  - Always unplug cords by pulling on the plug head, rather than the cord.
  - Don't press or overstretch electrical cords.
  - Don't fasten cords with staples.
  - Don't hang electrical equipment from cords.
  - Additionally, all cords and plugs in the workplace must be visually inspected for external defects prior to use. If you encounter a cord or plug with damage, do not use that equipment.

- Install Proper Physical Barriers Around.

Physical barriers must always be used to protect employees from any electrical hazards. Cabinet doors on electrical panels must always be closed, and panels must not have holes where an employee could come into contact with exposed wires.

If cabinets cannot be closed, or if an electrical hazard cannot be fully closed in, shields, barriers, or insulating materials must be used.
For example, if a qualified electrician is performing maintenance on an electrical panel and must keep the panel open, physical barriers must be put in place to prevent others from entering the area. Signs must be placed to warn employees of the hazard, and the area in front of the electrical panel must be kept free of any obstructions.

- **Beware of Conductive Tools and Cleaning Materials**

If an employee is working in an area where an electrical hazard is present, always assume that electrical parts are live, and act accordingly. Do not use conductive tools in the area.
If employee is cleaning the area, note that some cleaning materials are conductive as well and require additional caution. Solvent and water-based cleaning materials are electrically conductive, as are steel wool and metalized cloth. Keep these cleaning products, as well as any conductive tools, away from live electrical parts and equipment.

- **When Working overhead, look above for Electrical Lines**

When performing any work or maintenance overhead, beware of electrical lines. In most workplaces, there is the potential for live electrical equipment and parts above the floor level, which are only accessible with ladders or elevated platforms. Be sure to use a portable ladder with non-conductive side rails, and stay at least 10 feet away from any exposed electrical lines while performing overhead work.

- **Use extreme caution with Flammable Materials**

Electrical equipment that can cause ignition must not be used where flammable vapors, gases, or dust are present. The only exception to this rule is when qualified personnel take measures to lockout and isolate electrical energy sources before these potentially flammable materials may be used or the electrical equipment is designed for use under these types of conditions.

- **Only qualified person should work on live electrical wires / equipment**

If encounter a live electrical wire, stay away. Only qualified personnel with the proper training should work on live electrical wires. The same electrical safety precaution applies to hazardous electrical equipment. Any live electrical hazard must only be approached and managed by qualified personnel. If an employee sees a live electrical wire that is not attended, he must notify the appropriate electrical safety personnel, who must immediately place physical safety barriers.

- **Always follow Company's Electrical Safety Work Procedure**

Every company has unique electrical safety work Procedure depending on the electrical equipment and hazards present in individual industry and workplace. It is important all employees to always follow their company's specific electrical safety work Procedure to keep themselves, and other employees safe.

- **Electrical shock can be deadly**

In every situation, treat an electrical part (equipment/ devices) as if it is live. Electrically live parts do not look different from de-energized parts. To ensure safety, it's best to assume that any electrical part is live. Employees must take precautions to keep power on its path and protect themselves. No once can't be too careful when it comes to electricity.

The electrical system shall be visually inspected on quarterly basis by a qualified electrical engineer.
In order to prevent electrical hazard, the mining companies shall develop electrical safety procedure considering the requirements of OSHA 29 CFR 1910 Occupational Safety and Health Standards and NPFA 70E Standard for Electrical Safety in the Workplace.

Following are the minimum content (can be amended as per mining company requirements) shall be addressed in Electrical Safety Procedure:

❯	Purpose	❯	Introduction & Scope of Applicability
❯	Definitions /Acronyms	❯	Responsibilities
❯	Risk Management Hierarchy	❯	General Requirements for Electrical Safety
❯	Choice of Electrical Equipment	❯	Electrical Equipment in Hazardous Zones
❯	Working near Live Lines and Conductors	❯	Portable Electrical Equipment
❯	Hazard Communication	❯	Earthing and Bonding Requirements
❯	Maintenance, Inspection and Testing of Electrical Tools and Portable Equipment	❯	Personnel Qualifications
❯	Performance Measures	❯	Referenced and Supporting Documents

3.4.2 MECHANICAL SAFETY

Conveyor Belt Safety
A conveyor belt is the carrying medium of a belt conveyor system. The conveyor belts are used in the mining industry to transport the materials from one location to another. There are many hazards associated with working at or near a conveyor, including:

- Rotating parts or pinch points can drag in, crush or entangle
- Confinement or assembly areas (the area between a fixed object and a moving one) can shear or crush
- Parts that slide or reciprocate (press down) can crush or shear
- Items can break or be ejected (thrown from) the conveyor system
- tems can fall off the conveyor
- Electrical, fire or explosion hazards

Preventive maintenance of conveyor belt shall be carried out on monthly basis by a qualified technician.

Crasher safety
A crusher machine designed to reduce large rocks into smaller rocks, gravel, sand or rock dust. Mining industry using crushers must ensure crusher safety while carrying out its operation. The mining companies are recommended to develop crusher operation and safety procedures. The following minimum preventive measures must be taken while performing operations.
Use Log -Out / Tag-Out a piece of equipment before performing any maintenance or adjustments. Turn off the main electric panel disconnect and lock it out to prevent un-intentional energizing of the panel.

- Always double check the circuit once it has been disconnected to assure that the breaker is functioning correctly, and power is truly isolated/disconnected.
- Post warning signs in the relevant areas.
- The person operating the equipment or performing the maintenance and repair should also have the necessary training, skills and tools to perform these functions properly and safely.
- Do not perform any lubrication, maintenance, or repair to any piece of equipment while it is in operation
- Always wear your personal protective equipment (PPE) in the crusher area.
- Avoid hazards associated with rotating conveyor rollers or shafts.
- Standard guarding practices require that “in running pinch points” be guarded to help prevent getting drawn in.

Moving machinery Hazard & Safety
Moving machinery like trucks, excavators, forklifts etc. can cause injuries in many ways:

- People can be struck and injured by moving parts of machinery or ejected material. Parts of the body can also be drawn in or trapped between rollers, belts and pulley drives.
- Sharp edges can cause cuts and severing injuries, sharp-pointed parts can cause stabbing or puncture the skin, and rough surface parts can cause friction or abrasion.
- People can be crushed between parts moving together or towards a fixed part of the machine, wall or other object, and two parts moving past one another can cause shearing.
- Parts of the machine, materials and emissions (such as steam or water) can be hot or cold enough to cause burns or scalds.
- Energized parts of machinery can cause electrical shock and burns.
- Injuries can also occur due to machinery becoming unreliable and developing faults or when machines are used improperly through inexperience or lack of training or due to overconfidence.
- The mining companies operating at mining sites shall develop a Machinery Safety procedure covering all the rotating, moving and portable machinery being used at their sites. Following are the minimum content (can be amended as per mining company’s requirements) and shall be addressed in Machinery Safety Procedure.

1. Purpose
2. Introduction & Scope Applicability
3. Definitions /Acronyms
4. Responsibilities
5. Machinery Hazards
6. Control and Prevention of Machinery Hazards (Guards for Rotating Machinery, Abrasive Wheels, Hydraulic Systems, Portable Power Operated Tools, Pumps and Compressors
7. Equipment Register, Inspection, Testing and Maintenance
8. Personal Protective Equipment
9. Referenced and Supporting Documents

3.5 ACCIDENT AND INCIDENT INVESTIGATION

All accidents/incidents and near misses shall be recorded, reported to Mining Company's HSE Department immediately and investigated. Generated reports must be submitted within 24 hours.
For the purpose of accident reporting and investigation, an accident is defined as an unexpected, unplanned, and undesired event that results in:

- Physical harm (injury or disease) to individual.
- Damage to property.
- Near miss.
- Loss.
- Any combination of the above.
- Spillage of chemicals.
- In the case of a fatal or major accident, notification shall be forwarded immediately to the concerned authorities (HSE department of MoEM or Royal Oman Police) through company authorized personnel.

The incident site shall be secured in the undisturbed state as soon as is safe to do so. Names of witness and any evidence shall be secured. A preliminary investigation shall be initiated, and the Accident Report completed within 24 hours of the occurrence of incident. The investigation shall aim for,

» Establishing the events leading up to the incident.
» Identifying the Immediate Cause of the incident (Note: causes could be either unsafe conditions or could also be due to either direct cause on contributory factors).
» Identifying the underlying/ root causes of the incident.
» Identifying the required action to be taken in order to prevent a similar occurrence in the future.

All mining companies shall ensure that accident / incident reporting is in accordance with Accident and Incident Reporting Procedure.

Following are the minimum content (can be amended as per mining company's requirements) and shall be addressed in HSE Incident Reporting and Investigation Procedure.

1	Purpose	2	Introduction & Scope of Applicability
3	Definitions /Acronyms	4	Responsibilities
5	General Overview of the Procedure	6	Incident Ownership
7	Reporting and Investigation of Incident	8	Incident Investigation
9	Follow-up of Incidents	10	Training
11	Reporting of Serious Incidents to MoEM or ROP	12	incident root cause analysis

Refer to appendix-1 "'Accident/ Incident Report Forms for Serious and Non-Serious Incidents".

Upon MEM's request a Mining company is obliged to assign a third-party consultant to conduct accident investigation, at the mining company's expense.

3.6 WASTE MANAGEMENT PLAN AND PROCEDURE

The mining companies shall develop Waste Management Plan (WMP) for the respective mining sites to set out the primary applicable requirements associated with waste management in compliance with local & national legislations, international best practices.

The purpose of the WMP plan is to guide and obtain the acceptable collection, segregation, storage, handling, transportation and disposal of solid, liquid and hazardous wastes generated from the mining site in a way that minimizes the adverse impacts on human health and environment, including minimization of loss of valuable reusable/recyclable materials. Further the plan will provide a guidance to contractor and subcontractor on management of miscellaneous non-hazardous and hazardous wastes generated from the various activities. The key objectives of the waste management plan (WMP) are as follow:

- Implement the 3R principle - Reduce, Reuse, and Recycle.
- Maximize the potential to divert waste to landfill through reuse, recycling.
- Outline the procedure for collection, segregation, handling, storage, and disposal of waste and wastewater generated from the mining site.

- Ensure the waste is handled appropriately and receives the correct treatment to protect human health, Wild life and the environment.
- Ensure facility wide implementation of the WMP including the Contractor, subcontractors and visitors.
- Develop a culture of sustainable waste management in the mining site.

Based on the waste management plan, waste management procedure shall be developed by the mining companies. The waste management plan and procedure shall be implemented to achieve sustainability.

3.7 MINING SITE DESIGN SAFETY

The goal of the mining company should be to operate its mines efficiently, productively, economically, responsibly in a sustainable manner, and above all, safely. Whilst mining conditions vary enormously between different mineral deposits, and the use of different mining methods for each different deposit introduces a range of different inherent hazards and associated risks, there are some fundamental principles that need to be addressed in order to ensure that optimum performance is achieved in regard to all of the above performance parameters, without compromising mine safety.

The mining industries must ensure that mine safety which relates to the maintenance of the health and well-being of all persons who work or visit a mining operation. Further, mine safety must embrace the concept and responsibility for the entire mine operation – from the initial planning process through to the final days of mine operation, and even the stages of mine closure. Mine safety in this context is proper planning, designing, operating and closing the mine using the most appropriate and responsible methodologies, technologies and work practices so as to ensure that the risk of any accidents, or the risk of creating any unnecessary hazards – be they within the mine, or across the broader environment and community impacted by the mine – is minimized. All mining companies shall ensure that the mining design/mining plan is prepared considering the risk assessment.

3.8 RISK MANAGEMENT PLAN

Risk management encompasses the identification, analysis, and response to risk factors that form part of the life of a business. Effective risk management means attempting to control, as much as possible, future outcomes by acting proactively rather than reactively. Therefore, effective risk management offers the potential to reduce both the possibility of a risk occurring and its potential impact.
The key principle is the management of workplace health and safety risks, expressed "as low as reasonably practicable" or "to an acceptable level of risk":
How is an acceptable level of risk achieved, the following are the consideration?

1. To achieve an acceptable level of risk, this requires that management and operating systems must be put in place for each mining site.
2. This provides that the systems must incorporate risk management elements and practices appropriate for each mine to:
   a. identify, analyses, and assess risk.
   b. avoid or remove unacceptable risk.
   c. monitor levels of risk and the adverse consequences of retained residual risk.
   d. investigate and analyses the causes of serious accidents and high potential incidents with a view to preventing their recurrence.
   e. review the effectiveness of risk control measures, and take appropriate corrective and preventive action.
   f. mitigate the potential adverse effects arising from residual risk.
3. Also, the way an acceptable level of risk of injury or illness may be achieved may be prescribed under a regulation.

Similar definitions are used in different legislations. There is no absolute definition of 'acceptable' risk for mining activities. It is something that must be decided for each site and activity "Based on risk assessments conducted using a risk analysis matrix".

Following the risks related to mining marble, gabbro, chrome, copper, laterite, salt, limestone, gypsum, manganese and clay minerals. Exposure to dust is the typical hazard from all minerals while eye or skin contact or inhalation of dust particle though mouth.

The stated minerals below are only indictive examples and companies exploring other minerals shall develop a detailed risk assessment and submit it to MEM Mining Department for approval under the company expense.

Risks Related To Marble Mineral

Hazards	Associated Risk	Mitigation Measures
Marble Dust	• Dust particles can cause scratch, tearing or irritation while skin contact or eye contact. • Possibility of coughing sneezing and shortness of breath.	Dust Containment should be provided. Workers should be provided with respirators or adequate PPEs.
Marble Dust/ small pieces	Choking hazard from small pieces	Ensure the provision of adequate PPEs.
Noise	High noise causing Noise-induced hearing loss	• Workers should be provided with ear muffs an adequate PPE. • Maintenance of the noisy • equipment or replace them with the new ones.
Slip, trip, fall hazard from marble.	Fall trip of workers due to imbalance, uneven or slippery surface.	Provision of adequate PPEs to be ensured specially the shoes.

Risks Related To Limestone Mineral

Hazards	Associated Risk	Mitigation Measures
Dust Generation	• Inhaling dust may cause discomfort in the chest, shortness of breath, and coughing. • Dust particles can cause scratch, tearing or irritation while skin contact or eye contact.	• Dust Containment should be provided. Workers should be provided with respirators or adequate PPEs. • Periodic monitoring of dust level at work site specially monitoring PM10& PM2.5 • The workers should position themselves against direction of wind to avoid inhalation of dust.
Small pieces	Choking hazard from small pieces	Ensure the provision of adequate PPEs.
Noise	High noise causing Noise- induced hearing loss.	• Workers should be provided with ear muffs an adequate PPE. • Maintenance of the noisy equipment or replace them with the new ones.
Slip, trip, fall hazard at Limestone mineral site.	Fall trip of workers due to imbalance, uneven or slippery surface.	Provision of adequate PPEs to be ensured specially the shoes.
Manual Handling	Back pain and other health impacts due to improper lifting.	• Training of workers in correct way of lifting. • The lifting activity can be mechanized to avoid manual labour. • Periodic health check of workers for diseases related to dust & back pain.

Risks Related To Copper Mineral

Hazards	Associated Risk	Mitigation Measures
Dust Generation	• Irritate to skin or eyes by direct abrasive action of metal particles on skin tissue. • Inhaling dust may cause discomfort in the chest, shortness of breath, and coughing. • Prolonged exposure to copper dust or fume can cause irritation to the eye and skin.	• Dust Containment should be provided. Workers should be provided with respirators or adequate PPEs. • Periodic monitoring of dust level at work site. • The workers should position themselves against direction of wind to avoid inhalation of dust.
Small pieces	• Choking hazard from small pieces of copper. • Repeated exposure may cause a greenish discoloration of the skin, hair and teeth. • Copper pieces, if inhale may affect the liver and kidneys.	Ensure the provision of adequate PPEs.
Noise	High noise causing Noise- induced hearing loss.	• Workers should be provided with ear muffs an adequate PPE. • Maintenance of the noisy equipment or replace them with the new ones.
Slip, trip, fall hazard at copper mining site.	Fall trip of workers due to imbalance, uneven or slippery surface.	Provision of adequate PPEs to be ensured specially the shoes.

Risks Related To Manganese Mineral

Hazards	Associated Risk	Mitigation Measures
Dust Generation	• Irritate to skin or eyes by direct contact on skin tissue. • Inhaling dust may cause discomfort in the chest, shortness of breath, and coughing.	• Dust Containment should be provided. Workers should be provided with respirators or adequate PPEs. • Periodic monitoring of dust level at work site. • The workers should position themselves against direction of wind to avoid inhalation of dust.
Manganese Powder /dust	Manganese powder and dust are flammable and can cause dangerous fire hazard	Use sand or dry chemical to extinguish metals fire.
Noise	High noise causing Noise- induced hearing loss.	• Workers should be provided with ear muffs an adequate PPE. • Maintenance of the noisy equipment or replace them with the new ones.
Slip, trip, fall hazard at Manganese mines site.	Fall trip of workers due to imbalance, uneven or slippery surface.	Provision of adequate PPEs to be ensured specially the shoes.
Manual Handling	Back pain and other health impacts due to improper lifting.	• Training of workers in correct way of lifting. • The lifting activity can be mechanized to avoid manual labour. • Periodic health check of workers for diseases related to dust & back pain

Risks Related To Clay Mineral

Hazards	Associated Risk	Mitigation Measures
Dust Generation	• Inhalation of all clay materials especially silica can damage your lungs. • Dust particles can cause scratch, tearing or irritation while skin contact or eye contact.	• Wear a HEPA filter mask to Avoid excessive dust exposure. Dust Containment should be provided. Workers should be provided with respirators or adequate PPEs. • Periodic monitoring of dust level at work site specially monitoring PM10& PM2.5. • The workers should position themselves against direction of wind to avoid inhalation of dust.
Noise	High noise causing irritation and Noise-induced hearing loss.	• Workers should be provided with ear muffs an adequate PPE. • Maintenance of the noisy equipment or replace them with the new ones.
Slip, trip, fall hazard at Clay minerals site.	Fall trip of workers due to imbalance, uneven or slippery surface.	Provision of adequate PPEs to be ensured specially the shoes.
Manual Handling	Back pain and other health impacts due to improper lifting.	• Training of workers in correct way of lifting. • The lifting activity can be mechanized to avoid manual labour. • Periodic health check of workers for diseases related to dust & back pain.

Risks Related To Laterite Mineral

Hazards	Associated Risk	Mitigation Measures
Laterite mineral Dust Generation	• Exposure of Laterite dust can cause lung diseases such as silicosis. • It will also cause eye irritation, and cancer if exposure is for longer duration.	• Dust Containment should be provided. Workers should be provided with respirators or adequate PPEs. • Periodic monitoring of dust level at work site specially monitoring PM10& PM2.5. • The workers should position themselves against direction of wind to avoid inhalation of dust. • Ambient Air Quality Monitoring shall be conducted on regularly basis to assess the quality of ambient air.
Noise	• Hearing impairment. • High noise causing Noise- induced hearing loss.	• Workers should be provided with ear muffs an adequate PPE. • Maintenance of the noisy equipment or replace them with the new ones.
Slip, trip, fall hazard at Laterite mineral site.	Fall trip of workers due to imbalance, uneven or slippery surface.	Provision of adequate PPEs to be ensured specially the shoes.
Manual Handling	Back pain and other health impacts due to improper lifting.	• Training of workers in correct way of lifting. • The lifting activity can be mechanized to avoid manual labour. • Periodic health check of workers for diseases related to dust & back pain.

Risks Related To Gypsum Mineral

Hazards	Associated Risk	Mitigation Measures
Gypsum mineral Dust Generation	• Ingestion of large quantities can cause an obstruction causing pain and distress in the digestive tract. • It will also cause eye irritation, and cancer if exposure is for longer duration. • If dust is generated, repeated exposure through inhalation may cause cancer or lung disease. • Causes damage to organs.	• Dust Containment should be provided. Workers should be provided with respirators or adequate PPEs. • Periodic monitoring of dust level at work site specially monitoring PM10& PM2.5. • The workers should position themselves against direction of wind to avoid inhalation of dust. • If exposed or concerned, get medical advice and attention.
Noise	• Hearing impairment. • High noise causing Noise- induced hearing loss.	Workers should be provided with ear muffs an adequate PPE. Maintenance of the noisy equipment or replace them with the new ones.
Slip, trip, fall hazard at gypsum mineral site.	Fall trip of workers due to imbalance, uneven or slippery surface.	Provision of adequate PPEs to be ensured specially the shoes.
Manual Handling	Back pain and other health impacts due to improper lifting.	• Training of workers in correct way of lifting. • The lifting activity can be mechanized to avoid manual labour. • Periodic health check of workers for diseases related to dust & back pain.

3.9 HEALTH AND SAFETY FOR MINE WORKERS

Employers have legal responsibilities to ensure a safe and healthy workplace. As an employee you have rights and you have responsibilities for your own wellbeing and that of your colleagues.
These changes in the focus of workplace health and safety as MoEM has led to the development of the systems model of health and safety management. Both health and safety for workers in the mining and minerals industry are managed by a risk-based process as outlined by HSE Management System and its related procedures, which leads to the development of safety and health management systems.

This is characterized by the recognition of the following:

- Health and safety are affected by all aspects of the design and Operations of an organization.
- The design and management of health and safety systems must integrate environment, people and systems in proportions that reflect an organization's unique characteristics. No one system is universally effective.
- Health and safety are also management functions, not just the responsibility of individuals; that means there must be management commitment and involvement.
- Unifying elements produce a set of defined responsibilities and accountabilities for activities at all levels of the organization.
- Incidents, injuries and illnesses are an indication of a problem in the system, not simply human error.
- Human error can occur at all levels in an organization and not just by those who are injured or killed.
- Performance goals must reflect management objectives.

3.10 CHRONIC AND ACUTE HEALTH AND SAFETY RISKS

When assessing risks affecting health and safety it is important not to focus only on those relating to a specific incident (acute hazards) but also to allow for those that are generated as a result of repeated exposure to a hazard (chronic hazards). The characteristics of acute and chronic hazards are shown in Table 3-2.

Table 3-2: Characteristics of acute and chronic hazards

Acute Hazards	Chronic Hazards
Single exposure	Cumulative over time
Outcome: • Death • Injury	Outcome: • Long-term or short-term disability • Death
Opportunity for harm may exist for a short period of time	Opportunity for harm exists for long periods of time
Often close link between cause and effect	Outcome may appear long after exposure to harm

Acute hazards (often allied to the principal hazards shown in Table-1) tend to be managed via specific management plans. Chronic hazards tend to be covered under the requirement to provide a safe working environment and manage exposure to contaminants and other hazards to acceptable levels.

The management of occupational health is more complex, in that it can involve factors beyond the control of the mine operator, some of which may exist off the mine site. For example, it is very common under the workplace health and safety to require the mine to manage the fitness for work of a mine worker, including fitness for work as influenced by:

- Alcohol
- Drugs (prescribed, over the counter or illicit)
- Personal fatigue
- Physical impairment
- Psychological impairment.

In essence, the management of the potential for harm from these elements is controlled through the same process as safety, the development and implementation of an HSE management system that includes fitness for work considerations. Fitness for work - (for consistency) can be affected by the actions of the mine worker when they are not on the mine site.

For alcohol and drugs, many sites use all or some of the following assessments to decide a person's fitness for work:

- Voluntary self-testing
- Random testing before starting work
- Testing the person if someone else reasonably suspects that the person is under the influence of alcohol or drugs.
- post incident testing.

However, the system should not just be about testing for the presence of alcohol or drugs but should be an integrated process that includes education and awareness programs and an employee assistance program.

Management of fatigue needs to include:

- Management Of Workig Hours.
- Maximum Number Of Hours For A Working Shift.
- Number And Length Of Rest Breaks In A Shift.
- Maximum Number Of Hours To Be Worked In A Roster Cycle.
- Work Tasks And Work Environment Affecting Fatigue.

Non-work-related issues also need consideration (for example, family commitments or community impacts). The system must also provide for protocols for other physical and psychological impairment for people at the mining site.

In other words, health and safety in the workplace is about promoting positive wellbeing as well as preventing injury and illness.
An employer must ensure, so far as is reasonably practicable, that persons other than employees of the employer are not exposed to risks to their health or safety arising from the conduct of the undertaking of the employer.

As the regulatory authority of mining activities in Sultanate, MoEM has to make sure that all required work plans must be risk-based; that is, a work plan must:

- Identify the risks that the activities may pose to the environment, to any member of the public, or to land or property in the vicinity of the activities
- Specify what the person who proposes to undertake the activity will do to eliminate or minimize those risks as far as is reasonably practicable.

3.11 HEALTH OF WORKERS

In order to effectively manage occupational illness and disease, it is important to monitor and control exposure to hazards that may cause illness and disease and also to monitor the outcomes of exposure. These are very different processes. In the mining industry, monitoring is undertaken as:

Medical monitoring (outcome monitoring)	Legislative requirement	Company requirement	Based on risk and/or job/task	Workplace monitoring (exposure monitoring)	Hazardous work areas	Personal monitoring.

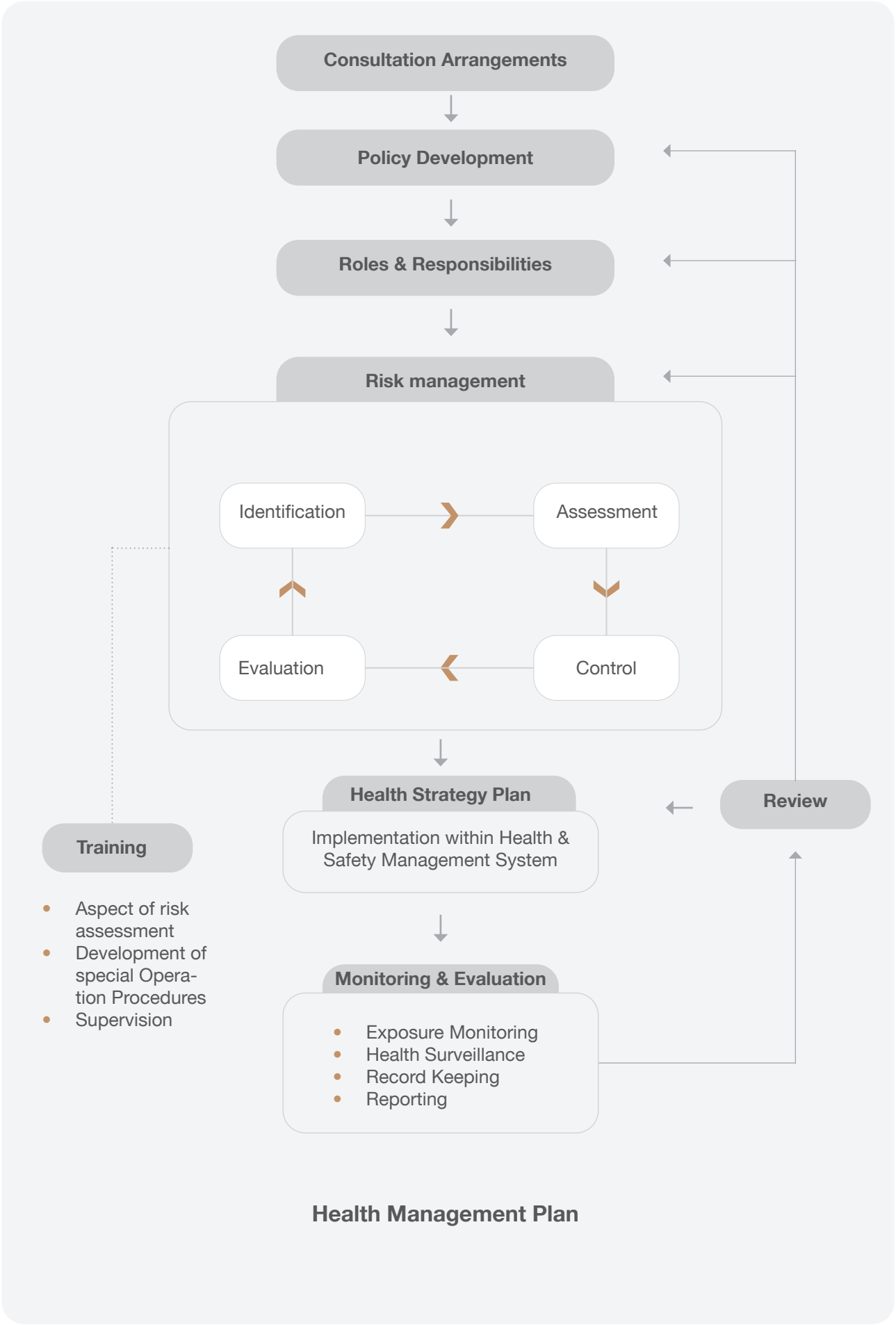
Medical monitoring through health surveillance is the ongoing systematic collection, analysis and interpretation of data for the purposes of improving health and safety. Surveillance refers to the compilation of data to track issues over a period of time for a group of workers. However, there is no comprehensive or central system of surveillance for occupational disease or illnesses, even though there are important sources of health data for workers in the minerals industry, including:

- pre-employment medicals
- ongoing health assessments
- surveillance schemes.
- Examination.

In all Sultanate of Oman governates, there are requirements for the health monitoring of workers exposed to occupational hazards. The extent of the requirements varies from mine sites and activities.

The use of workplace monitoring to determine the exposure to the potential health hazards in the minerals industry can be an effective management technique where there are well-established cause-and-effect and dose–response relationships. For many of these hazards, exposure standards exist as defined in Safe Workplace exposure standards for airborne contaminants. Exposure monitoring and the implementation of controls to manage the exposure of workers is a proactive approach to health management for these hazards.

Overall approach for Health Management Plan is as follows.



Health Management Plan

4 HEALTH SAFETY AND ENVIRONMENT IMPACTS OF MINING

The management of the health, safety and environment impacts of mining that extend to the communities beyond the mine lease are covered by a range of legislation covering environmental, social and health and safety aspects.

4.1 ENVIRONMENT

Mining can have significant environmental impacts, which can lead to long-term damage to the environment and surrounding communities. Therefore, it is important to implement measures to minimize these impacts and ensure that mining is carried out in a sustainable and responsible way.

Each mining company shall demonstrate that their project's environmental impacts can be managed in a manner that complies with statutory obligations and meets communityexpectations. As in all risk management processes, risks and their causes and potential consequences must be identified, and measures proposed to avoid or minimize any associated adverse impacts.

The environmental approval process (for environmentally significant projects) requires the project proponent to:

- develop an environmental impact statement (EIS) on the effect of their mining operations on the immediate mine area as well as adjacent areas
- develop an environmental management plan (EMP) that outlines how they will monitor and audit their operations throughout the life of the project, including how they will rehabilitate the environment after mining (EMPs are subject to regular reporting to and inspection by regulatory agencies).

The specific environmental issues that are nominated in standard EIS guidelines as potentially important in the assessment of impacts in relation to mining industry, for example, are:

- transportation issues (including road safety issues)
- soils and geological issues
- water issues
- air quality issues
- noise, vibration and blasting issues
- flora and fauna issues
- other heritage issues
- visual impacts
- Aboriginal heritage issues (this includes impacts caused by subsidence, vibration and changes to hydrological patterns)
- coastal issues
- hazards issues
- social and health issues
- economic issues
- cumulative issues.

The social impact assessment further outlines the risks that must be considered in relation to the health of the community and those that could result from any potential changes in air quality, noise and vibration, safety on the roads, and the flooding regime.

4.2 SAFETY

As identified in previous sections, many of the safety issues that are present on a mining site do not affect the community directly. However, it is recognized that the consequences for the families or communities of injured or ill workers may be significant.
The following are the most significant issues for community safety related to mining operations:

4.2 .1 ROAD SAFETY

The minerals industry presents road safety challenges to rural communities in which it operates.

Mining companies' road safety interventions shall be extend beyond their fleets of company vehicles and their workers' commutes and include consideration of the driving, walking and riding practices of community members in the locality.

To address road and traffic safety issues on roads at mining sites, the four elements that constitute road transport systems: speed, road environment, vehicles and users. Each element needs to be understood and managed in a coordinated approach. Such a systematic approach is known as Safe System for addressing traffic hazards and reducing road trauma on public and industrial area like mine sites roads.

Following are the requirements to be considered for road safety inside the mining area,

- Mining companies are to develop the easy access towards mining site from public roads or community areas. Preferably paved road needs to be made to reach towards mining sites.
- If unpaved roads are to be used, maintenance of the road to be done by spraying water and placing gravels to avoid dust generation during vehicle movement.
- Speed limit signs are to be displaced at roads in mining areas.
- To avoid the dust generation, vehicles speed must be strictly followed to move with slow speed on roads in mining areas.
- Road map is to displaced t site area and humps locations are to be displaced at road for road user safety.
- Mining companies are to arrange defensive driving training to their drivers.
- Know the condition of the roads and drive only as fast as those conditions allow.
- Drivers & Passengers must always wear seat belt.
- Stay alert and drive defensively, with caution.
- Watch out for and anticipate other drivers, pedestrians near the road in mining areas.
- Stay out of the other vehicle's blind spot.
- Keep a safe distance from other drivers by maintaining a safety cushion around machine or vehicle.

4.2.2 VEHICLE SAFETY

The mining companies must ensure the maintenance of vehicles are carried out as per the maintenance schedule. In addition, it shall ensure the following:

- Driver Fitness [Health, Impaired driving, Fatigue, Vision etc].
- Driver Training.
- Safe Driving techniques.
- Fleet Management in the Mining Industry.
- Overloading of vehicles.
- Vehicle loading covers are applied.
- Speed limit within the mining areas to be strictly followed.
- Vehicles should be equipped with reverse sound alarm.
- The servicing record of vehicles should be maintained.
- In Vehicle Monitoring System to monitor drivers behavior, speed control and vehicles location.

4.2.3 MINE SITE ACCESS

Controlling access to mine sites, whether active or abandoned, is essential where the safety of the affected parties must be considered. This is potentially a serious problem where informal small-scale mining is undertaken or where trespassing could result in accidents, leading to injuries and even fatalities.

Several potential hazards are associated with uncontrolled access, including the following:

- **Surface shafts and other vertical openings:** Falling is a particular risk in abandoned workings. Vertical or inclined shafts can be hidden by undergrowth, darkness, water or loose debris. Mining sites are recommended to make necessary arrangements to reduce the risk of Incomplete sentence.
- **Interaction with heavy mobile equipment or plant:** On operating sites, the potential for interaction with heavy mobile equipment on haul roads or entanglement in conveyors is a safety issue. Mining workers at site should remain vigilant to avoid the interaction with heavy mobile equipment, vehicle or rotating machinery. Mining companies are recommended to arrange the appropriate measure for workplace safety of the workers.
- **Landslip:** During the mine life cycle, there is the potential for geotechnical failure resulting in landslip. During construction, the key risks are associated with cuttings and large excavations. In the operations phase, there is potential for the localized failure of pit walls, waste emplacements and haul road earthworks. Following closure of the mine, there continues to be a risk of failure of the final pit walls and mineral waste emplacements, resulting in risks to anyone who may be in the area after the closure. Safety for the confined space entry to be ensured.
- **Water:** Water in mines can be deep. If it fills an area with steep sides, it might not be easy for a person to climb out. It is applicable to the underground mining sites. Especial care should be taken in rainy season. Mining companies are recommended to confirm the groundwater level to maintain the necessary safety measures.
- **Bad air:** Abandoned mine workings may be hazardous due to pockets of low oxygen levels or high concentrations of dangerous gases, such as carbon monoxide. Coal mines are especially prone to containing such gases. Although the coal mines are not discovered in Sultanate of Oman but considering the potential hazards / risks of underground mining, all the mining companies are advised to monitor the air quality on daily basis especially the oxygen level at start of the daily activities.
- **Hazardous materials:** Mines can contain various types of heavy metals. Bacterial action can create acids and other compounds that are hazardous to humans. Acid mine drainage is of great concern in some areas. Mining companies are advised to prepare the Hazardous Material handling procedure covering the handling, storage and transportation of hazardous material. Details are provided in section **4.3.5 CONTAMINATION BY HAZARDOUS MATERIALS**

4.2.4 TAILINGS DAMS

Any tailings dam must ensure physical, radioactive, and chemical safety for both the environment and the community during mine operation and after closure, taking into consideration long-term stability, extreme events and slow deterioration.

Following failure modes and opportunities are to be considered to reduce risk during design, operation and monitoring phases. Tables 4.1 and 4.2 summarize the relationship between the possible failure modes and

opportunities to reduce the risk of failure. Note that earthquakes and seismically induced failure is difficult to mitigate over any meaningful timescale and therefore earthquake-exposed sites must rely heavily on the design parameters and emergency response planning. All known failure modes must be monitored and reasonably predicted given adequate information and an understanding of the expected behavior of the system. Table 4.1 enumerates several parameters of interest, changes in which are characteristic of behavioral changes in the dam system. The identification of undesirable behaviors is key to assessing the risk of failure.

Table 4-1: Failure modes and opportunities are to be considered to reduce risk

Failure Mode	Design	Operation	Monitoring
Slope instability	✓	✓	✓
Earthquake	✓		
Overtopping		✓	✓
Seepage	✓		✓
Foundation	✓		✓
Structural	✓	✓	✓
Mine Subsidence	✓	✓	✓
Unknown	✓		

Table 4-2: Failure modes and corresponding monitoring parameters

Failure Mode	Parameter and behaviour
Slope instability	Displacement, rotation, settlement, pore pressure change, tension cracks
Earthquake	Ground acceleration, pore pressure change, settlement
Overtopping	Freeboard change, pore pressure change, seepage flux
Seepage	Seepage quantity and quality, settlement/ sloughing
Foundation	Displacement, rotation, tension cracks
Structural	Displacement, tension cracks, seepage (core failure)
Mine Subsidence	Ground acceleration, settlement
Erosion	Effluent quantity and quality change, surface elevation changes

4.2.5 BLASTING SAFETY

Blasting at mine sites, particularly when close to site boundaries, can have impacts on the surrounding community, infrastructure and environment due to vibration through the air (overpressure) and earth (ground vibration), and the generation of dust, fumes, noise, odors and flyrock. Flyrock is the undesirable throw of debris from a blast and can cause severe injury and property damage.

Blast impacts can directly or indirectly affect the health and safety of surrounding communities. Fumes and dust can directly affect health and flyrock can directly compromise safety. In contrast, other impacts, such as vibration, may be more likely to exacerbate stress reactions in nearby residents, which may be an indirect pathway to ill-health. Vibration may cause residents to feel anxiety about potential damage to their homes, property, commercial interests and ecological sites of significance.

Blast mitigation and management measures shall manage any potential risk to the public, communities, mining personnel, livestock and fauna on surrounding lands, to transport networks and infrastructure and their users and to heritage sites through controls such as:

- complying with shot firing safe work designs, equipment and procedures
- monitoring air blast overpressure and ground vibration for each blast (to demonstrate compliance)
- setting up blast exclusion zones
- limiting blasting activity (for example, only during weekdays between 9 am and 3 pm, not on public holidays, with a maximum number of blasts averaged over a 12-month period)
- considering meteorological conditions to avoid adverse weather (for example, noise-enhancing conditions or winds that would blow dust or fumes towards neighboring residential areas)
- notifying landholders of the blasting schedule, with up-to-date, widely accessible information
- carrying out property inspections and investigations
- maintaining road closure management plans to ensure the safety and protection of road users and to minimize potential impacts on road users, local residents and businesses
- having an appropriate system to respond to local residents' complaints and issues
- coordinating blast schedules with neighboring mining site to minimize the cumulative impacts of blasting.

4.2.6 HAZARDOUS MATERIALS SAFETY

Mining and processing operations transport, store and use a range of hazardous materials, including fuels, process reagents, lubricants, solvents and explosives. These can present safety risks to the community if not appropriately controlled. When manufacturing, importing, transporting, storage or handling hazardous or radioactive or explosive materials, safety conditions as provided in the valid regulations in the Sultanate have to be adopted after availing the license from relevant authorities in ROP and other concerned authorities.

Exposure to chemicals commonly used in the mining site can have short- and long-term health effects such as poisoning, skin rashes and disorders of the lung, kidney and liver. Common hazardous materials used in the mining activity (equipment fueling and workshop) include diesel fuel, lubricants, paints, solvents etc.).

The following precautionary measures must be undertaken while handling hazardous materials.

- Transportation of hazardous materials and radioactive material should comply with local / national regulations.
- It must be ensured that suppliers provide warning labels and Safety Data Sheets with chemicals.
- All storage tanks, drum stores, loading pads and areas, and work locations where dangerous goods are used and transferred must be bunded.
- The gross capacity of the bunded area should be 110% of the capacity of the biggest tank or 25% of the total capacity of all tanks within the bund whichever is greater. Wall type bunds at tank storage facility should be from 0.5 m to 1.5 m high. The distance between tank and bund walls must be at least 1 m. If the bund walls are more than 1 m above floor, provide steps or ladder for quick escape.
- For drum storage, the gross capacity of a bunded area should be sufficient to hold at least the volume of 25% of the drums to be stored up to 10 Kl plus 10% of any volume in excess thereof.
- Stormwater collected in bunded areas may be contaminated. The stormwater collected in bunded area should be disposed as hazardous waste through approved contractor.
- Vehicles/persons should not be allowed to spread contaminants out of a bunded area. This can be controlled by having high standard of housekeeping.
- Adequate fire precautions shall be taken against the potential risk of fire. The dangerous goods should be properly placarded with safety signage
- Training both theory and practical, including simulated exercises should be given to all staff who is handling hazardous materials.
- Clearly label containers, equipment, and areas for the handling of radioisotopes with radioactive labeling tape. Dedicate equipment such as pipettes and glassware to radioactivity work to help avoid cross contamination.
- Minimize the time spent near radioactive materials.
- Keep as much distance between yourself and the radiation source(s) as possible.
- Wear personal protective equipment. The minimum requirements include a laboratory safety coat, gloves, safety glasses and close-toed shoes. Wear whole-body dosimeters when handling radioactive material. Wear either a single or double pair of gloves, depending on the radionuclide you are working with.

Failure to understand the hazards of the chemicals can lead to their casual use and often leads to employee injuries (occupational health hazards), costly clean-up, or property losses. Hence, mining companies' employees required to follow below steps while using the chemicals:

- Identify the required chemicals for the mining activities.
- Prepare chemical inventory including the following information; name, Chemical Abstracts Service (CAS) number, stored & maximum allowable storage quantities at any time (kg and L), storage location, expiry date, manufacturer, container size and type, and name of responsible person for the storage area.
- Request MSDS forms from the companies that supply the chemicals. Keep a log of all MSDS forms on hand. These records are necessary for training of employees and for quick reference in the event of an emergency.
- Label all containers
- Identify the safe uses of the chemicals in workplace
- Follow safe handling instructions and identify personal protective equipment to be used while handling chemicals
- Beware of instructions regarding the mixing of chemicals (if required).
- Always wash your hands thoroughly after handling chemicals. If a chemical spill on you, wash it off at once. Use chemical shower to get cleaned up quickly.
- Do not eat, drink, or smoke while handling chemicals to prevent accidental swallow of chemicals or accidental ignition of flammable chemicals.
- Chemicals must be stored in a designated place with compatible chemicals
- Do not store chemicals with edible items

Safety Data Sheet (SDS) forms identify the classification of the chemicals. Below shows a detailed description of the different classes of chemical products and the meaning of the pictograms (under Classification, Labelling, and Packaging Regulation and Globally Harmonized System (GHS) on the classification and labelling of chemicals):

Part 1: Physical Hazards		Symbol: **Exploding bomb** GHS01	Unstable explosives Explosives, divisions 1.1, 1.2, 1.3, 1.4 Self-reactive substances and mixtures, types A, B Organic peroxides, types A, B
		Symbol: **Flame** GHS02	Flammable gases, category 1 Flammable aerosols and solids, categories 1, 2 Flammable liquids, categories 1, 2, 3 Self-reactive substances and mixtures, types B, C, D, E, F Pyrophoric liquids and solids, category 1 Self-heating substances and mixtures, categories 1, 2 Substances and mixtures, which in contact with water, emit flammable gases, categories 1, 2, 3 Organic peroxides, types B, C, D, E, F
		Symbol: **Flame over circle** GHS03	Oxidizing gases, category 1 Oxidizing liquids, categories 1, 2, 3 Oxidizing solids, categories 1, 2, 3
		Symbol: **Gas cylinder** GHS04	Compressed gases Liquefied gases Refrigerated liquefied gases Dissolved gases
		Symbol: **Corrosion** GHS05	Corrosive to metals, category 1
Part 2: Health Hazards		Symbol: **Skull and crossbones** GHS06	Acute toxicity (oral, dermal, inhalation), categories 1, 2, 3
		Symbol: **Corrosion** GHS07	Skin corrosion, categories 1A, 1B, 1C Serious eye damage, category 1
		Symbol: **Exclamation mark** GHS08	Acute toxicity (oral, dermal, inhalation), category 4 Skin irritation, categories 2, 3 Eye irritation, category 2A Skin sensitization, category 1 Specific target organ toxicity following single exposure, category 3 Respiratory tract irritation Narcotic effects
		Symbol: **Health hazard** GHS09	Respiratory sensitization, category 1 Germ cell mutagenicity, Reproductive toxicity and Carcinogenicity, categories 1A, 1B, 2 Specific target organ toxicity following single exposure, categories 1, 2 Specific target organ toxicity following repeated exposure, categories 1, 2 Aspiration hazard, categories 1, 2
Part 3: Environmental Hazards		Symbol: **Environment** GHS10	Acute hazards to the aquatic environment, categories 2, 3 Chronic hazards to the aquatic environment, categories 3, 4

Control of substance hazardous to health (COSHH) assessment is to be performed by mining companies HSE engineer/ HSE officer. Refer to COSHH assessment form in Appendix-2.

4.2.7 FIRE SAFETY

The objective of fire and explosion control measures is to avoid any of the fire or explosion risks by eliminating either the potential ignition sources or potential fuel sources, or both. However, it is likely that some potential fuels and some ignition sources will remain, so these shall be reduced by:

- Minimising the inventory of potential fuels (also known as minimising the fire load);
- Minimising the number of potential ignition sources.
- Keeping potential ignition sources apart from potential fuel.
- Using only fire-resistant conveyor belting.
- Ensuring that rubbish and other flammable waste material is removed promptly; for example, paper, wood, plastic and old vehicle tyres.
- Removing potentially flammable spillage from the mine.
- Avoiding hot surfaces and frictional sparking through good design, installation, commissioning and by regular inspection, testing and maintenance, including the periodic and effective monitoring of bearings, brake units etc.
- Ensuring proper lubrication.
- Removing ignition sources from equipment that is out of use; for example, vehicle batteries.

All mining companies must formulate an effective Emergency Preparedness and Response Plan and mount an effective initial response. The aim of an emergency plan is to ensure the safety of those on site, to reduce the impact of the incident on the facility and the environment and to ensure that the local authorities are called where necessary.

Fire risk assessments is a requirement of the Fire Safety Plan and is a structured approach to determining the risk of fire occurring in premises or from a work activity, and identifying the precautions necessary to eliminate, reduce or manage the risk. Where appropriate, to prepare and keep under review risk assessments in relation to the use, storage, handling, disposal and transportation of hazardous or flammable material and ensure that, so far as is reasonable practicable, the risks associated with dangerous substances are reduced or controlled.

Mining companies are to ensure that fire alarm and detection systems, smoke detection, emergency lighting and fire extinguishers are appropriately located and properly maintained. Firefighting equipment is meant to provide firefighting measures to the mining sites. Especially the portable fire extinguishers are to be placed at appropriate locations.

4.2.8 SPILL HAZARD

Spills have the potential to cause severe environmental damage as well as considerable economic consequences for a company. Planning for an oil spill emergency helps minimized potential danger to human health and the environment by ensuring a timely and coordinated response. Well-designed contingency plans can assist response personnel in their efforts to contain and clean up oil spill by providing information that the response team will need before, during and after spills, occur. The following points must be noted.

- Workers must ensure that any spills are treated with great care, and dealt with promptly, to minimize the possibility of any of them becoming a major issue.
- Mining companies must maintain oil spill equipment capable of addressing spills from their quarry sites.
- The response plan must list any critical environmental resources within the likely impact areas and the means to protect them.
- The response plan must list the inventory of all equipment to be maintained at the site and who is responsible for its maintenance.
- Enough number of trained personnel to mount effective oil spill response operation.

Mining companies are recommended to develop Chemical spill emergency plan considering the aspects of chemical spill hazards and their mitigation plan. An effective spill response procedure should consider all

of the items listed below. The complexity and detail of the plan will, of course depend upon the physical characteristics and volume of hazardous materials being handled, their potential toxicity, and the potential for releases to the environment.

- Review Safety Data Sheets (SDSs) or other references for recommended spill cleanup methods and materials, and the need for personal protective equipment (e.g. respirator, gloves, protective clothing, etc.)
- Acquire sufficient quantities and types of appropriate spill control materials to contain any spills that can be reasonably anticipated. The need for equipment to disperse, collect and contain spill control materials (e.g. brushes, scoops, sealable containers, etc.) should also be reviewed.
- Acquire recommended personal protective equipment and training in its proper use. For example, if an air purifying respirator or self-contained breathing apparatus are needed, personnel must attend training of the use of respirator and fit-testing.
- Place spill control materials and protective equipment in a readily accessible location within or immediately adjacent to the chemical storage.
- Develop a spill response plan that includes:
  - Names and telephone numbers of individuals to be contacted in the event of a spill.
  - Evacuation plans for the room, building or working area, as appropriate.
  - Instructions for containing the spilled material, including potential releases to the environment (e.g., protect floor drains).
  - Inventory of spill control materials and personal protective equipment.
  - Means for proper disposal of cleanup materials (in most cases, as hazardous waste) including contaminated tools and clothing.
  - Decontamination of the area following the cleanup.
- Discuss the spill response plans with all employees in the mining site area. HSE offer should arrange training for employees who work directly with chemicals and who are expected to respond outside their work area to assist with spill cleanup.

4.3 OCCUPATIONAL HEALTH

The mining industry is a high health risk occupation. Mining companies of larger and more complex surface mines should consider doing so as part of their duties to ensure the health and safety of workers. Following are the health hazards factors to be considered to ensure the workplace safety for workers at mining sites area.

4.3.1 AIRBORNE CONTAMINANTS

Airborne particulates and gaseous emissions have the potential to cause personal health problems in the community, and dust and odor can cause annoyance and complaints.

Dust derived from the mechanical breakdown of rock and soil is the most widespread and abundant emission from mines and occurs across a range of particle sizes. Of direct relevance to health are the finer fractions, particles less than 10 microns in diameter (PM10) and especially those less than 2.5 microns in diameter (PM2.5). Finer particles are more readily transported into the lungs, where they can cause irritation and disease. In general, smaller particles are carried further by the wind than larger particles and so can affect nearby communities.

Amenity impacts from dust are usually associated with coarse particles and particles larger than PM10. The impact of dust from a nearby mine on local amenity depends on the distance from the mine site and climatic conditions, such as wind speed and direction. Concerns about amenity from mine-site dust often relate to the 'visibility' of dust plumes and dust sources. Visible dust is usually due to short-term episodes of high emissions, such as from blasting. Other amenity impacts include dust depositing on fabrics (such as washing) or on house roofs, and the transport of dust from roofs to water tanks during rain.

Gaseous emissions from mining include pollutants such as sulphur dioxide and nitrogen dioxide, which have well defined human health effects. Blasting at mine sites in the world generally uses a mixture of ammonium nitrate and fuel oil, or ANFO. The blasting of ANFO explosives can cause orange blast clouds of nitrogen dioxide that can travel across the mine's boundaries into the surrounding area. They usually disperse rapidly and pose no acute health risk, but under certain conditions the gas plume may persist and can affect nearby people or residents who are downwind of the blast site. Symptoms from high-level exposure can include:

eye, nose and throat irritation and coughing

dizziness and headache

shortness of breath

wheezing or the exacerbation of asthma.

Serious lung inflammation (pulmonary oedema) are normally known to develop several hours after exposure to very high levels of nitrogen dioxide.

Control of dust generated at mine sites from different mining activities. Following are the general methods to be adopted to suppress the dust.

Control of drill dust. Drill dust is suppressed by water injected through the drill steel, a common practice for many years. Usually, respirable dust is reduced by 95% or better. However, this does not prevent dust from entering the air during the initial collaring period as the drill hole is started. Various means have to been tried to prevent the escape of dust during collaring. These range from simple handheld sprays to elaborate types of suction traps around the end of the drill steel. Although none of these are very efficient.

Control of blasting dust. Control of blasting dust is generally applied on hard-rock mines. Water is used to spray the blast area beforehand. Ventilation is used to exhaust fumes and dust via an untraveled return and between shifts. In most cases, the faces are shot during an off shift, so no workers are in the mine at the time of the blasts. It is generally noted that in stone mines the retention time of the dust is usually less than 2 hours. If ambient levels of silica dust are high after this period or if workers are exposed to an excessive amount of dust from blasting when they reenter the mine area, it usually indicates that the ventilation needs to be improved.

Control of dust from crushers. Dust from crushers is controlled by water sprays and local exhaust ventilation from the crusher enclosure. The amount of water needed to do the job is hard to specify. It depends on the type of material crushed and the degree to which water will cause downstream handling problems. If the rock is dry, a starting point is to add a water quantity equivalent to 1% of the weight of the material being crushed. The nozzle pressure of sprays at the grizzly and crusher jaw should be below 60 psi to avoid stirring the dust cloud and reducing the capture efficiency of the ventilation system. The amount of air required for dust control depends on how much the crusher can be enclosed. Enough air should be exhausted from a plenum under the crusher to produce a strong indraft at the jaw, grizzly, and any other openings around the crusher.

In stone mines, dust that escapes the crusher is hard to contain because of the large cross-sectional area of the entries. The crusher is normally located in a crosscut that has been benched to facilitate dumping from trucks. The crusher operator is located in an enclosed booth that is pressurized with filtered air. The crosscut is divided by a stopping (or leak-tight curtain) that essentially puts the crusher and dump point in a stub heading. Air is exhausted from a plenum under the crusher to create an indraft at the crusher jaws. It is then directed through the stopping. Dust in this air can be removed with a baghouse or directed into the return.

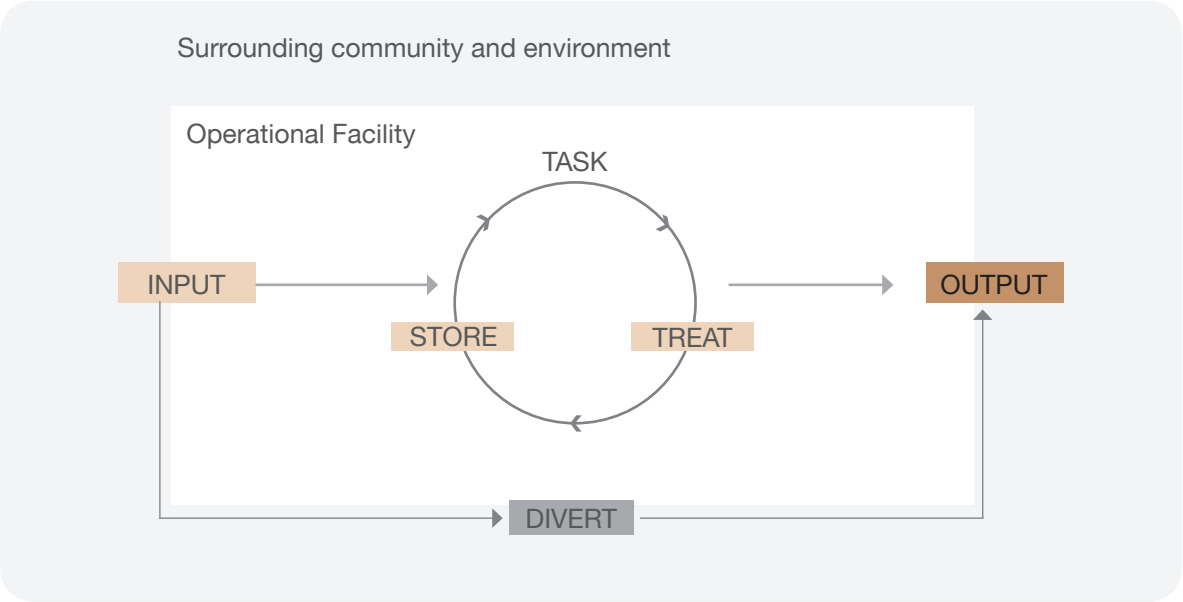
4.3.2 WATERBORNE CONTAMINANTS

Water is vital to mining operations. It is illustrated that the water flows between the environment and mining facilities (see Figure 3-1). Inputs include water received by a mine and surface and ground water. The output is water that is removed from the facility after it has been through a task, treated or stored for use. Water is classified as a diversion when it flows from an input to an output without being used by the facility. The flow is not stored with the intention using it in a task or treating it.

Mining tasks that require water include:

1 dust suppression	2 underground mining	3 ore processing
4 truckload water spray on the road inside the mine to suppress dust	5 haul road dust suppression	6 coal handling and processing plant
7 tailings storage facility	8 amenities use	9 co-disposal

Figure 4-1: Input–output model of mining/environment water flows



The use of water in mining has the potential to affect the quality of surrounding surface water and groundwater. Water contaminated with high concentrations of metals, sulphide minerals, dissolved solids or salts can negatively affect surface water quality and groundwater quality. Impacts on human health can occur where the quality of water supplies used for irrigation, drinking or industrial applications is affected.

In water basins where multiple industries co-exist, it is important that cumulative impacts on water be managed. It is critical for mining proponents to work with government, other industries and communities to ensure sustainable water use and the protection of water supplies used by nearby communities and for ecosystem protection.

There are four main types of mining impacts on water quality:

- **Acid mine drainage:** Acid mine drainage severely degrades water quality and can make water virtually unusable. The highly acidic water, commonly known as acid mine drainage, is produced by the exposure of sulfide minerals (most commonly pyrite) to air and water, resulting in the oxidation of sulfur and the production of acidity and elevated concentrations of iron, sulfate, and other metals.
- **Heavy metal contamination and leaching:** Heavy metals (such as arsenic, cadmium, lead and zinc) are leached out and carried in the water. This is accelerated in low pH conditions, such as are generated by acid mine drainage. It can also occur due to discharges of contaminated water when tailings dams overtop, or seepage through dam or pit walls.
- **Processing chemicals pollution:** Chemicals used to separate the mineral can spill, leak or leach into water bodies. These chemicals can be toxic to humans (for example, cyanide) and also present an environmental risk.
- **Erosion and sedimentation:** Excessive sediment can clog rivers and waterways.

The release of water from a mine site is governed by licensing arrangements in many countries. The exposure of humans to noncompliant released waters may result in increased health risks, in addition to legal action and damage to reputation. During extreme weather, unplanned releases can cause significant environmental damage and pose major health risks.

4.3.3 NOISE

Noise is one of the most significant issues for communities located near mining projects, particularly due to 24-hour, 7-day operations. Mining activities such as blasting, drilling, digging and loading and the operations of excavators, trucks, conveyor belts and other machinery all contribute to elevated levels of environmental noise. This can be particularly disruptive for local rural communities accustomed to quiet surroundings. In some regions, there may be multiple mine sites that affect the same community, causing cumulative impacts. Noise can also occur throughout all stages of the logistics chain, including truck haulage and port activities.

Blasting can cause noise and vibration, which can have an impact on neighboring premises. Airborne vibration from blasting (known as airblast/ explosion) can cause objects to rattle and make noise. At the levels experienced from blasting associated with mining, structural damage to adjoining properties is unlikely to occur. In addition, the noise levels from blasting at a mine site are unlikely to cause any hearing damage to anyone outside the site.

To manage the impact of noise from their heavy vehicles, blasting, and fixed plant infrastructure on neighboring local communities, mining companies must develop a noise management plan that includes monitoring systems, procedures, training, Noise map and audits.

4.3.4 LIGHT

Excessive or obtrusive artificial light from mining operations or steps in the logistics chain, such as transport, can affect nearby communities. Light sources include fixed lighting around infrastructure, mobile lighting plants and mobile plant and equipment lights. When artificial outdoor lighting is annoying and unnecessary, it is known as light pollution. Light pollution can be divided into two main types:

- annoying light that intrudes on an otherwise natural or low-light setting.
- excessive light that leads to discomfort and adverse health effects.

Mining companies must consider lighting risks to ensure that it does not adversely affect communities or accommodation camps and villages.

4.3.5 CONTAMINATION BY HAZARDOUS MATERIALS

A range of hazardous materials could be present at a mining operation. Some specific metals, such as uranium and lead, are inherently risky to extract. There is also variability in how the minerals are processed. Particular aspects of operations that might cause health threats include the following:

- **Smelting**, where the ore is processed at high temperatures, Toxic gases can be released through air emissions and heavy metals can be discharged into groundwater and surface waters.
- **In situ leach mining,** where the ore is processed in place in the ground, Hazardous pollutants can be released into streams, lakes or drinking water wells.
- **Heap leaching and other leaching methods,** where chemicals such as cyanide or sulphuric acid are employed, Leaks of toxic solutions are common and can contaminate ground or surface water.
- **Tailings dams,** where the waste products from a mineral-processing plant are retained.

The broader geographical possibilities for contamination resulting from processing and transport should also be considered. Pollutants from smelters, for example, such as lead and mercury, can be carried long distances by wind and water. Mining pollution can be distributed far from the mine site and can create public health impacts along the transport route.

Further detailed information on hazardous materials management that affects mining operations and communities is in the leading practice Hazardous materials management guide (DITR 2009b).

4.3.6 THE PSYCHOSOCIAL HAZARDS OF MINING ON COMMUNITIES

Large-scale mining operations can affect the people living in their vicinity in a variety of ways (table 4-3). Potential negatives include landscape disturbance, the contamination of rivers and other water sources, the destruction of traditional livelihoods, reduced amenity (noise, dust etc.), increased conflict within communities, local price inflation, housing shortages, rapid population influx and loss of cultural heritage.

The nature and scale of impacts can vary markedly from mine to mine, depending on a host of different factors, including:

- The mine's location (is it a settled area, or remote and sparsely populated?)
- Whether the mine is on or near local people lands who are living in the locality since generations and are emotionally attached to the place.
- The method of mining used (such as open cut or underground)
- The local economy (is it largely dependent on mining and industry, or mainly agricultural?)
- Local people's experience and knowledge of mining
- The community's adaptability and resilience
- How well the mine managers understand and manage impacts.

Impacts also vary across the project life cycle (from construction to operation to closure), and through the commodity price cycle (booms present different issues from downturns).

It is required from mining companies to undertake a social impact assessment as part of the 'front end' project approval process. The assessments are intended to enhance understanding of how communities might be affected by a development and to identify how unwanted impacts can be avoided or mitigated.
Mining companies are required to implement social management systems that include a greater investment in baseline studies, ongoing monitoring of social impacts and risks, and regular updating of management plans to prevent and reduce unwanted impacts and manage risks. Failure to address community concerns can threaten mining companies license.

To operate, making it harder to get regulatory approval for new projects, reducing workforce productivity, causing reputational damage to the company and, in some cases, exposing it to legal action. See table 4-3 for some of the changes induced by mining that can lead to social impacts.

Table 4-3: Social impacts from Mining activities

Social and cultural change	
Population and demographics	In-migration, out-migration, workers' camps, social inclusion, growth or decline of towns, conflict and tensions between social groups.
Social infrastructure and services	Demands on and investment in housing skills (shortages and staff retention), childcare, health, education and training.
Crime and social order	Corruption, domestic violence, sexual violence, substance abuse and trafficking, prostitution, change in social norms, pace of change for vulnerable communities.
Culture and customs	Changes in traditional family roles, changing production and employment base, effect of cash on community, reduced participation in civil society, community cohesion, sense of place, community leadership, cultural heritage.
Community health and safety	Disease, vehicle accidents, spills, alcohol and substance abuse, pollution, interruption to traditional food supply, awareness and treatment programs.
Labour	Health and safety, working conditions, remuneration, right to assemble, representation in unions, Labour force participation for women.
Gender and vulnerable groups	Disproportionate experiences of impact and marginalization of vulnerable groups (women, disabled, aged, ethnic minorities, Indigenous and youth), equity in participation and employment

Human rights and security	Abuses by security personnel (government, contractor, company), social disorder in camps, suppression of demonstrations, targeting of activists, rights awareness programs.
Economic change	
Distribution of benefits	Employment, flow of profits, royalties and taxes, training, local business spending, community development and social programs, compensation, managing expectations, equitable distribution across state/regional/local/ ethnic/family groups, cash economy.
Inflation/deflation	Housing (ownership and rents), food, access to social services.
Infrastructure	Demands on and investment in roads, rail, ports, sewerage, telecommunications, power and water supplies.
Social and socioeconomic change	
Pollution and amenity	Air (e.g. dust), water (e.g. acid and metalliferous drainage, cyanide, riverine and submarine waste disposal), noise, scenic amenity, vibration, radiation, traffic, government capacity to monitor and regulate.
Resources (access/competition)	Land, mobility, water (groundwater, river, ocean), mineral resources (artisanal and small-scale mining), cultural heritage, forest resources, human resources, post-mining land use.
Resettlement	Consent and consultation for resettlement, compensation, ties to land, adequacy of resettlement housing and facilities, equity, post-settlement conditions, livelihoods.
Disturbance	Disruption to economic and social activities (including by exploration), consultation for land access, frequency and timing, compensation.

4.3.7 HEAT STRESS

Heat stress is usually the result of work being performed at elevated temperatures. Contributory factors may also include a decrease of natural body ventilation by protective clothing e.g. chemical & impervious suits. Workers who are exposed to extreme heat or work in hot environments may be at risk of heat stress. Exposure to extreme heat can result in occupational illnesses and injuries. Heat stress can result in heat stroke, heat exhaustion, heat cramps, or heat rashes. Heat can also increase the risk of injuries in workers as it may result in sweaty palms, fogged-up safety glasses, and dizziness. Burns may also occur as a result of accidental contact with hot surfaces or steam.

Heat stress occurs when the body›s means of controlling its internal temperature starts to fail. As well as air temperature, factors such as work rate, humidity and clothing worn while working may lead to heat stress. Therefore, it may not be obvious to someone passing through the workplace that there is a risk of heat stress.

Mining companies must take special precautions to avoid heat-related illness in unusually hot weather when working outdoors or in unconditioned indoor environments. People suffer heat-related illness when their bodies are unable to regulate internal body temperature. Heat-related illness must be prevented by following these guidelines when working outdoors in hot weather:

- Encourage water intake at frequent intervals hroughout the day to prevent dehydration, relieve thirst and maintain an adequate urine output.
- Plain water is usually adequate without need to take additional salt or minerals beyond those in one’s diet. A sports beverage can replace the salt and minerals you lose in sweat.

- Wear appropriate clothing. During periods of elevated temperature, employees must wear light- colored, lightweight, loose-fitting cotton clothing that allows ventilation of air to the body.
- Protect yourself from the direct sun by wearing a wide-brimmed hat. (Sunglasses and sunscreen are also recommended).
- Stand or sit up slowly. Flex leg muscles before moving.
- Take time to cool down. Rest often in shady areas. A few hours in air conditioning can help stay cooler later in the heat.
- Take time to acclimate to heat and humidity. A heat wave is stressful to worker's body. Gradual adaptation improves the employees' ability to tolerate heat by sweating more efficiently, thus cooling the body and making it easier to maintain a normal temperature.

4.3.8 STRESS AND ILL-HEALTH

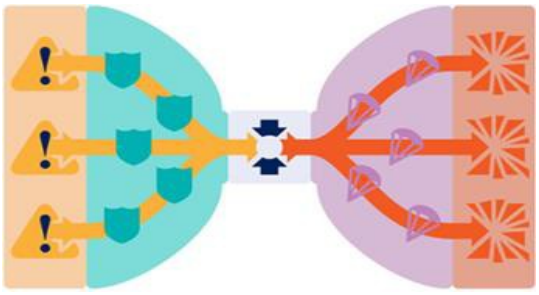
Mining companies must suitably control operations that are known to trigger stress responses, particularly those that persist across long periods of time. The most obvious are physical aspects that arise as a function of mining operations, such as mining-induced disturbances of visual amenity, noise, light, odor, traffic and vibration, all of which can occur 'too often' and persist 'too long' and potentially produce a sustained stress response.

Where multiple mining projects are operating in the same general area, nuisance and amenity factors may have a cumulative effect, exacerbating community distress. Cumulative impacts result from the aggregation and interaction of impacts and may be the product of past, present or future activities. In such cases, a more strategic management approach that includes multiple-company and cross-industry approaches is needed. The following best practices are suggested to be adopted in such circumstances.:

- strategic and regional planning
- information exchange, networking and forums
- pooling of resources to support initiatives and programs
- multi-stakeholder and regional monitoring.

4.3.9 PLACE IDENTITY

Place identity is an important consideration in mining projects and can have significant social and cultural impacts on the communities affected by mining activities. It is important for mining companies to engage with local communities and stakeholders to understand and respect the place identity of the area, and to work towards sustainable and responsible mining practices that consider the values and needs of the community.



Mining companies can use Bow-tie methodology to manage unwanted events from a risk management perspective. In this form of analysis, the unwanted event is the center (or knot) of the bowtie. On the left and right side of the knot are listed the causes and consequences of that event, respectively. Each of the causes and consequences is linked to a series of controls that have the potential to either prevent the event occurring (preventive controls) or reduce the extent of the consequences (mitigating controls).

In the following example, the unwanted event (the knot in the middle of the bow-tie) is community distress. The particular cause that is addressed is reduced visual amenity. Because this guide is focused on community health, consequences could be factors such as increases in incidences of reporting of psychological distress, unhealthy behaviors (such as increased alcohol use) and symptoms of illness. However, at earlier stages it is more likely to result in community anger, loss of trust in the mining company and so on. Potential preventive controls are shown in Table 4-4; mitigating controls are shown in Table 4.5.

Table 4-4: Preventive controls

Undertake a visual impact assessment
Undertake baseline landscape characterization.
Assess the impacts (determine the visibility of the mine from many vantage points, including the person or group that would experience an impact, the duration of impacts etc).
Develop preventive and mitigating controls.
Undertake community engagement
Determine community values in terms of visual sensitivity to changes in particular landscapes, particularly in relation to residential dwellings, locations of public and private importance, heritage sites, tourist destinations, major and secondary roads.
Manage community complaints early to prevent escalation, including receipt of complaints, investigation, appropriate remedial action, feedback to the complainant, communication to site management or personnel and notification to external bodies where necessary.
Maintain and publicize a 24-hour, 7-day community and employee information phone line and email address.
Include in the mine's annual review report a summary of any visual or landscape management issues and actions arising throughout the year.
Mine design
Buildings and structures designed, located and constructed so as to blend as far as possible with the surrounding landscape (colored in suitable natural tones etc.).
Mining operations
Keep out-of-pit dumping to a practical minimum.
Limit vegetation clearance to required areas only.
Respreads any pre-stripped topsoil, fallen timber and leaf litter.
Undertake progressive rehabilitation
Aim to rehabilitate land as soon as possible after disturbances.
Carry out temporary rehabilitation (of overburden spoils etc.).
Progressively excavate, backfill and rehabilitate pit areas over the life of the mine.
Remove infrastructure areas such as access tracks or roads and drill sites that are no longer needed to alleviate compaction and increase infiltration.
Construct earthworks to control drainage and provide sediment and erosion control.

Screening to minimize visual impacts
Retain existing roadside and fence line vegetation.
Use vegetation screening around individual residential premises.
Use vegetation screening and elevated bunds around mine infrastructure and activities (accommodation, offices etc).
Rehabilitation
Recontour and rehabilitate out-of-pit spoil dumps to elevated landforms following mining operations to reduce visible impacts and support sustainable grazing.
On the closure of the mine, decommission and remove all structures.
Develop and implement a maintenance and monitoring plan for revegetated areas
Manage replanted areas through a landscape maintenance program that responds to site and environmental conditions and includes ongoing monitoring of planting success and weed management.
Employ an environmental/community officer (or delegate) to inspect and ensure compliance with the visual amenity plan.

Table 4-5: Mitigating controls

Ongoing community engagement
Community complaints management, including receipt of complaints, feedback to the complainant, communication to site management or personnel and notification to external bodies where necessary.
Maintain and publicize a 24-hour, 7-day community and employee information phone line and email address.
Include in the mine's annual review report a summary of any visual or landscape management issues and actions arising throughout the year.
Run community forums, information evenings and workshops.
System to investigate community issues and complaints
Investigation of the community issues and complaints with the site team and community representative (if any) and communication to site management.
Investigate the facts and surrounding circumstances and showing the employees or the local community that this been done thoroughly and sensitively.
Implementation of remedial action
Document the implementation of mitigation measures and monitoring their implementation for the purpose of compliance.
HSE Manager to ensure the implementation of the remedial actions and their effectiveness.

4.3.10 SUBSTANCE ABUSE

Substance abuse isn't something that should be take lightly. It occurs when a person uses alcohol, prescription medicine, and other legal and illegal substances too much or in the wrong way.

Substance abuse differs from addiction. Many people with substance abuse problems are able to quit or can change their unhealthy behavior. Addiction, on the other hand, is a disease. It means a person can't stop using even when his/her condition causes him/her harm.

Mining companies are advised to participate in workforce and community programs that build awareness of the effects of drugs and alcohol on health, wellbeing and medical and psychological conditions, particularly for at-risk groups (such as young men).

4.3.11 COMMUNICABLE DISEASES

The health needs of communities dependent on or living around mining sites can be significant, particularly in developing countries but sometimes also in remote regions of developed countries. There is the risk of communicable diseases (including respiratory, gastrointestinal or other diseases) arising from interactions among the workforce and local communities.

Mining companies must adopt a program to address the risk of communicable disease require appropriate management and education of the workforce to be put in place. These programs originate at the mine site and target employees at risk of a range of communicable diseases.

4.4 COMMUNITY HEALTH AND SAFETY IMPACT ASSESSMENT

The assessment and management of community health and safety are part of the risk management and social responsibility of owners and operators in the minerals industry. Community health and safety are usually considered as an integrated part of the broader environmental and social impact assessment (ESIA) process or may be completed as a stand-alone health and safety impact assessment (HSIA) if the impacts warrant it. Whichever method is used, it is important to ensure that the assessment systematically addresses the potential negative and positive effects of policies, plans, programs and projects on community health and safety by identifying, preventing and/or mitigating the impacts and risks.

The issues to be considered from a community health and safety perspective are broad, as mining affects a range of determinants, including direct effects on health and safety and indirect effects on health (such as social, cultural, environmental and economic factors), as summarized in Table 4-6. Additional consideration may be needed for high-risk groups in the community.

Table 4-6: Effects on the community from mining

Direct Effects	Indirect Effects
• Physical injury • Mental health and wellbeing • Infectious disease • Chronic disease • Emergency situations	• Housing • Water supply and sanitation • Transport • Learning and education • Crime and security • Social care and public services • Commercial goods and services • Social capital and community cohesion • Leisure and recreation • Energy • Waste • Land and space

The cumulative impact of mining operations in a mining area needs to be included in the impact assessment. Impacts may be synergistic or additive, and short-, medium- and long-term effects need consideration.

4.4.1 THE HEALTH AND SAFETY IMPACT ASSESSMENT PROCESS

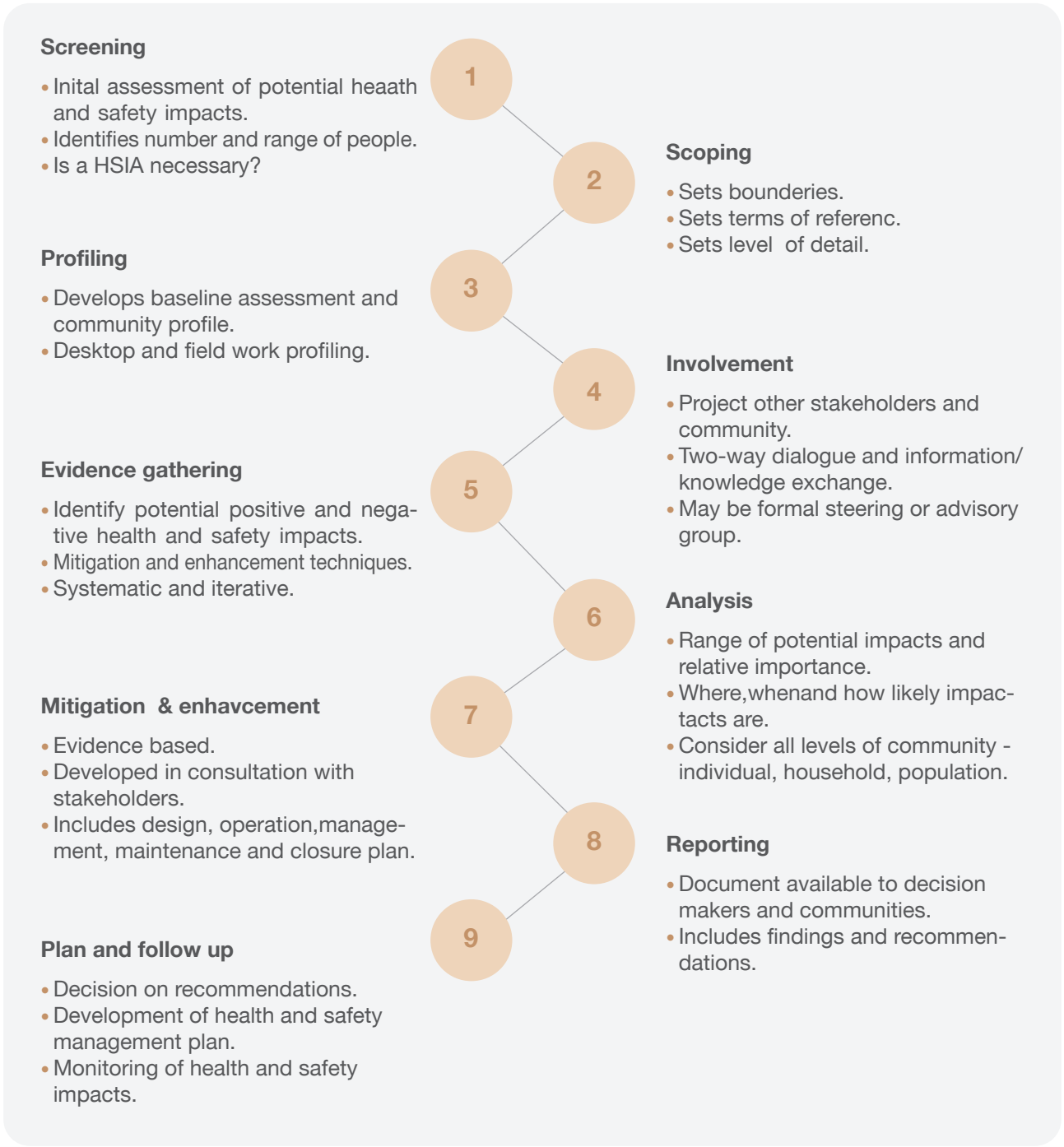
A health and safety impact assessment (HSIA) systematically analyses potential health and safety impacts and aids the development of options to maximize the positive impacts and minimize the negative impacts. A workplace health and safety risk assessment can be combined with the community HSIA to inform strategic health and safety planning.

The model shown in Figure 4.2 is modified from International Council on Mining and Metals (ICMM). It outlines the steps required for an effective and thorough health and safety impact assessment (HSIA). Although the model is presented as a linear process, in practice it is iterative, and steps may need to be revisited if new or additional information becomes available. Each step needs to be managed to ensure that appropriate and relevant information is sourced and used.

The following ICMM documents provide detailed information on how to complete a health impact assessment:

- Good practice guidance on health impact assessment (2010)
- Good practice guidance on occupational health risk assessment (2009).

Figure 4-2: Model health impact assessment process



4.4.2 MANAGEMENT OF HEALTH AND SAFETY IMPACTS

The HSIA identifies the potential impacts and recommends measures that will minimize negative impacts or enhance positive impacts through the development and implementation of a health and safety management plan. The recommendations need to be reviewed, and that is most effective if the review is completed in partnership with other stakeholders, including the communities affected. The actions identified in the plan shall be:

1	2	3	4
implementable	proven to work	socially and culturally acceptable to the community	cost-effective

4.4.3 CONTROLS AND INTERVENTIONS

It is always more effective to prevent harm occurring than to simply react to it. Therefore, the hierarchy of measures to be considered is similar to the hierarchy of control used in workplace health and safety. Table 11 outlines a hierarchy of controls or interventions for community health and safety issues and some examples. The type of control or intervention used differs according to:

- The nature of the hazard.
- The location of the community (developed versus developing country).
- The level of involvement (passive versus active).
- Whether the intervention is sole or partnered.
- Workforce planning.
- Families and relationships.
- The nature of the community (indigenous or otherwise).

Table 4-7: Hierarchy of interventions for community health and safety

AVOID	Design the project so that a feature that may cause a potential negative health impact is designed out. For example, reroute a road and provide a footpath for pedestrians and safe places to cross, or prevent stagnant pools of water in which mosquitoes can breed forming on the site.
REDUCE	At project site (source): This involves adding something to the basic design to abate the impact. Pollution controls fall into this category (for example, reduce emissions from chimney stacks by using air filters). In community (receptor): Some impacts cannot be avoided or reduced at the project site. In this case, measures can be implemented offsite in the community (for example, provide safe crossing points on busy roads and reduce traffic speeds near settlements).
REMEDY	Some impacts involve unavoidable damage to a resource, which then needs repair or remedial treatment (for example, provide medical treatment for a chemical spillage, replace a water well lost during construction or remediate contaminated land).
COMPENSATE	Where other mitigation approaches are not possible or fully effective, compensation for loss, damage and general intrusion might be appropriate. This could be 'in kind', such as by planting new food crops elsewhere to replace what has been lost, by making financial payments for losses of productive farming land, or by providing community facilities to compensate for the loss of recreation and amenity space.

4.4.4 Monitoring

Monitoring occupational health, safety and environmental outcomes and OHSE determinants is a critical part of a successful health and safety and environmental management plan for stakeholders and communities. Having baseline health information as part of the HSEIA (health, safety and environmental impact assessment) provides an effective reference to identify positive and negative impacts and key indicators. There may be stakeholders and other service providers who are collecting relevant information, and data sharing may be possible. Where this is not possible, information relevant to the key indicators will need to be collected. The key indicators need to relate to the direct and indirect health effects identified in Table 4.6.

5 Corporate Social Responsibility

Corporate social responsibility is 'the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large'. This section briefly presents some key concepts in that guide and then provides some illustrations from a community health and safety perspective.

Community development includes helping people to link up and support each other through organizations and networks. It can also involve industry working with or influencing governments, other institutions and agencies to contribute to such areas as:

- improving public health and other services
- enhancing the local environment
- building community pride
- strengthening local institutions
- working with marginalized groups to help them participate more fully in the development of their community.

5.1 COMMUNITY DEVELOPMENT IN A HEALTH AND SAFETY CONTEXT

The International Council on Mining and Metals (ICMM) practice guidance on health impact assessment (ICCM 2010) highlights the important and positive contribution that mining companies can make to the health and wellbeing of mine workers and the communities in which they operate. It also encourages the careful selection of health and safety interventions that match the needs of the local community and take advantage of the organization's resources and expertise. Mining companies are advised to involve in local community development in the HSE context.

6 TRAINING ORIENTATION

Mining operation cannot function without well trained personnel. A mine that has embraced new technology can very quickly fail, if the personnel are not trained in the technology, or are of insufficient educational and skill background and experience. Lack of education and training not only inhibit the operation but has the potential to contribute to development of hazards which may ultimately threaten mine safety. In relation to education of mining engineers, the mining companies shall engage in providing training and orientation to all personnel including contractors & subcontractors. The scope of the training will ensure that workers are able to fulfill the safety in operation and comply with the legislations and standards.

Personnel working routinely with hazardous materials need to receive additional specialized training detailing the specific handling, labeling, storage, and disposal requirements. Training details (e.g. participants, subjects, training hours, etc.) need to be recorded and maintained. The effectiveness of the training shall be evaluated, and training record maintained. Below are examples of training programs that need to be adopted. HSE induction for the new employees, contractor and subcontractors.

- Refresher training on health, safety and environment
- Training on operational safety
- Toolbox Talk Meeting
- Riks assessment training
- First Aid training
- Fire-Warden training
- Working at Hight
- Working at confined space
- HSE management system and permit to work.
- Other HSE related trainings

7 RECORD KEEPING

Records management is a necessary component in the management system and shall be used to demonstrate evidence of ohse compliance. The mining companies shall be responsible for accurately and systematically reporting and maintaining the records and associated documents on OHSE aspects.

Documentation will be retained to demonstrate legal compliance and safety aspects. Written documentation such as checklist, inspection record. Receipts, invoices, and waste transfer notes etc. Will be kept including the following.

- A copy of the contractor's trade license for waste transport and disposal.
- Ohse inspection records of the mining site.
- HSE induction records.
- Equipment and machinery maintenance & certifications.
- Safety data sheets of chemicals.
- All OHSE procedures.
- All environmental performance data.
- Internal audit records.
- Incident reports including corrective and preventive actions.
- Non-conformance reports including corrective and preventive actions.
- Any complaints by external parties (grievance register).
- Relevant records of competence/qualifications of staffs and subcontractor.
- The documentation listed above will be subject to internal audits.
- Environmental monitoring reports.
- Ea (environment authority) environmental permit / approval.
- Emergency response plan.

8 CAMP / ACCOMODATION SAFETY

Camp / mining company worker's accommodation must be located at a safe distance from the quarry area. It is the responsibility of Mining company to ensure the provision of welfare facilities in Camp/accommodation considering the safety of the workers and environment. The accommodation shall be provided with potable water supply, sanitary facilities, power supply and entertainment areas for extracurricular activities like supports etc. Sites must be adequately drained, plumbed and graded to prevent flooding and pooling of water. It must be ensured to compliance with local codes, statutes and by laws for structural adequacy, fire precaution, firefighting, electrical grounding, lightning protection and other regulations as required. The drinking water quality should meet national regulations.

Following are the aspects of site layout or welfare facilities at mining site,

Safety Signages	Site Access ways	Fire preventions	Drying/ Changing rooms	Car Parking/ Transport
Pedestrian access	Site hording/ fencing	Drainage system	Health care facility	Adequate lighting provisions
Canteen/ Mess rooms	Toilets/ Washrooms	Worker accommodation	Site cleanliness/ Housekeeping	Network accessibility/ internet

9 REFERENCES

1. Royal Decree 19/2019 Mineral Resources Law.
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3. Ministerial Decision 80/94 Issuing Regulation for Noise Pollution control in Work environment.
4. Civil Defence law NO. 76/91 (AS AMENDED) Civil Defense Procedures Regulation.
5. Ministerial Decision 25-2009-Regulations for Organization of Handling and Use of Chemicals.
6. Royal Decree NO. 35/2003 the Labour Law.
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8. Ministerial Decision 80/94 Issuing Regulation for Noise Pollution control in Work environment.
9. Civil Defence law NO. 76/91 (AS AMENDED) Civil Defense Procedures Regulation.
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28. WBCSD (World Business Council for Sustainable Development) (1999). Corporate Social Responsibility, Meeting Changing Expectations. Geneva, Switzerland, WBCSD.
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31. OSHA - https://www.osha.gov/personal-protective-equipment.
32. The Mines Regulations 2014, Guidance on Regulations, L149 (First edition) Published 2015 amended 2020, Health and Safety Executive.

10 Appendices

Appendix-1: Accident/ Incident Report Forms for Serious and Non-Serious Incidents.
Appendix-2: COSHH assessment form.
Appendix-3: Community grievance form.

Appendix-1

Accident/ Incident Report Forms for Serious and Non-Serious Incidents

A) Serious OSH Incident Notification

To be submitted to the concerned Authorities. Mining Department of MEM.

a) For Fatalities And Serious Incidents Within 24 Hrs. Of Incident.

1. Reporting Company Information:			
Name of Company:			
Registration Number:			
Address of Company:			
Authorized Contact Person:		Email Address:	
Telephone Number:		Mobile Number:	

2. Reporting on behalf of a Sub-Contractor (hired by or working for Mining Company but not nominated directly by MoEM).	☐ Yes	☐ No
Name of Sub- Contractor:		
Type of Business:		
Address:		

3. Incident Information				
DD/MM/YYYY		Time (24 hr):		
Type of Incident:	☐ Fatality	☐ Serious Dangerous Occurrence	☐ Serious Injury	☐ Serious OccupationalIIIness
Other consequences resulting from Thisincident	Restricted Workday Case	Medical Treatment Case	First Aid Cases	Equipment / Property Damage
Incident Description: (Attach additional pages if required)				
Incident Location on Site:				
Incident Workplace Address:				
Region where incident occurred:			Location of Incident	
Applicable Reports:		☐ HSE Department of MoEM	☐ Royal Oman Police /Medical	☐ Other (Specify)
Attached:		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

4. Injury Type based on Immediate Judgment of the Severity:

The actual severity and consequences of the notified injury based on diagnosis by experienced Incident Investigator or licensed health care professional and supported by medical report shall be reported to MEM.

☐ Injury causing the affected person temporarily unable to perform any regular job or restricted work activity on a subsequent scheduled workday or shift	
☐ Immediate medical treatment of the injured person(s) as an in-patient in a hospital;	
☐ Medical treatment of the injured person(s) within 48 hours of exposure to a substance;	
Immediate medical treatment of the injured person(s) for:	
☐ fracture (not including fingers or toes)	☐ electric shock or electrical burn;
loss of a distinct part or organ of body including the amputationof any part of body;	serious burns due to thermal and chemical agents;
loss of consciousness and/or requiring resuscitation;	entrapment of a body part in machinery / equipment / plant
a serious head injury;	a spinal injury;
a serious eye injury including loss of sight (temporary or permanent);	dislocation of joints
	the loss of bodily function; and
exposure to a hazardous material;	Serious laceration
the separation of skin from any underlying tissue (such asscalping or de-gloving);	Other

5. Injury Severity known at the time of Incident

The actual severity and consequences of the notified injury based on diagnosis by Experienced Incident Investigator or licensed health care professional and supported by medical report shall be reported to MoEM or ROP.

☐ Fatality
☐ Permanent Total Disability
☐ Permanent Partial Disability
☐ Lost Workdays Injury
☐ Lost Workdays Occupational Illness

6. Injured Person's Personal Details (For Injuries):
In case of an incident with more than one injured person, complete the information for each person using separate forms

Name:		Occupation:	
Relationship with Company:	☐ Company Employee	☐ Subcontractor Employee	☐ Other Person (e.g. Visitor,)
Nationality:		Date of Birth:	
Passport Number:		Length of Service:	------Years ------Months
Contact Phone Number:		Gender:	☐ Male ☐ Female

7. Actions Taken Immediately after the Incident:
(Attach additional pages if more space is required)

No.	Actions	Responsibility	Status
1.			
2.			
3.			

Declaration by Reporting Company:

I declare that all information provided in this document is true, correct and complete.

Signature of the Authorized Contact Person :		OfficialStamp:	
Date : (DD/MM/YYYY)			

Official Use by MoEM/ ROP

Relevant Authority Stamp	Reviewed and Entered into Database by:	
	Name:	
	Signature:	
	Date: (DD /MM /YYYY)	
Remarks		

B) Non-Serious OSH Incident Notification Form

All non-serious Incidents not requiring notification to MoEM or ROP should be investigated and results recorded using this Form.

Part A – Incident Information			
1. Reporting Company Information			
Name of Company:			
Registration Number:			
Address of Company:			
Authorized Contact Person:			
Telephone Number:		Email Address:	
Telephone Number:		Mobile Number:	

2. Incident involving a Sub-Contractor (hired by or working for Company but not nominated directly by MEM):	☐ Yes	☐ No
Name of Contractor:		
Type of Business:		
Address:		

3. Incident Information:			
Date of Incident (DD/MM/YYYY)		Time (24 hr):	
Incident Type:			
☐ Restricted Work Case			
☐ Medical Treatment Case			
☐ First aid Injury			
☐ Equipment / Property Damage			
☐ Near-miss			

4. Incident Details:	
Brief description of the main circumstances leading to the Incident: (Attach additional pages if more space is required)	
Incident Location on Site:	
IncidentWorkplace Address:	
MedicalReport: (If applicable)	

5. Injured Person's Personal Details (For Injuries):
In case of an incident with more than one injured person, complete the information for each person using separate forms

Name:		Occupation:	
Relationship with Company:	☐ Company Employee	☐ Contractor Employee	☐ Other Person (e.g. Visitor,)
Nationality:		Date of Birth:	
Passport Number:		Length of Service:	------Years ------Months
Contact Phone Number:		Gender:	☐ Male ☐ Female

Part B – Incident Investigation Summary

1. Incident Causes Details:
To be supported with the incident investigation report

Immediate Cause (Unsafe Act)	☐ Failure to secure	☐ Operating equipment without authority
	☐ Failure to warn	☐ Servicing equipment in operation
	☐ Removing / Defeating Safety Devices	☐ Using defective equipment / tools
	☐ Failure to use PPE properly	☐ Using equipment improperly
	☐ Operating at improper speed	☐ Improper lifting/ loading/ placement
	☐ Lack of awareness / knowledge	☐ Improper position for task
	☐ Lack of attention / concentration	☐ Horseplay (practical joke with harmful impacts)
	☐ Violation / taking shortcuts	☐ Others

Immediate Cause (Unsafe Conditions)	☐ Inadequate guards or barriers	☐ Inadequate or improper protective equipment
	☐ Inadequate warning system or notice	☐ Inadequate or excess illumination
	☐ Inadequate ventilation	☐ Congestion/ restricted action/ poor access
	☐ Fire and explosion hazards	☐ Poor housekeeping, disorder
	☐ High / Low temperature exposure	☐ Excessive noise exposure
	☐ Hazardous gases/dusts/vapors/fumes	☐ Radiation exposure
	☐ Defective tools, equipment or materials	☐ Equipment failuren
	☐ Others	

Root Causes (Personal factor)	☐ Physical Capability (Any sensory deficiency, Inadequate size-or strength or physical disabilities)	☐ Physical Condition (previous injury/illness, Fatigue, blood sugaror Impairment due to drugs)
	☐ Mental State (poor judgment, memory failure, poorcon-dition, fears or emotional disturbance)	☐ Skill Level (Inadequate required skill, lack of coachingon skill or infrequent performance of skill)
	☐ Behavior (save time, avoids discomfort, improper supervisory, inadequate disciplinary pro-cess or inappropriate aggression)	☐ Mental Stress (Frustration,confusion/conflicting direc-tions,emotional overload, extreme meaning-lessactivities or concentration/judgmentde-mands)
	☐ Human Error	☐ Others

Root Causes (System Factor)	☐ Inadequate Training / Knowledge transfer	☐ Inadequate Leadership Supervision
	☐ Inadequate / Missing Work Procedures(SoP)	☐ Inadequate Incident Investigation / Analysis
	☐ Inadequate Purchasing/Material handling	☐ Inadequate Engineering / Design / Controls
	☐ Inadequate Tools/Equipment	☐ Inadequate Maintenance
	☐ Inadequate Risk Assessment / Management	☐ Inadequate Communication
	☐ Inadequate Contractor Management	☐ Inadequate Planned Inspections
	☐ Inadequate Management of Change	☐ Inadequate Emergency Response Plan
	☐ Others	☐ Others

2. Injury Details:
To be supported with diagnosis by Licensed Health Care Professional and/or Medical Report

Nature of Injury / Illness:	☐ Abrasions / Bruising	☐ Amputation - Traumatic	☐ Bite / Sting
	☐ Burn	☐ Concussion	☐ Crush / Internal Injury
	☐ Cuts/ Laceration/ OpenWound	☐ Hearing Loss / Deafness	☐ Dislocation
	☐ Electric Shock	☐ Foreign Body under Skin	☐ Fracture
	☐ Foreign Body in Eye	☐ Infectious Disease	☐ Hernia
	☐ Heat Related Illness	☐ Occupational Illness / Disease	☐ Musculoskeletal Disorder Chronic / RSI
	☐ Nerve / Spinal Cord Injury	☐ Psychological (Stress)	☐ Poisoning / Toxic Effect - Ingestion
	☐ Poisoning / Toxic Effect – Inhalation	☐ Strain / Sprain	☐ Respiratory Disease
	☐ Skin Irritation / Disease	☐ Other	☐ Other

Mechanism of Injury /Illness:	☐ Bite / Sting	☐ Biological Factors	☐ Cave-In or Collapse
	☐ Chemicals / Substances / Radiation	☐ Drowning / Submersion	☐ Dust / Fumes / Gases
	☐ Extreme Temperature / Fire	☐ Electricity	☐ Equipment / Property Damage
	☐ Hit by Moving Object / Crush / Vehicle	☐ Manual Handling	☐ Fall from Height
	☐ Occupational Violence	☐ Penetrating Injury (needle stick, puncture wound)	☐ Mental Stress
	☐ Repetitive Motion	☐ Slip, Trip and Fall	☐ Sound / Pressure
	☐ Struck by Falling Object	☐ Other Unspecified Mechanism:_____	

Agency / Source of Injury / Illness:	☐ Animal / Human	☐ Confined Space	☐ Environmental Conditions
	☐ Fixed Machinery / Plant	☐ Infectious Agent	☐ Materials or Chemical Substances
	☐ Mobile Plant / Equipment	☐ Non-Powered Equipment / Tools / Appliances	☐ Non-Powered Equipment / Tools / Appliances
	☐ Powered Equipment / Tools Appliances	☐ Road Transport / Vehicles	☐ Scaffolding or Ladders
	☐ Sharps / Scalpels / Needles etc.	☐ Trench or Excavations	☐ Other

Bodily Location:	☐ Head / Neck	☐ Cervical Spine ☐ Face (excluding eye) ☐ Neck	☐ Ear ☐ Forehead ☐ Nose	☐ Eye ☐ Mouth ☐ Scalp / Skull
	☐ Trunk	☐ Abdomen ☐ Pelvis	☐ Back ☐ Spine	☐ Genitals ☐ Thorax
	☐ Upper Extremity	☐ Clavicle (Collar Bone) ☐ Forearm ☐ Thumb	☐ Elbow ☐ Hand ☐ Upper Arm	☐ Fingers (other than Thumbs) ☐ Shoulder ☐ Wrist
	☐ Lower Extremity	☐ Ankle ☐ Hip / Groin ☐ Thigh	☐ Buttocks ☐ Knee ☐ Toes	☐ Foot ☐ Lower Leg ☐
	☐ Internal Organs	☐ Arteries ☐ Intestines ☐ Lungs	☐ Brain ☐ Kidney ☐ Spleen	☐ Heart ☐ Liver ☐ Stomach
	☐ General	☐ Heat Related	☐ Occupational Illness	☐ Other:_____

3. Actions Taken Immediately after the Incident:
(Attach additional pages if more space is required)

No.	Actions	Responsibility	Date Completed: (DD/MM/YYYY)
1.			
2.			
3.			

4. Incident Root Cause(s):
(Refer to Section 1. Attach additional pages if more space is required)

1.	
2.	
3.	

5. Corrective Actions to Prevent Recurrence:
(Attach additional pages if more space is required)

No.	Actions	Person Responsible:	Target Date (DD/MM/YYYY)
1.			
2.			
3.			

6. Incident Cost: (Approximate / Best Estimate)

No		Item / Area	Amount (OMR.)
1	☐	Injury Cost (Treatment, Hospital, Transport, Insurance, etc.)	
2	☐	Legal Cost (Compensation claims, judicial prosecutions, etc.)	
3	☐	Productivity Cost (Business disruptions, Delays, Production loss / day, Material,Salaries, etc.)	
4	☐	Asset Cost (Property, Machinery, Equipment, Structure, Vehicle, etc. – Repair & Maintenance)	
5	☐	Asset Cost (Property, Machinery, Equipment, Structure, Material, Vehicle, etc. – Replacement)	
6	☐	Enforcement Action (Penalty Issued by Authority etc.)	
7	☐	Incident Scene / Area Restoration Cost (arrangements to make safe, cleanup, etc.)	
8	☐	Other Cost relevant to / associated with the Incident	
9		**Total Cost**	

7. Risk Assessment
(considering / implementing the post incident corrective actions and controls)

Probability:	☐ Rare	☐ Possible	☐ Likely	☐ Often	☐ Frequent
Severity of Consequence:	☐ Insignificant	☐ Minor	☐ Moderate	☐ Major	☐ Catastrophic
Level of Residual Risk:	☐ Low	☐ Moderate	☐ High	☐ Extreme	☐
	☐	☐	☐	☐	

8. Declaration by Injured Person (If applicable)

I declare that all information provided in this document is true, correct and complete.

Name of InjuredPerson or Representative:		Signature of InjuredPerson or Representative:	
Date: (DD/MM/YYYY)			

9. Reviews & Approvals:

☐ Complete investigation report attached
☐ included / attached to report (e.g. Copies of Relevant Procedures, Permits to Work, Photos, Drawings, MSDS, Copy of Police Report, Copy of Medical Report, Interviews, etc.)
☐ Corrective actions listed in this form and/or the attached investigation report will be fully implemented in a timely manner

Incident Investigation Status: ☐ Closed – Completed ☐ Report attached

Signature of Investigation Team Leader	Signature of OSH Manager or Equivalent
Date (DD/MM/YYYY) / /	Date (DD/MM/YYYY) / /

Appendix-2:

COSHH assessment form

COSHH Risk Assessment No: **Product Name:**				
Supplier name:			Department:	
Describe the activity or work process. (Inc. how long/ how often this is carried out and quantity sub-stance used)				
Location of process being carried out?				
Identify the persons at risk:	Students ☐	Faculty ☐	Contractors ☐	Any others specify)
Name the substance involved in the process and its manufacturer. (A copy of a current safety data sheet is attached to this assess-ment)				

Classification (state the category of danger)					
	☐ Toxic		☐ Oxidizing		☐ Gas Under Pressure
	☐ Harmful/ Irritant		☐ Flammable		☐ Carcinogen
	☐ Corrosive		☐ Explosives		☐ Dangerous for the environment

Hazard Type							
Gas	Vapor	Mist	Fume	Dust	Liquid	Solid	Other (State)
☐	☐	☐	☐	☐	☐	☐	☐ .....

Route of Exposure					
Inhalation ☐	Skin ☐	Eyes ☐	Ingestion ☐	Other (State) ☐	.....

Workplace Exposure Limits (WELs) please indicate n/a where not applicable	

State the Risks to Health from Identified Hazards

Control Measures:		
Is health surveillance or monitoring required?	☐ Yes	☐ No

Personal Protective Equipment (state type and standard)					
 Dust mask	☐		 Visor	☐	Suitable for chemical splashes
 Respirator	☐		 Goggles	☐	
 Gloves	☐		 Overalls	☐	
 Footwear	☐		Other	☐	

First Aid Measures			

Storage			

Disposal of Substances & Contaminated Containers					
Hazardous Waste	Skin ☐	Return to Depot ☐	Return to Supplier ☐	Other ☐	☐

(If Other Please State): .....

Is exposure adequately controlled?	☐ Yes ☐ No

Risk Rating Following Control Measures
High ☐ Medium ☐ Low ☐

Appendix-3

Community grievance form

نموذج شكاوى/تظلم الجمهور/ الموظف Form/ Grievance Public/Worker			
الرقم المرجعي Number/ Reference			
اعد بواسطة by/ Prepared		التاريخ Date	
تم تقديمه إلى to/ Reported		التاريخ Date	
معلومات الشكوى Information/ Grievance			
تاريخ وصول الشكوى Received/ Date			
اسم المشتكي Name/ Complainant			
موضوع الشكوى Subject			
التفاصيل Details			
القرارات Decision			
الحلول المقترحة Actions/ Resolution Proposed			
Complainant /Acceptance موافقة المشتكي		**التاريخ Date**	
ملاحظات أخرى Notes/ Other			

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