



Hpakant/Lonkin Gems Tract - Zone 1 Environmental Management Plan

Myanmar Gems and Jewellery Entrepreneurs Association
October 2018

Large-scale mining
activities



Hpakant/Lonkin Gems Tract – Zone 1 Large-Scale Mining Environmental Management Plan

Prepared for
Myanmar Gems Enterprise on behalf of Myanmar Gems and Jewellery Entrepreneurs Association

Prepared by
Coffey Myanmar Limited and Valentis Services Company Limited

In collaboration with
Estelle Levin Limited and Total Business Solutions Company Limited



October 2018

DRWEN00015AA_Hpakant/Lonkin EMP_Z01_Rev1

Quality Information

Revision History

Revision	Description	Date	Originator	Reviewers	Approver
Rev0	Draft EMP	28/07/2017	Coffey	Barton Napier Emma Waterhouse	Barton Napier
Rev1	Final EMP	31/10/2018	Coffey	Barton Napier Emma Waterhouse	Barton Napier

Distribution

Report Status	No. of copies	Format	Distributed to	Date
Rev0	3	PDF Hard copy	Myanmar Gems Enterprise	1/08/2017
Rev1	3	PDF	Myanmar Gems Enterprise	31/10/2018

Executive summary

This environmental management plan (EMP) covers all mining activities in Zone 1 in the Hpakant/Lonkin Gems Tract in Kachin State, Myanmar. The plan applies to large-scale mines in Zone 1.

The objectives of this EMP are to help implement the aspirations and expectations of the Myanmar people, provide a consistent approach to the management of jade mining impacts in the Hpakant/Lonkin Gems Tract, set out measures to determine environmental and social performance of jade mining, and specify transitional arrangements for implementing environmental and social management for jade mining in this area of Myanmar.

This EMP is the first version of the plan. Subsequent versions will introduce further management measures and requirements once satisfactory environmental and social performance has been demonstrated in Zone 1.

Context and background

The Myanmar Gems Enterprise (MGE) of the Ministry of Natural Resources and Environmental Conservation (MONREC) is responsible for the regulation and marketing of jade and other gemstones in Myanmar. MGE requested preparation of environmental management plans (EMPs) to improve environmental and social management of existing and future jade mining in Myanmar.

This EMP is one such plan and establishes the framework for management of environmental and social impacts of jade mining in Zone 1, one of 10 mining zones in the Hpakant/Lonkin Gems Tract. Valentis Services Company Limited, a Myanmar-based mining exploration and services company, and Coffey Myanmar Limited, an international consulting company have prepared this EMP (together with EMPs for the other nine zones) on behalf of the Myanmar Gems and Jewellery Entrepreneurs Association (MGJEA).

Information collected from field visits to the Hpakant/Lonkin Gems Tract has informed the preparation of this EMP. Consultation has been undertaken with government agencies, and people involved in the jade mining industry. An advisory group has also provided Valentis/Coffey with advice on the issues addressed in this EMP. The group includes representatives of Myanmar Government regulatory authorities, Kachin State Ministers, Estelle Levin Limited (ELL), jade miners and non-government organisations.

Stakeholders consulted raised a wide range of issues and concerns, many outside the scope of this EMP. Issues raised by communities in Zone 1 included their reliance economically on mining companies, drug use and associated crime, dust nuisance, traffic safety, blasting impacts (including hearing loss), availability of water, flooding from waste rock blocking some tributaries, and land stability especially around the villages.

The legal framework for jade mining is provided by the Myanmar Gemstone Law. The Second Amending Law of the Myanmar Gemstone Law (2016) requires detrimental environmental effects of jade mining to be managed. MGE has issued numerous notifications and letters under this law to mining companies in the Hpakant/Lonkin Gems Tract requiring improved environmental and social performance.

Existing environment

Zone 1 drains to Uru Creek via several tributary streams which have been highly modified by jade mining. Uru Creek is a tributary of the Chindwin River, a tributary of the Ayeyarwady River which flows into the Andaman Sea. Large-scale mining in Zone 1 has resulted in open pits up to 250 m deep, many with steep slopes and some filled with water forming pit lakes. Waste rock dumps cover most of the area. Settlements and villages occupy areas not required for mining. Remnant vegetation persists in undisturbed areas of Zone 1 (the northern and western regions).

Several decades of artisanal mining and large-scale mining in Zone 1, including direct disposal of overburden into watercourses, has severely degraded watercourses with visual signs of elevated sediment concentrations and suspended sediments. Erosion is extensive from mined faces and waste rock dumps. No erosion and sedimentation controls are in place. Wastewater from local communities, and water collected from pits is discharged to watercourses. No major flooding was reported in Zone 1, but water runoff may impact downstream areas of Uru Creek due to higher water flow during the rainy season.

Three main villages are located in this zone and are home to approximately 900 residents. Some residential properties are located only a few metres away from the mine sites, and villagers' primary income is based on jade mining and jade scavenging through mine waste dumps. Two private health clinics and one school are located within the zone. Community-based groups have been established to carry out rescues after natural disasters and fires. A number of religious monuments are present, including pagodas, monasteries and churches. Graveyards (which have been moved twice) are the most significant cultural feature in Zone 1.

Project description (mining activities) and their impacts

The Hpakant/Lonkin Gems Tract is organised into jade mining areas known as maws. Concessions are granted within each maw and are demarcated with either a wooden post or rock piles. There are 23 maws located in Zone 1. The number of concessions within these maws is unknown. Large-scale mining and artisanal and small-scale mining are carried out in this zone.

Large-scale mining uses a combination of excavators and blasting to remove up to 250 m of overburden to expose the jade-bearing formations – Uru Boulder Conglomerate. The jade is extracted by drilling, blasting and sorting through the excavated material. Overburden and waste rock is disposed to waste rock dumps, with mining companies using a combination of mine site and common waste rock dumps in this zone. Recovered jade is sorted and graded before being formally declared and a royalty paid to MGE. Stone pickers (locally known as Yemasay) illegally work in mines and on waste rock dumps searching through active workings and waste rock dumps for smaller pieces of jade. Yemasay can be formed into groups who work under a 'lawpan' who provides them with accommodation, food, transport and tools, in exchange for a share of any jade found.

Mining impacts the physical, biological, social and cultural environment in Zone 1. Impacts arise from land disturbance (clearance of vegetation and earthworks), physical changes to watercourses and contamination of water, inappropriate waste disposal, generation of dust, noise and vibration, increased road traffic and other health and safety hazards. Towns, villages and settlements in Zone 1 also experience a range of impacts on livelihoods and amenity, from a loss of property and need for resettlement, to loss of access to traditional resources and religious sites. Mining also brings more people into the zone, with indirect health and economic impacts on local residents through, for

example, increased exposure to alcohol and drugs, and increased competition for jobs, and goods and services.

A detailed environmental and social risk assessment has been carried out to identify and assess environmental and social impacts. Most impacts can be managed with standard measures, procedures and good practice. The most significant residual impacts related to: unsafe mine sites and unsafe working practices, which, together with the large number of Yemasay on mine sites, could lead to serious injury and death; slope failure causing landslides; and flooding due to watercourses being infilled with sediment. These are major risks to people and property and the environment in Zone 1.

Mitigation measures

This EMP includes measures and procedures for managing all identified environmental and social impacts, with particular focus on the major and high residual impacts. These include standard management measures that apply to all mining phases and management measures that apply to each phase – before mining, during mining and after mining. The management measures and procedures are set out in management plans and procedures.

Standard management measures to be implemented are set out in the following plans and procedures:

- Code of Conduct that sets out the expected behaviour and responsibilities of workers and mining companies, including towards the environment and local communities.
- Community Grievance Mechanism.
- Incident Reporting Procedure.
- Land Access Management Plan (including resettlement and compensation).
- Cultural Heritage Management Plan.
- Non- hazardous Waste Management Plan.
- Chemicals and Hazardous Materials Management Plan.

Additional management measures to be implemented are set out in the following plans and procedures:

- Air Quality and Dust Suppression Management Plan.
- Biodiversity Management Plan.
- Community Support and Development Plan.
- Community Health, Safety and Security Management Plan.
- Erosion and Sediment Control Plan.
- Emergency Preparedness and Response Plan.
- Mine Closure Management Plan.
- Mine Pit and Waste Rock Dump Management Plan.
- Noise and Vibration Management Plan.
- Occupational Health and Safety Plan.

- Rehabilitation Management Plan.
- Water Management Plan.
- Worker Accommodation Management Plan.

Implementation and monitoring

Mining companies are responsible for implementing this EMP, and for ensuring their workers are trained in its requirements. Mining companies will provide the resources (people, equipment and funds) to properly implement this EMP and will demonstrate fulfilment of their commitment through inspection and monitoring, and reporting of their environmental and social performance.

This EMP is the first step towards improving the environmental and social performance of jade mining in the Hpakant/Lonkin Gems Tract and does not, at this stage, require full implementation of Myanmar National Environmental Quality (Emission) Guidelines. The EMP instead focusses on guidelines and standards that address the highest risks to the environment, communities and people.

Year 1 will establish the framework for implementing this EMP, including providing training and other resources, while in years 2 to 5 this EMP is to be implemented. During this period, regional monitoring will establish a baseline from which to determine the adequacy of the management measures and procedures in this EMP for managing environmental and social impacts. In Year 6, mining company performance will be reviewed, together with outcomes of the regional monitoring. The EMP will be revised at this point, including with a requirement for full compliance with National Environmental Quality (Emission) Guidelines. Five-yearly reviews of this EMP will occur thereafter.

Specific inspection and monitoring requirements are set out in each management plan and procedure of this EMP. Environmental monitoring of the Hpakant/Lonkin Gems Tract will be done via a regional monitoring network. Discharges to the environment from a specific mine must be monitored by the mining company (e.g., mining wastewater discharged to a watercourse). Regular audits and inspections also must be undertaken during mining, including monthly audits by ECD to assess compliance against this EMP. Other, ad hoc audits should be undertaken in response to, for example, a serious incident, after a storm event, and/or following an environmental-related complaint from the community.

The mining company will prepare an annual environmental compliance report that reviews mining performance against the requirements set out in this EMP. The report will include outcomes of inspections, monitoring and audits and will provide a summary of any major environmental incidents over the previous 12-month (calendar) reporting period. A copy of the annual environmental report will be provided to MGE and ECD for comment and review. All incidents must be reported and investigated in accordance with the Incident Reporting Procedure.

This EMP will be reviewed and revised in accordance with the transitional arrangements.

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1 Introduction

The Myanmar Gems Enterprise (MGE) of the Ministry of Natural Resources and Environmental Conservation (MONREC) is responsible for the regulation and marketing of jade and other gemstones in Myanmar. MGE seeks to improve regulation and the environmental and social performance of the jade mining industry in Myanmar. To achieve this, MGE has requested environmental management plans (EMPs) be prepared to improve environmental and social management of both existing and future jade mining.

MGE has instructed the Myanmar Gems and Jewellery Entrepreneurs Association (MGJEA) to act as the project proponent and fund the project. MGJEA has engaged Valentis Services Company Limited (Valentis), a Myanmar-based mining exploration and services company, and Coffey Myanmar Limited (Coffey), an international consulting company, to prepare EMPs for ten zones in the Hpakant/Lonkin Gems Tract in Kachin State, Myanmar (Figure 1.1). Each EMP applies to all mining activities in the zone, rather than for a specific mine.

This EMP covers large-scale mining within Zone 1. Figure 1.2 shows the location of this zone. This EMP establishes the framework for management of environmental and social impacts of jade mining in Zone 1 and will be the first step in the process required to improve the performance of the jade mining industry. This EMP is the first version; subsequent versions will introduce further management measures and requirements once satisfactory performance has been demonstrated.

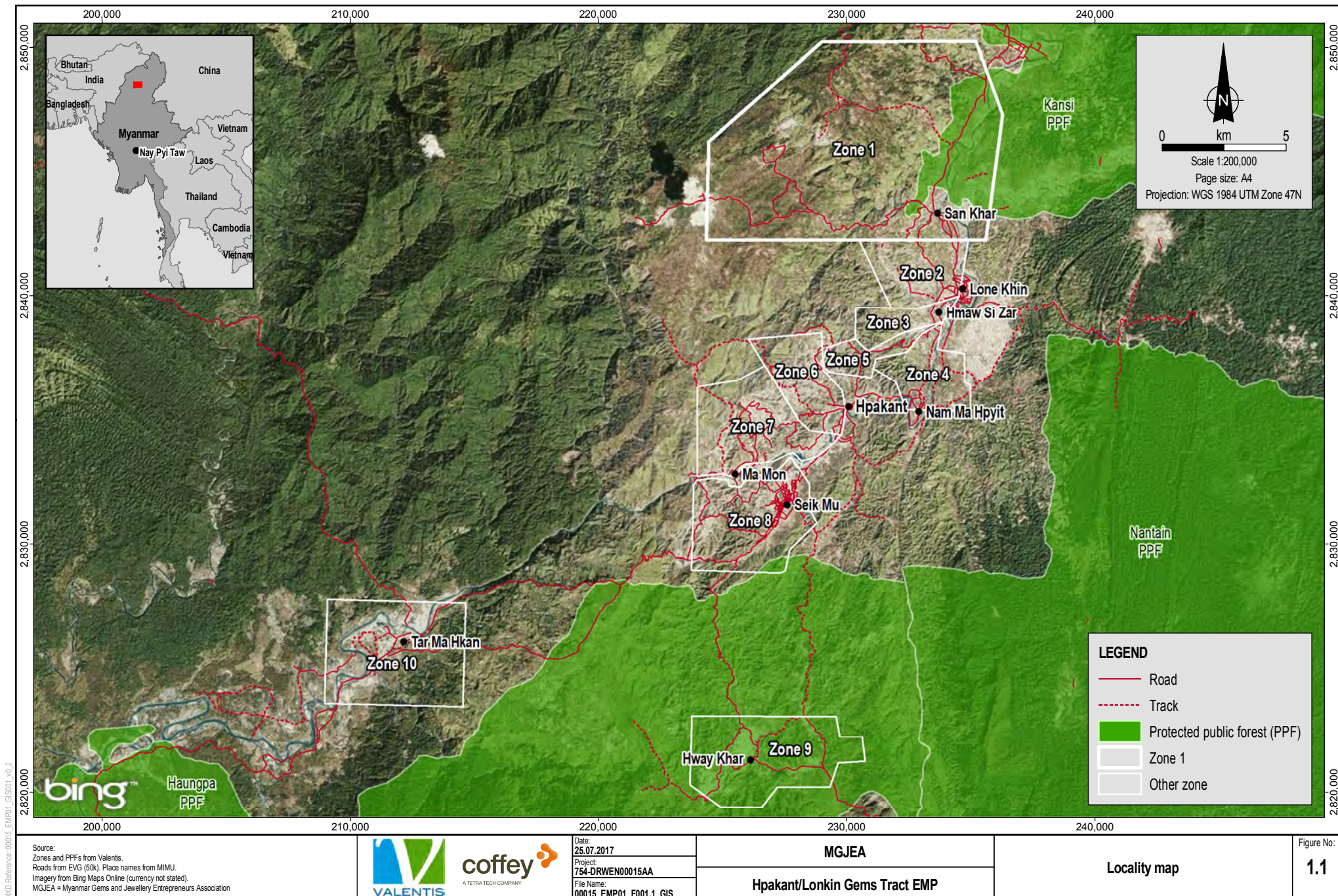
An advisory group comprising a diverse range of stakeholders has provided Valentis/Coffey with advice on the issues addressed in this EMP. The advisory group comprises representatives of Myanmar Government regulatory authorities, Kachin State Ministers, Estelle Levin Limited (ELL), jade miners and non-government organisations. Field visits have also been undertaken to the Hpakant/Lonkin Gems Tract.

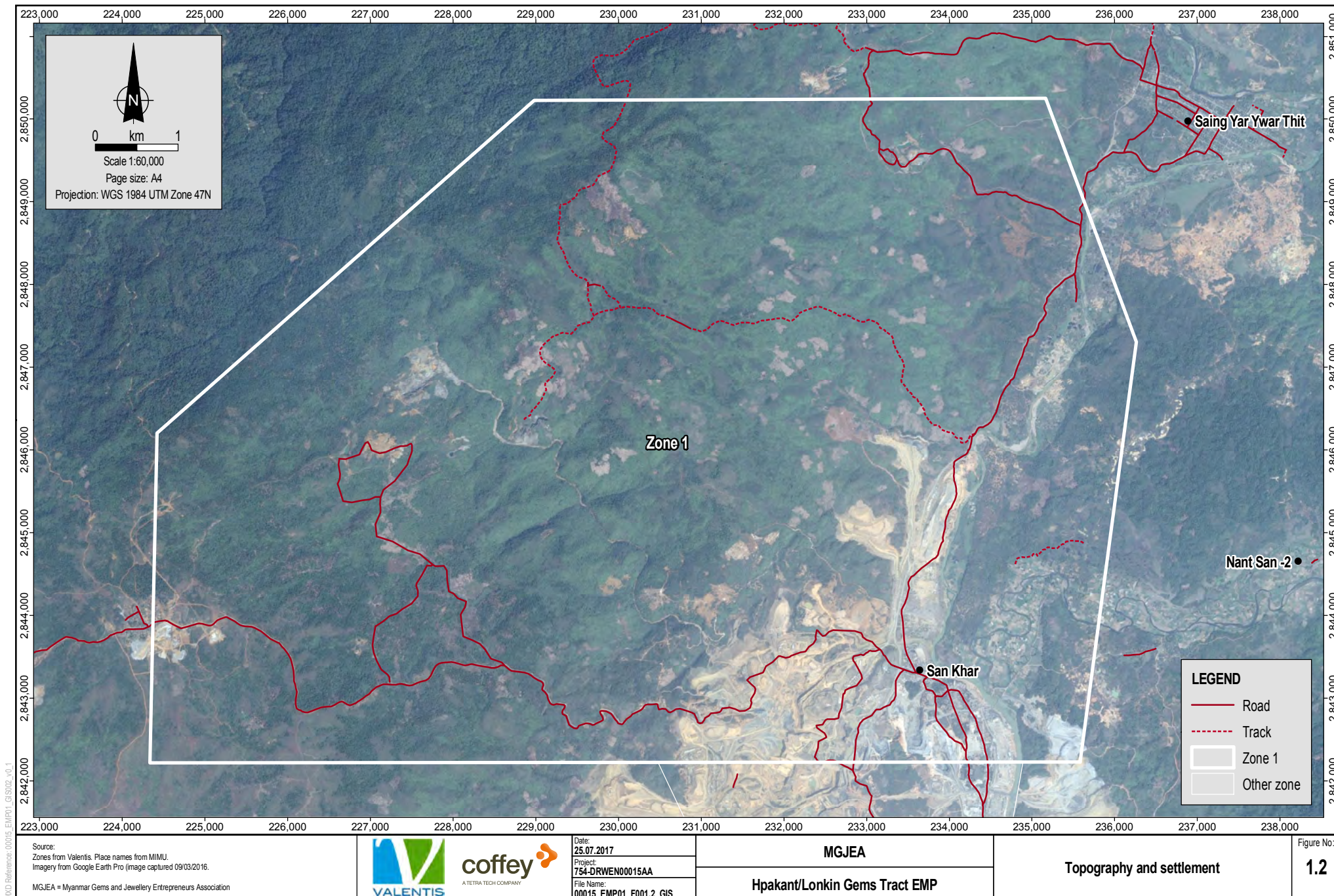
1.1 Background

Myanmar is widely considered to produce the best jade in the world, with considerable and growing demand both locally (shops and markets across Myanmar) and internationally (at the annual Gems Emporium). Myanmar jade accounts for approximately 90 percent of the world's jade and commands the highest prices at market (Irwin, 2016). The Hpakant/Lonkin area of Kachin State is the main jade-producing area of Myanmar, followed by the Hkmati area in Sagaing Region.

The large scale, mechanised and intensive jade mining at Hpakant/Lonkin started as recently as the mid-1990s. Prior to this time, the majority of the jade mining was smaller scale, subsistence mining.

A moratorium was in place on jade production in Hpakant from March 2012 until September 2014 after the breakdown of a 17-year ceasefire agreement between the government and the Kachin Independence Organisation in 2011 (Irwin, 2016). Operations were temporarily halted in 2015 when renewed fighting broke out and resumed in March 2015 (Irwin, 2016). The scale of jade mining has increased significantly after the official resumption in late 2014, with mining companies relying on more and more powerful and sophisticated equipment.





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2 Definitions

Affected party – a person or persons or organisation impacted by mining activities.

Ambient air quality – the quality of the outside air environment.

Aquatic – in respect of biodiversity, refers to plants and animals living or found in or near water.

Artisanal and small-scale mining – mining with hand tools and small machines. Hand tools include iron bars, diamond-tipped hammers, picks and hoes. Machines include water pumps and hoses to hydraulically expose jade and alluvial gold-bearing ore, and sluice boxes to capture alluvial gold. In some instances, an excavator and several small trucks may be used to remove overburden and excavate jade and alluvial-gold bearing ore.

Biodiversity – the variety among all living things including the different plants, animals and microorganisms, the genetic information they contain, and the ecosystems that they form.

Boom – a temporary barrier used to contain a spill.

Bund – a secondary containment system comprising a wall or container of sufficient capacity to contain all the stored liquid. Also, a stone or earth formed into an embankment to hold back water or other liquid (in the case of a spill).

Catchment area – an area where all runoff from rainfall drains to a watercourse, lake or the sea. A catchment area may comprise several smaller catchments.

Chance find – an unexpected discovery of cultural heritage.

Chemical – a compound that has been artificially produced and occurs in solid or liquid form.

Closure – the process of closing a mine once operations and decommissioning are finished. Closure involves the final rehabilitation of the mine and monitoring to evaluate progress against closure objectives.

C:N:P – ratio of carbon, nitrogen and phosphorous in fertiliser.

Communicable disease – an infectious disease transmissible from person to person either by direct or indirect contact.

Community – a group of people who share a common sense of identity and interact with one another on an ongoing basis.

Community Reference Group – a group formed of members of the community to facilitate communication between mining companies and local residents, including for the community to raise issues and concerns, to inform the community about jade mining activity and social development progress, and to address issues related to involuntary resettlement and indigenous peoples.

Competent waste rock – rock and subsoil that will not slump or erode to such an extent that the effectiveness of the constructed landform is reduced.

Complaint – a formal expression of discontent concerning a mining company action raised by an affected party.

Corporate social responsibility – corporate social responsibility (CSR) is a mining company's initiatives to assess and take responsibility for the environmental and social impacts of its activities.

Corrective action – an action taken to correct a situation that has already occurred to improve a process or procedure to eliminate the causes of non-conformance and to prevent recurrence of incidents.

CSR fund – as specified by The Second Amending Law of the Myanmar Gemstone Law (2016), a fund not less than two percent of the investment for health, education, transportation and other developments of the related work area.

Cultural heritage – a site, building or artefact having historical, religious, cultural, or archaeological significance, including graveyards and burial sites. A site, building or feature defined under applicable laws.

Cut-off drain – a channel dug into the ground upstream of a mine face to collect and divert water away from the mine face.

Decommissioning – the process of preparing a mine for closure. It begins at the end of mining and involves demolition and disposal of all unwanted infrastructure and services.

Dewatering – the process of draining (either partially or wholly) an aquifer. This may occur via artificial processes (i.e., pumping) or natural processes (i.e., spring discharge).

Direct seeding – the sowing of a mix of seeds harvested from local species to promote a structurally diverse ecosystem that has components of the pre-clearing native vegetation.

Diversion bund – a mound of earth constructed to divert water away from slopes or mine faces. Often constructed in conjunction with a cut-off drain.

Drainage line – a depression or low point that will collect water and cause it to flow downhill.

Explosive charge – explosive material inserted or poured into a blast hole and set off using a detonator.

Emergency – a present or imminent event that requires prompt coordination of actions, or special regulation of persons or property, to protect the health, safety, or welfare of people or to limit damage to property and the environment.

Firebreak – an obstacle to the spread of fire, such as a strip of open space in a forest or a strip of bare land in a grassed area.

Grievance – a complaint lodged by an affected party alleging damage, impact, or dissatisfaction specifically resulting from the actions, or a lack of action, by a mining company. A grievance is usually raised with the expectation of a corrective action, compensation or both.

Greywater – wastewater generated at accommodation camps and offices from sinks, showers/baths, laundry and other domestic appliances.

Guideline values – maximum concentrations or specified ranges of concentrations of a pollutant that should not be exceeded.

Habitat – the area or natural environment in which an organism (plant, animal, micro-organism) or population of organisms naturally grows or lives, and includes physical (e.g., soils, climate) and biological (e.g., vegetation, food sources) aspects of that environment.

Hazardous material – any solid, liquid or contained gaseous substance with properties that make it potentially dangerous or harmful to human health, safety and/or the environment. Hazardous properties might include the following:

- Flammable i.e., burns easily.
- Corrosive e.g., very high (alkaline) or low (acid) pH.
- Reactive e.g., explosive or toxic.
- Biological e.g., medical waste.

Hazardous waste – any unwanted or unusable hazardous material.

Hydraulic jetting – a stream of water delivered by a high-pressure hose at a face to dislodge and wash away soils or subsoils to expose jades (historically known as placer mining).

Incident – a specific event or sequence of events that result in unwanted or unintended impact on the environment, safety, security, health, the livelihoods of people and/or an impact on property, or on legal/regulatory compliance.

Infection control procedures – measures taken to minimise the risk of spreading infections.

Involuntary resettlement – the involuntary taking of land resulting in relocation, loss of shelter, loss of assets, or loss of means of livelihood. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood as a result of project-related land acquisition and/or restrictions on land use).

Landfill – a system of rubbish disposal in which waste is buried in an excavated hole in the ground. A landfill may be unlined, or where practical, lined with an impermeable material such as clay or geotextile fabric.

Large-scale mining – mining using heavy machinery including fleets of vehicles, haul trucks, excavators, and other plant and equipment to excavate large volumes of overburden and jade bearing material.

Material Safety Data Sheet (MSDS) – a document that provides health and safety information about products, substances or chemicals that are classified as hazardous or dangerous goods.

Mine face – the active working part of an open pit.

Mine wall – the walls of an open pit.

Mining company – a company, joint venture, cooperative, persons or person holding a permit to produce gemstone from a gemstone block or concession.

Misfire – the situation where an explosive charge fails to explode or only partially explodes leaving unexploded charges in the blast hole.

Natural hazard – a naturally occurring event that can have a negative effect on people, property or the environment. Natural hazards include earthquakes, landslides, storms, flooding and fire.

Near miss – an unplanned event that could have resulted in injury, illness, danger to health, environmental harm or property damage.

Non-conformance – non-fulfilment of a requirement of this EMP and/or applicable laws and rules.

Non-hazardous waste – any unwanted or unusable solid, liquid or gaseous substance that does not pose an immediate hazard to human health, safety and/or the environment.

Open-pit mining – the process of excavating rock or minerals from the earth by their removal from an open pit.

Overburden – rock or soil overlying a mineral deposit or gemstone bearing formation.

Pit toilet – a type of outdoor toilet excavated in the ground, used where it is impractical to provide a standard, flushing-type toilet.

PPE – personal protective equipment. Refers to specialised clothing or equipment worn by workers for protection against health and safety hazards at a work site. As a minimum, PPE would include high-visibility clothing or vest, long trousers, long-sleeved shirt, boots and gloves. Where needed PPE would include a safety helmet, safety glasses, ear muffs, a face mask and breathing apparatus.

Preventative action – an action taken before a situation has occurred to improve a process or procedure to eliminate the causes of non-conformance and to prevent recurrence of incidents.

Progressive rehabilitation – the process of rehabilitating disturbed areas (for example, mine batters) that are no longer necessary for mine operation.

Recyclable non-hazardous waste – non-hazardous waste that is recovered and treated or processed into products, materials or substances, whether for the original or other purposes. Commonly recycled waste includes glass, paper, cardboard and some plastics.

Rehabilitation – the process of stabilising and revegetating disturbed areas (for example, mine batters) to create a stable landform, stable drainage and self-sustaining vegetation.

Relevant authority – the Ministry of Natural Resources and Environmental Conservation or its delegated authority for jade mining, as set out in The Myanmar Gemstone Law.

Reusable non-hazardous material – non-hazardous material that instead of becoming waste is used again for the same purpose or is reused for another purpose. Reuse is a type of waste prevention and commonly includes materials such as wood.

Revegetation – the act or process of preparing disturbed land to establish the right conditions to encourage a new vegetative cover by natural processes such as plant colonisation and succession, or manmade/active accelerated processes such as direct seeding or seed propagation and planting.

Riparian – relating to the area adjacent to or situated on the banks of a watercourse or waterbody, for example river banks and or lake shores.

Runoff – water flowing across land following rainfall.

Sediment basin – a large pond or dam or series of ponds and dams constructed to collect stormwater runoff and allow sediment to settle. They can be excavated into the ground or constructed as an aboveground structure.

Sediment trap – a structure constructed across a drainage line to slow water and cause suspended soil to settle. Typically excavated into the ground and constructed of rocks and gravel.

Sensitive receptor – areas occupied or buildings inhabited by people who are more susceptible to the adverse effects of exposure to noise or other emissions such as air pollutants, and usually include houses, schools, hospitals, drug rehabilitation centres and monasteries.

Septic system – a self-contained, onsite collection and treatment system that collects sewage (human waste) and greywater in a septic tank. The tank is usually a buried watertight chamber made of concrete, fibreglass, PVC or plastic where solids (sludge) settles to the bottom, with liquids on the top. The liquid effluent then flows by gravity or is pumped to a series of infiltration drains buried in the soil.

Silt fence – a fence placed across a drainage line to slow water and cause suspended sediment to settle. Typically made of straw bales or woven mats or fabric.

Sluicing – a process to recover jades and gold by washing jade and gold bearing material through a sluice box with water. Gold or jades are collected in the riffles or ribs at the bottom of the box. Waste soil is washed from the box by the steady stream of water. Larger stones are often removed by hand and discarded.

Spill kit – a compilation of absorbent materials, cleaners and chemical neutralisers used to contain accidental spills.

Terrace – to ensure the stability of open pit mining using terraces or benches.

Vegetation – a group or assemblage of plants growing in a certain area or a specific region.

Waste rock – all material excavated to recover gold and/or jade.

Waste rock dump – designated area for the disposal of overburden and waste rock.

Watercourse – a creek, stream, river or other water channel, either natural or man-made, temporary or permanent.

Worker – any person working for a mining company including all mining company owners, employees, contractors, subcontractors and family members.

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3 Project description (mining activities)

The mining tenure and mining methods used in this zone are described in this section.

3.1 Mining tenure

The Hpakant/Lonkin Gems Tract is organised into jade mining areas known as maws. There are 109 maws. Concessions are granted within each maw and are demarcated with either a wooden post or rock piles. Maws located in this zone include:

- Kadamaw.
- Katta.
- San Ka Htan.
- SanKar.
- Taw Maw (Yan pyo).
- Taw Maw (La Jaung).
- Du Maw.
- Pan Kyar Maw.
- Pa Wa.
- Myin Maw.
- Maw Sit.
- Maw Kyein.
- Shwe Win Maw.
- Lay Aein Su.
- La Gaung.
- Wa Lu.
- War Kyel.
- War Toe.
- Aung Sein.
- Aba (U Pai).
- Bone Gar.
- War Boe (U Pai).

The number of concessions within these maws is unknown.

3.2 Mining methods

Large-scale mining uses a combination of excavators and blasting to remove up to 250 m of overburden to expose the jade-bearing formations – Uru Boulder Conglomerate. The jade is extracted by drilling, blasting and sorting through the excavated material. Sorting is done at the mine site or at a sorting facility. Water is used in some sorting operations to wash soil from the jade stones.

Overburden and waste rock from sorting is disposed to waste rock dumps, typically located off the concession. Mining companies use a combination of mine site and common waste rock dumps in this zone.

Recovered jade is sorted and graded before being formally declared and a royalty paid to MGE. The jade is then stored for later sale at the annual Gems Emporium, or sold directly to a licenced trader, or informally traded/transported.

Stone pickers (locally known as Yemasay) illegally work in mines and on waste rock dumps. They search through the active workings and waste rock dumps for smaller pieces of jade. Yemasay can be formed into groups who work under a 'lawpan' who provides them with accommodation, food, transport and tools, in exchange for a share of any jade found.

A detailed description of large-scale mining is presented in the following sections.

3.2.1 Mining method

Large-scale mining uses conventional open pit mining methods (Plate 3.1). Typical open cut mining involves:

- **Vegetation clearing.** Forest is cleared and clearing residue burnt or used for firewood and building materials.
- **Overburden removal.** Overlying soil and rock is removed to expose the Uru Boulder Conglomerate, the jade bearing formation. Thickness of the overburden layer varies from a few meters to several hundred meters. Overburden is transported to designated waste rock dumps.
- **Blasting.** Once the jade-bearing formation is exposed, drilling and blasting is used to loosen the bed.
- **Sorting.** After blasting, excavators spread the ore to expose jadeite in a sorting area. Workers locate the jadeite manually. In some mines, ore is transported to ore storage locations for subsequent sorting. Jadeite is heavier than the other material and detected by its weight as it drops from the excavator bucket. Diamond-tipped hammers are used to chip suspected boulders/stones to confirm they are jadeite. Jadeite produces a different sound when struck. Chipped areas enable the inside of the boulder or stone to be seen and a light shone through the chipped area can confirm the assessment and give an indication of the quality of the jadeite.
- **Waste disposal.** After jadeite has been recovered the remaining waste is transported to the waste rock dump.



Source: Soe Moe Kyaw Win

Plate 3.1 Large-scale mining to expose deep Uru Boulder Conglomerate

3.2.2 Mining equipment

The main equipment used typically consists of:

- Drill rigs for preparing blast holes. Typical equipment used includes Furukawa drill rigs which can drill up to 12 feet (3.6 m). Mines typically have 3 to 4 drill rigs.
- Tracked excavators for excavating overburden and jade-bearing material. Typical fleets in this zone comprise 10 to 30 excavators of varying capacity.
- Haul trucks for transporting jade-bearing material and waste rock. Fleets comprise 30 to 50 30-tonne trucks in various configurations. Each truck makes 8 to 10 trips per day to the waste rock dump.

Excavators, trucks and vehicles are regularly serviced and refuelled at the maintenance workshop. Some refuelling and repairs are done at the mine site.

3.2.3 Workforce and administration

The average workforce consists of 600 workers who work two shifts. Workers are paid overtime for hours worked beyond the standard 8-hour shift. They do not employ people under 18 years of age.

Most mines have an administrative office, kitchen, maintenance workshop, health clinic, workers accommodation, dining hall, and dormitory type and shared bathing facilities. Some mine sites provide a recreation ground. Worker accommodation facilities are located separate to the fuel and firewood storage areas.

The administrative work is divided into different parts and managed by assigned supervisors. Typical roles include:

- Heavy machinery supervisor.
- Workforce supervisor.
- Kitchen supervisor.
- Blasting supervisor.
- Mine pit manager (Kyin Kaung).

3.2.4 Mine plan

Mostly, there is no proper mine plan. Mining is based on experience. The Uru Boulder Conglomerate is located based on the experience of adjacent mines, with black and reddish-coloured conglomerates being a very good indicator of jadeite-bearing formations. Similarly, blasting is done through experience based on rock type and depth. No rehabilitation is done and there are no plans for mine closure including backfilling mines and final rehabilitation.

3.2.5 Groundwater and surface water management

Mines in this zone have intercepted groundwater which seeps from unconsolidated aquifers most likely associated with the bedding planes of the Uru Boulder Conglomerate and overlying formations (see Plate 3.1). Discharges will vary with the seasons and recharge zones for the aquifers. Less discharge is observed in the dry season.

Surface water runoff collecting in the pits in the wet season is collected in sumps and pumped out of the pit to adjacent drainage lines where it flows to watercourses that discharge to Uru Creek.

3.2.6 Blasting

MGE has issued notifications regarding blasting times. Blasting is approved three times a day (7:00 am, 11:00 am, 4:00 pm). Ammonium nitrate mixed with diesel fuel is used for explosive material. Ammonium nitrate is supplied by a production facility at Lonkin. Before blasting, mine operators display a warning sign indicating a blast is about to occur. Whistles are blown one hour before the blast and workers in the area are informed using radios.

3.2.7 Waste rock disposal

Waste rock is disposed both within the concession area and out of the concession area. Some of the waste rock is deposited within the concession area as backfill in the open pit, the rest is deposited in waste rock dumps. The remaining waste rock is disposed out of concession area. There is one common waste dump in this zone, with 11 common waste rock dumps identified and being established in zones in the Hpakant/Lonkin Gems Tract.

3.2.8 Hazardous materials and waste management

Fuel is stored in large tanks, typically 15,000 gallons (approximately 56,000 L). Up to 70 tanks are kept at mine sites, with at least 30 tanks full at any time depending on the number of excavators and trucks in the mine fleet. Mining equipment is typically refuelled near the fuel storage area.

Ammonium nitrate is stored separate to the fuel storage area in a warehouse. Sufficient stocks are kept for proposed blasting activities. Up to 50 sacks of ammonium nitrate are used each day when blasting is being conducted.

Flammable materials such as used engine oil, firewood, and plastic containers are kept at mine sites. Used engine oil, oil filters and some broken engines are sold to people who process and on sell or dispose of the hazardous waste.

There is no formal reuse or recycling system. There is typically no community or government-managed waste collection service. Domestic waste and waste from worker accommodation is buried on site or mixed with waste rock and disposed in waste rock dumps.

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4. Commitment

Project Proponent's letter of endorsement

According to Environmental Impact Assessment Procedure – clause 77, the project proponent endorses that the following data are correct.

- (a) The Environmental Management Plan (EMP) is accurate and complete.
- (b) The EMP has been prepared in strict compliance with applicable laws including Environmental Impact Assessment Procedures.
- (c) The commitments, mitigation measures and plans in Environmental Management Plan (EMP) will always be complied at all times **where applicable**.

Name
LA HPAI HKUN SA
Position
CHAIRMAN
MYANMAR GEMS & JEWELLERY
Signature
ENTREPRENEURS ASSOCIATION

For and on behalf of the Myanmar Gems and Jewellery Entrepreneurs Association

Date 18.7.2019

5 Environmental management framework

The Myanmar laws, rules and guidelines that require environmental and social impacts of jade mining to be managed and the objectives of this EMP are set out in this section.

5.1 Myanmar laws, rules and guidelines

The Myanmar laws, rules and guidelines that must be complied with in implementing this EMP are listed in this section. Relevant laws, rules and guidelines are included in the management plans.

Myanmar citizens' rights

Constitution of the Republic of the Union of Myanmar, specifically:

- Article 21(a) Every citizen shall enjoy the right of equality, the right of liberty and the right of justice, as prescribed in this Constitution.
- Article 34 Every citizen is equally entitled to freedom of conscience and the right to freely profess and practise religion subject to public order, morality or health and to the other provisions of this Constitution.

Regulating gemstone production

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 4(d) empowers the Ministry of Mines to acquire land or legally transfer land with the consent of the owner that is within a gemstone tract.
- Section 15(b) requires the Ministry of Mines to issue a gemstone production permit if the applicant pays the determined price within the specified time.
- Section 15(c) requires the Ministry of Mines to determine the tenure and price of any extension of a small-scale gemstone production permit.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

Protecting the environment

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.

- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

Environmental Conservation Rules (2014), specifically:

- Rule 68, requires owners of small enterprises to obtain the Environmental Conservation Department's advice regarding impacts of its business before applying for a licence to operate the business.

Environmental Impact Assessment Procedure (2015), specifically:

- Articles 102 to 110 set out a project proponent's legal and financial obligations, and obligations to monitor its preconstruction, construction, operation, decommissioning, closure and post-closure activities, and to comply with applicable laws, rules, standards, the EMP and ECC.
- Article 113 requires a project proponent to grant the Ministry or its representatives access to its sites for monitoring and inspection purposes.
- Article 115 requires a project proponent to grant immediate access to its site in event of emergency or where there is a risk of non-compliance with environmental and social requirements.
- Article 117 requires a project proponent to grant the Ministry rights of access to the proponent's contractors and subcontractors.

National Environmental Quality (Emission) Guidelines set out noise, air emission and water discharge criteria for protecting human and ecosystem health.

The Foreign Investment Law (2012), specifically:

- Section 4(c) restricts or prohibits businesses established with foreign capital which cause damage to the natural environment and ecosystems.

Protecting biodiversity

The Protection of Wildlife and Conservation of Natural Areas Law (1994), specifically:

- Section 36 makes it an offence to kill, hunt, wound, possess, or sell normally protected wild animals, extract, collect or destroy wild plants; destroy an ecosystem or any natural area, or interfere with the boundary of a natural area without permission from the Director General of the Forest Department.
- Section 37 makes it an offence to kill, hunt, wound, or sell completely protected wild animals, or export a completely protected wild animal or protected wild plant and any part thereof without permission from the Director General of the Forest Department.

The Forest Law (1992), specifically:

- Section 4 empowers the Minister for Forests to reserve forest for the protection of watersheds and catchments, and conservation of the environment and biodiversity.
- Section 5 empowers the Minister for Forests to declare areas outside reserved forests for the protection of water and soil, conservation of dry-zone forests, the environment and biodiversity.

Protecting rivers, water resources and fisheries

The Conservation of Water Resources and Rivers Law (2006), specifically:

- Section 8 prohibits persons doing works on watercourses or changing watercourse channels that ruin or cause waste of the water resources.
- Section 11(c) prohibits persons from disposing of soil and other materials from mining into watercourses or waterbodies or gullies which flow to watercourses or waterbodies.
- Section 22 requires persons to obtain permission to stockpile materials on river banks and waterfronts.

The Conservation of Water Resources and Rivers Rule (2013) prohibits dumping of rubbish and dangerous materials in rivers.

Freshwater Fisheries Law (1991), specifically:

- Section 36 requires permission from the Department of Fisheries to construct, maintain or use a dam, bank or weir on freshwater fishery waters.
- Section 40 prohibits persons from harassing fish or aquatic organisms or polluting their habitat.
- Section 41 prohibits persons from affecting water quality and quantity in a leasable or reserved fishery and the rivers and creeks supplying water to that fishery.

Protecting cultural heritage

The Protection and Preservation of Antique Objects Law (2015), specifically:

- Section 12 requires anyone who finds an antique object to notify the relevant ward or village tract administrator.

The Protection and Preservation of Ancient Monuments Law (2015), specifically:

- Section 15(f) requires a person to obtain prior permission from the Department of Archaeology and National Museum to dig, quarry or mine within the specified area of an ancient monument which includes buildings, religious buildings and structures, natural and manmade caves, and other manmade structures and features.

The Protection and Preservation of Cultural Heritage Regions Law (1998), specifically:

- Section 13 requires a person to obtain prior permission from the Department of Archaeology for work within an ancient monument site or zone, on a building within a zone, in a cultural heritage region, and to construct a bridge, canal or embankment, or carry out an archaeological excavation.

- Section 22 requires buildings in cultural heritage regions to be constructed in accordance with conditions set by the Ministry of Culture.

Protecting public and worker health

Public Health Law (1972), specifically:

- Section 3(1) requires the government to advise, inspect and supervise activities for a healthy environment including garbage disposal, drinking water, pollution and building construction and maintenance.
- Section 3(4) requires the government to prevent and eliminate contagious diseases including through public vaccination programs.
- Section 4 empowers the government to form, direct and advise groups and government ministries and departments on public health matters set out in this law.
- Section 5 grants organisations appointed by the government to carry out inspections of workplaces, shops and buildings regarding environmental health matters including food, products, housing and private clinics.

The Prevention and Control of Communicable Diseases Law (2015), specifically:

- Section 3 requires the Department of Health to immunise children against communicable diseases and educate people about these diseases to prevent outbreaks.
- Section 4 requires the Department of Health to control the spread of an outbreak of a principal epidemic disease or notifiable disease through immunisation and other measures.
- Section 9 requires households to report communicable disease outbreaks to the nearest health department office or hospital.
- Section 11 outlines the measures a health officer may take to prevent and control the spread of communicable diseases including inspections and medical examinations.

The Control of Smoking and Consumption of Tobacco Product Law (2016), specifically:

- Section 9 requires non-smoking areas to be designated, clearly marked and supervised.

Protecting workers' rights

Myanmar Investment Law (2016), specifically:

- Section 51 requires investors to employ qualified people as senior managers, and technical and operational experts, and to ensure they have the entitlements and rights of labour laws and rules.
- Section 73 requires the investor to obtain and maintain the type of insurances stipulate in the rules.

Minimum Wages Act (2013), specifically:

- Sections 12 and 13(a) to (g) which set out the duties of an employer to pay minimum wages.

Payment of Wages Law (2016), specifically:

- Sections 3 to 5 which set out the methods and timeframes for payment of wages.
- Sections 7 to 10 which set out the wage deductions employers are entitled to make.
- Section 14 which set out the requirement for employers to pay overtime wages in accordance with the law.

The Leave and Holidays Act (1951) sets out worker's entitlements to public holidays and annual leave.

Employment and Skill Development Law (2013), specifically

- Section 5 requires an employment agreement and sets out the content of the agreement.
- Section 14 requires an employer to train employees in the type of work they are being employed to do.
- Section 30(a) and (b) requires employers to make monthly payments to a training fund not less than 0.5% of total wages for the company.

The Labour Organisation Law (2011), specifically:

- Section 17 permits labour organisations to draw up their constitution and rules, and gives them the right to negotiate with employers.
- Section 18 grants a labour organisation the right to request an employer reappoint employees if their dismissal relates to their membership of a labour organisation.
- Section 19 gives labour organisations the right to represent workers in settling a dispute before the Conciliation Body.
- Section 20 gives labour organisations the right to participate in discussions with the government, employers and complaining workers on their rights.
- Section 21 gives labour organisations the right to participate in collective bargaining in accordance with the labour laws.
- Section 22 requires labour organisations to conduct their activities peacefully.

The Settlement of Labour Disputes Law (2012), specifically:

- Section 38 requires employers to negotiate a complaint within a prescribed period.
- Section 39 does not allow employers to alter a worker's conditions during or after a dispute that is before an arbitration body or tribunal.
- Section 40 prohibits employers locking out workers or workers striking over a dispute without seeking to negotiate or seeking conciliation or arbitration by an arbitration body or tribunal.
- Section 51 requires employers to compensate workers whose benefits are reduced as a result of a dispute.

The Social Security Law (2012), specifically:

- Section 11(a) requires companies to register for the social security system and benefits contained in law if they employ a minimum or greater number of people determined by the Ministry of Labour.
- Section 15(a) outlines funds included in the social security fund including health and social care, family assistance, and invalidity, superannuation, survivors and unemployment benefits, and social housing plan.
- Section 18(b) requires employers to deduct contributions from workers' wages and to pay that money and the employers contribution to the social security fund.
- Section 48 requires employers to have insurance for the employment injury benefit fund, and workers to submit a medical certificate when claiming against the fund.
- Section 49 states employees covered by the employment injury benefit fund under this law, cannot make claims under the Workmen's Compensation Act 1923.
- Section 75 sets out employers' obligations to maintain records of employee appointment, contact details, work, injuries and termination, and to make that information available to the social security offices on request.

The Workmen's Compensation Act (1923), sets out an employer's obligations to arrange for injured workers to be treated and compensated for injuries sustained while working.

The Electricity Law (2014), specifically:

- Section 59 requires a company or person holding a licence to do electricity-related work to compensate persons injured, disabled or killed by electrocution or fire caused by an electrical fault in accordance with the applicable labour compensation law or the provisions of this law.

Managing dangerous goods and products

The Indian Explosives Act (1884), specifically:

- Section 5 requires a licence to manufacture, possess, use, sell, transport and import explosives.
- Section 7(a) grants the government or local administration the right to enter any place to inspect and examine the manufacture, possess, use, sell, transport and import of explosives if they believe the licence conditions are not being met.

The Explosive Substance Act (1908), specifically:

- Section 3 prohibits unlawful or malicious use of explosives to harm people and prescribes the punishment for such acts.
- Section 4 prohibits unlawful or malicious intent to use explosives to harm people and prescribes the punishment for such acts.
- Section 5 prohibits persons having in their possession explosive substances for suspicious activities and prescribes the punishment for such acts.

The Petroleum and Petroleum Products Law (2017), specifically:

- Section 9 requires a licence from the Ministry of Transportation and Communication to transport petroleum and petroleum products in vehicles, boats, barges and trailers. It requires accidental leaks and spills to be cleaned up in accordance with current laws.
- Section 10 requires a licence from the Ministry of Natural Resources and Environmental Conservation for the storage of petroleum and petroleum products and for the transportation of petroleum and petroleum products.
- Section 11 requires dangerous petroleum and petroleum products to be clearly marked with appropriate signage.
- Section 31 outlines obligations of license holders to protect the environment from accidental leaks and spills of petroleum and petroleum products.

Managing road transport and motor vehicles

Motor Vehicle Law (2015) requires motor vehicles to be registered and drivers to be licensed for particular types of vehicles. It aims to provide a safe and efficient road network and to reduce pollution from motor vehicles.

Providing emergency response capability

Myanmar Fire Department Law (2015), specifically:

- Section 25 requires owners of offices and accommodation facilities or a fire-prone industry to have fire-fighting capabilities and provide fire-fighting and safety equipment.

Using appropriately qualified experts

The Myanmar Engineering Council Law (2013), specifically:

- Sections 20 to 25 allow suitably qualified persons to apply for registration as a graduate technician or technician, and the Myanmar Engineering Council to issue a certificate of registration.
- Sections 26 to 30 allow suitably qualified persons to apply for registration as a registered engineer, and the Myanmar Engineering Council to issue a certificate of registration.
- Section 31 grants registered graduate technicians, technicians and engineers the right to practice their relevant discipline or area of expertise and requires them to abide by the laws, rules and procedures issued under the law.

5.2 Requirement for implementation of this EMP

Jade mining is authorised and regulated by the Myanmar Gemstone Law. The Second Amending Law of the Myanmar Gemstone Law (2016) requires the environmental and social impacts of jade mining to be managed.

Article 3(f) states the objectives of the law are “*not to impact the activities of environmental conservation by gemstone production*”.

Article 16(f) requires the gemstone production permit holder to “*abide by the rules, procedures, orders and directives issued under this Law in respect of the following matters*”. Article 16(f)(5) states “*making provisions for the prevention of detrimental effects on the environmental conservation works due to gemstone production operation.*”

Article 46(a) requires the gemstone production permit holder to “*respect to be the least of environmental impact and not to have social impact of the public in carrying out the process of production of gemstone*”.

Article 54 provides the powers necessary for the Ministry of Mines, the Department of Mines and the Myanmar Gems Enterprise to issue notifications, orders, directives and procedures. Article 54 states:

54. In implementing the provisions of this Law:

(a) The Ministry of Mines may issue rules, regulations and bye-laws with the approval of the Union Government;

(b) The Ministry of Mines may issue notifications, orders, directives and procedures;

(c) The Department of Mines and Myanmar Gems Enterprise may issue orders and directives with the approval of the Ministry of Mines.

The Environmental Impact Assessment (EIA) Procedure (2015) sets out the requirements for the environmental and social impact assessment of projects and their environmental management.

Annex 1 lists the activities for which environmental and social impact assessment is required and the type of impact assessment required for the activity. No 136 requires an Initial Environmental Examination (IEE) to be prepared for precious stone mining covering an area less than 20 ha and less than 50,000 tonnes per annum. An Environmental Impact Assessment (EIA) is required for precious stone mining covering an area greater than or equal to 20 ha or greater than or equal to 50,000 tonnes per annum.

Large-scale jade mining activities might trigger the need for an IEE or EIA depending on the volume of jade produced. Medium-scale, small-scale and artisanal mining activities are unlikely to trigger the need for an IEE or EIA to be prepared.

Where mining activities were in progress before the introduction of the Environmental Conservation Rules, Article 8 of the EIA Procedure requires an Environmental Management Plan (EMP) to be prepared and to be informed by an environmental and social audit. The EMP and Environmental Compliance Certificate (ECC) would apply to a specific mine. This EMP has been prepared for a zone and all jade mining activities in the zone.

MGE and the Department of Mines may, with the approval of the Ministry of Mines, issue orders and directives. MGE has issued numerous notifications and letters to mining companies in the Hpakant/Lonkin Gems Tract requiring improved environmental and social performance. MGE or the Department of Mines could require the EMP to be implemented by existing and new jade mines by issuing an order or directive. Figure 5.1 shows three ways in which the EMP could be implemented.

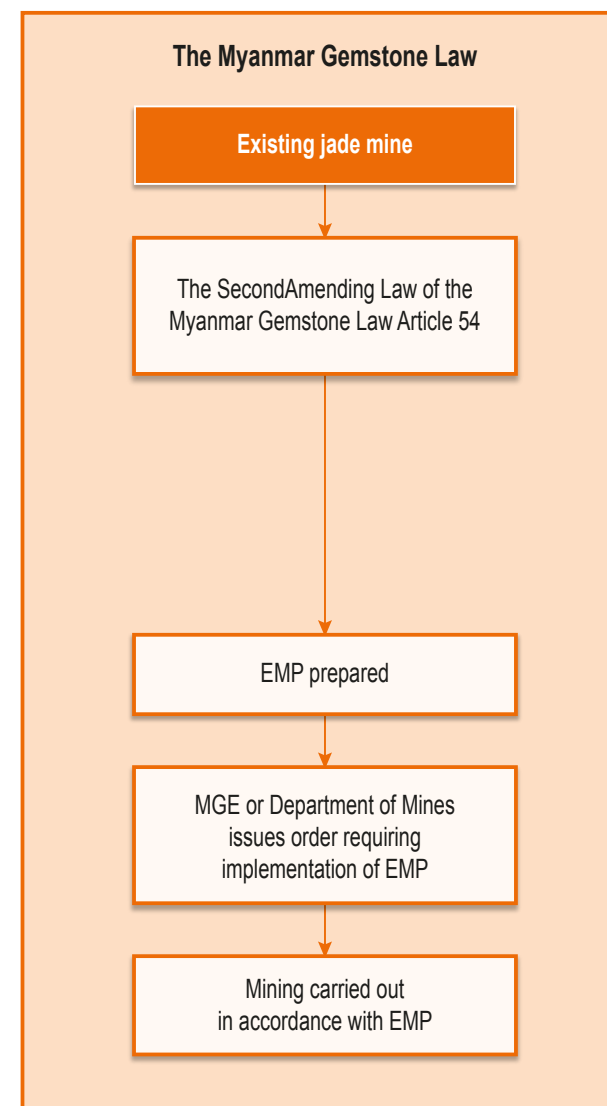
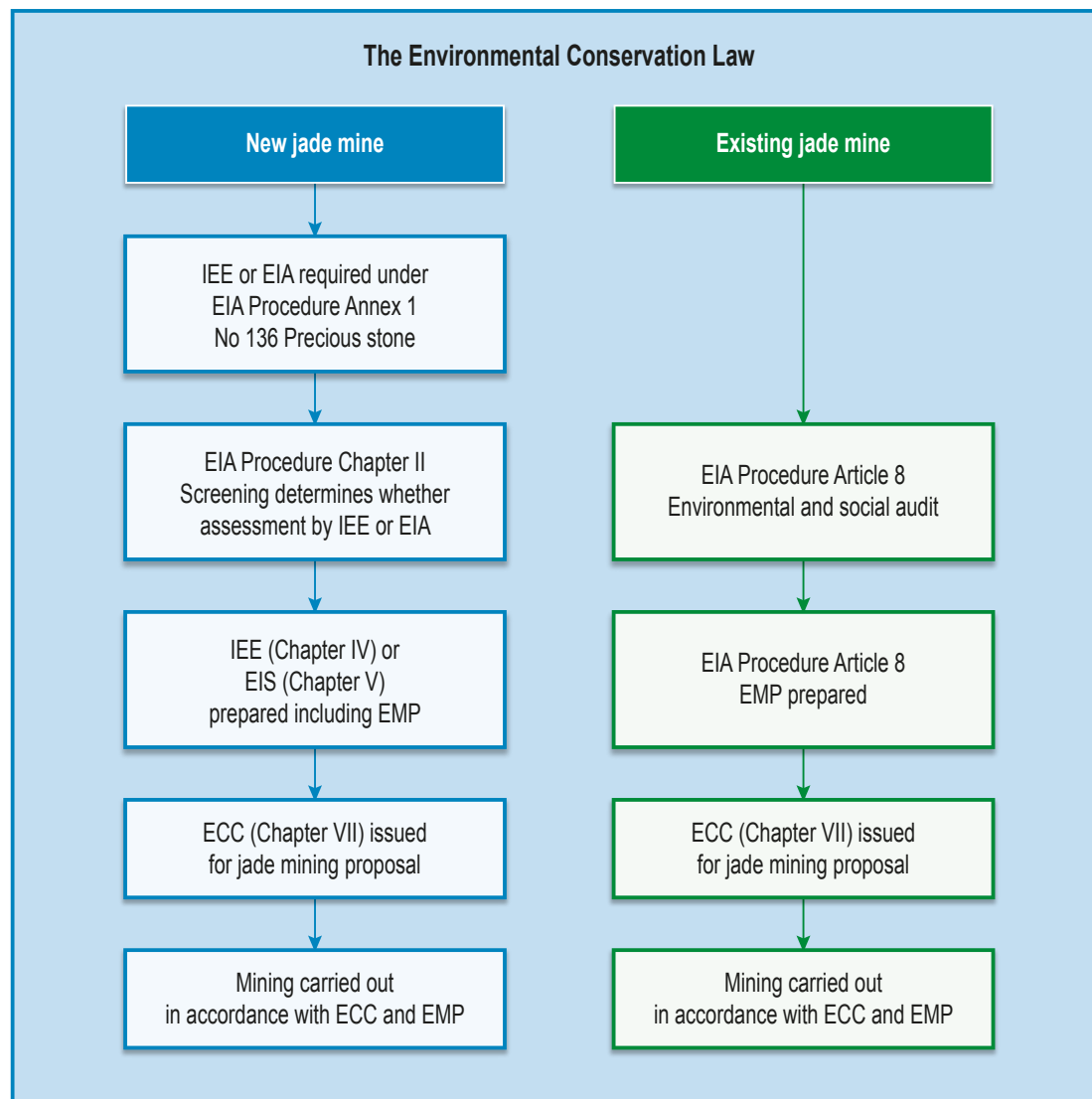
The content of an EMP is set out in Article 63 of the EIA Procedure. Further guidance on mining-related EMPs is provided in the guidance note Environmental Management Plan for Mining Sector.

This EMP has been prepared in accordance with the EIA Procedure and Environmental Management Plan for Mining Sector.

5.3 Objectives of this EMP

The objectives of this EMP are:

- Implement the aspirations and expectations of the Myanmar people, as set out in the Constitution of the Republic of the Union of Myanmar.
- Provide a consistent approach to the management of environmental and social impacts of jade mining in the Hpakant/Lonkin Gems Tract.
- Set out the measures for determining environmental and social performance of jade mining.
- Set out transitional arrangements for comprehensive implementation of environmental and social management of jade mining in the Hpakant/Lonkin Gems Tract.



6 Existing environment

Jade from the Hpakant/Lonkin area has been mined since the 1800s largely under the influence of the Burmese monarchy and the Duwas (or chiefs) of the area that is now Kachin State. Jade was exported mainly to China. Economic growth in China in the late 1990s facilitated a rapid expansion of the jade industry. Historically, jade has been mined using open cut methods, although during the 1990s some jade companies also employed tunnelling and long wall mining (TANKS, 2016). Mine sites have not been closed or rehabilitated, and are currently abandoned or used as waste dumps (TANKS, 2016). This area has experienced several decades of mining. The environment can be characterised as heavily modified with extensive influence of jade mining.

6.1 Location and topography

The Hpakant/Lonkin Gems Tract is located in northern Myanmar approximately 350 km north of Mandalay. The area is located within Kachin State, Myitkyina District and Hpakant Township. Zone 1 is defined by the geographic coordinates (latitude and longitude) listed in Table 6.1.

Table 6.1 Geographic coordinates of Zone 1

Point	Long (DMS)	Lat (DMS)	Long (DM)	Lat (DM)
1	96° 21' 56.56" E	25° 40' 26.85" N	96° 21.943' E	25° 40.448' N
2	96° 15' 13.35" E	25° 40' 19.00" N	96° 15.223' E	25° 40.317' N
3	96° 15' 13.48" E	25° 42' 28.62" N	96° 15.225' E	25° 42.477' N
4	96° 17' 54.11" E	25° 44' 42.23" N	96° 17.902' E	25° 44.704' N
5	96° 21' 35.89" E	25° 44' 47.11" N	96° 21.598' E	25° 44.785' N
6	96° 22' 17.23" E	25° 43' 12.11" N	96° 22.287' E	25° 43.202' N

DMS – degrees, minutes and seconds; DM – degrees and decimal minutes

Zone 1 is located in the north of the Hpakant/Lonkin Gems Tract and is the largest zone to the west of Uru Creek. Uru Creek is a tributary of the Chindwin River, which is a tributary of the Ayeyarwady River which flows into the Andaman Sea. Steep-sided ridges and narrow valleys extend away from Uru Creek to the watershed with the adjacent catchment. Elevation ranges from 230 m at Uru Creek to 760 m at the watershed. The zone drains to Uru Creek via several tributary streams which have been highly modified by jade mining.

This zone is the most active for jade production in comparison to the other zones. After several decades of mining many areas have now been mined out, particularly the southern region abutting Zone 2 which has been heavily modified by mining operations.

Large-scale mining has resulted in large open pits reaching a depth of up to 250 m, many with steep slopes and some filled with water forming pit lakes. Waste rock dumps cover most of the area. Settlements and villages occupy areas not required for mining including waste rock dumps. The northern and western regions of Zone 1 remain undisturbed and no active mining is occurring east of Uru Creek. The western and northern areas of Zone 1 are largely undisturbed by mining activity and are characterised by steep hills and valleys with sparse forest cover.

6.2 Geology

Myanmar lies at the junction of two tectonic plates, the Indian Plate and the Burma Plate. The Indian Plate and Burma Plate abut at a tectonic feature called the Sunda megathrust. The Indian Plate is moving in a northerly direction under the Burma Plate at an average rate of 40 to 60 mm per year. The northward movement of the Indian Plate is causing stresses in the Central Andaman zone which is spreading apart at an average rate of 25 to 30 mm per year. The Sagaing Fault is the major tectonic feature of central Myanmar and the feature which releases some of the stresses associated with opening of the Central Andaman zone.

The four major tectonic provinces of Myanmar are north-south trending linear belts between the major fault lines. These are from east to west: Shan-Tanintharyi Block; Central Cenozoic Belt; Western Fold Belt and Rakhine Coastal Belt. Hpakant/Lonkin Gems Tract is located in the Shan-Tanintharyi Block and straddles the Sagaing Fault. The geology of the Hpakant/Lonkin Gems Tract (Figure 6.1) can be characterised as consisting of:

- Serpentinised peridotites forming the higher slopes and crests of hills and mountains.
- Crystalline schist on the lower slopes.
- Boulder conglomerate from the lower slopes and valleys extending east.
- Tertiary sedimentary rocks and Quaternary unconsolidated rocks and alluvium on the valleys to the east.

General stratigraphy of this zone is Tertiary sedimentary rocks and Quaternary unconsolidated rocks overlying the Uru Boulder Conglomerate. Bedrock underlies the Uru Boulder Conglomerate unit and is exposed in some areas.

Primary jadeite is found in dykes associated with Ultrabasic and Uru Boulder Conglomerate of Pleistocene age, as placer deposits. Secondary jadeite is found in the Uru Boulder Conglomerate and associated alluvial deposits. Secondary jadeite occurs as boulders, well-rounded stones and perfectly-rounded stones and is the key target for jade mining in the Hpakant/Lonkin Gems Tract. Large-scale and medium-scale mining is targeting the deeper deposits with small-scale and artisanal mining targeting the alluvial wash deposits. A cross section showing the occurrence of jadeite in dykes and the Uru Boulder Conglomerate is shown in Figure 6.2.

6.3 Climate, air quality and noise

The region is classified as a humid subtropical climate bordering on a tropical savanna climate. There is a dry season (November–April) and a wet season (May–October). Temperatures are very warm throughout the year, although the wet season months (December–February) are milder.

Weather data for Myitkyina, which is located 120 km east of Hpakant/Lonkin Gems Tract, is presented in Table 6.2. While local differences are expected, the general trends are expected to be similar. The highest average temperatures occur between March and October when averages are above 30°C. In the cooler months of November to March average minimum temperatures range from 10°C to 16°C. More than 90% of the rainfall occurs during the wet season, with most rain falling in June and July.

The air quality within the area is heavily influenced by mining activities. Traffic, drilling and blasting, and excavation and dumping of waste rock effect air quality principally through the generation of dust. Air quality is poorest in the dry season when the hot, dry conditions result in significant dust being

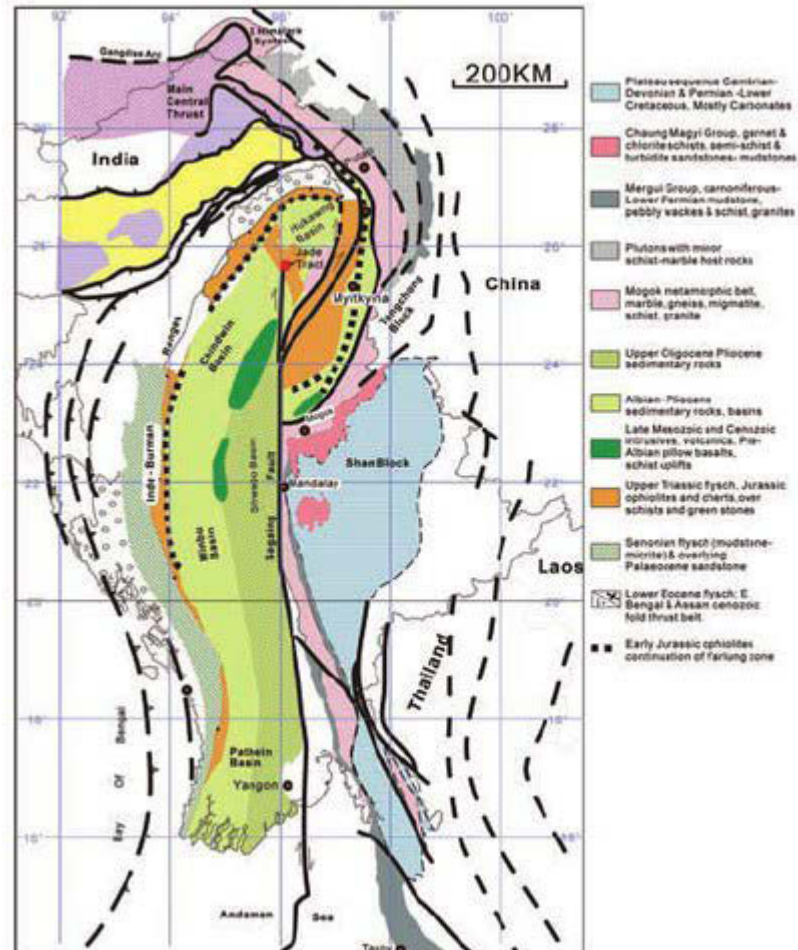
generated from haul roads and excavation of overburden. Water is used to suppress dust on some village roads.

Noise and vibration are heavily influenced by mining activities. The main noise sources are mining equipment (excavators and drill rigs), haul trucks and blasting. Blasting is allowed at three times each day (7:00 am, 11:00 am and 4:00 pm); however, blasting was heard and is reported outside these times. No specific management of noise and vibration was observed from existing mine operators.

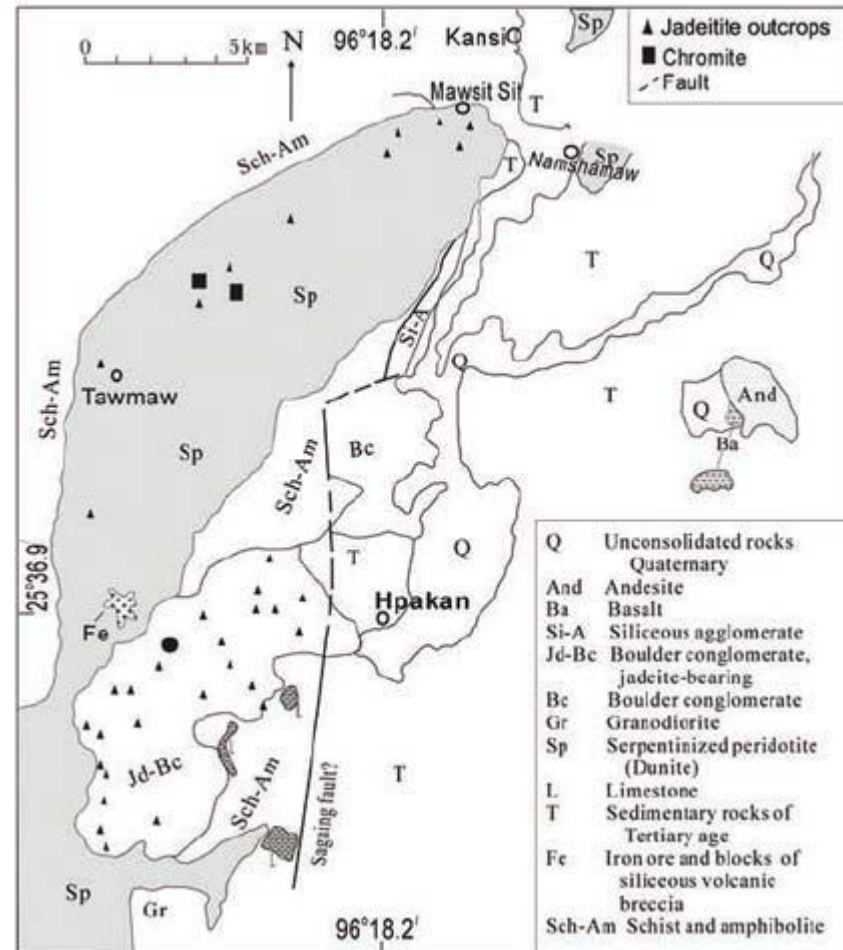
Table 6.2 Climate statistics (Myitkyina)

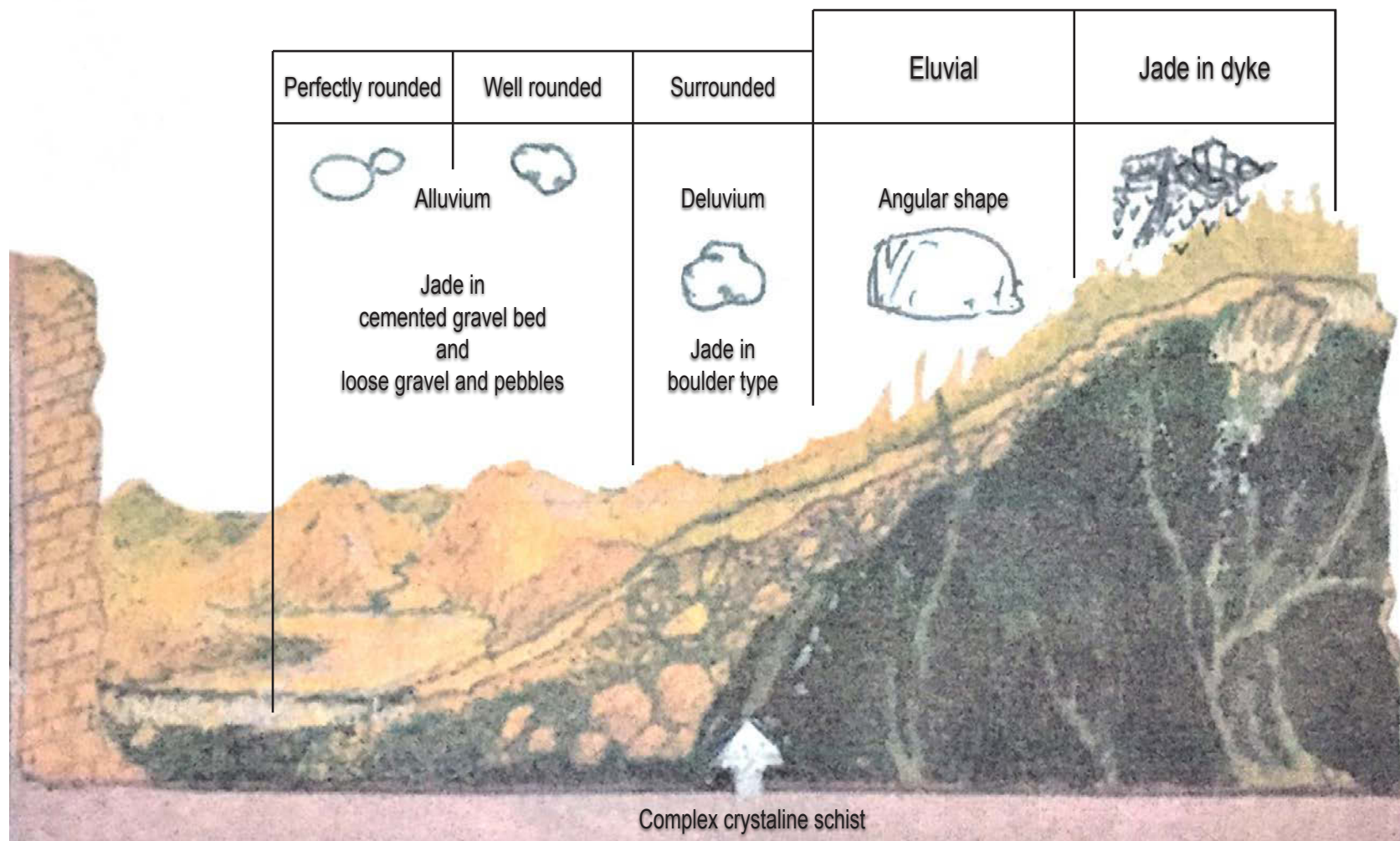
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C	32	36.1	41.3	42.2	42.5	40.5	39.5	39.6	38	36.3	34.7	29.8	42.5
Average high °C	24.2	26.7	30	33.3	32.7	30.6	30	30.6	31.2	30.3	27.4	24.6	29.3
Average low °C	10.3	12.7	16.4	19.5	22.3	24.1	24.2	24.3	23.4	21.2	16	11.6	18.8
Record low °C	-0.1	3.4	4.8	9.9	12.5	16.4	18.5	19	15.6	9.4	5.3	2.1	-0.1
Average rainfall mm	8	18	26	46	159	535	513	411	285	158	28	9	2,196

(a)



(b)





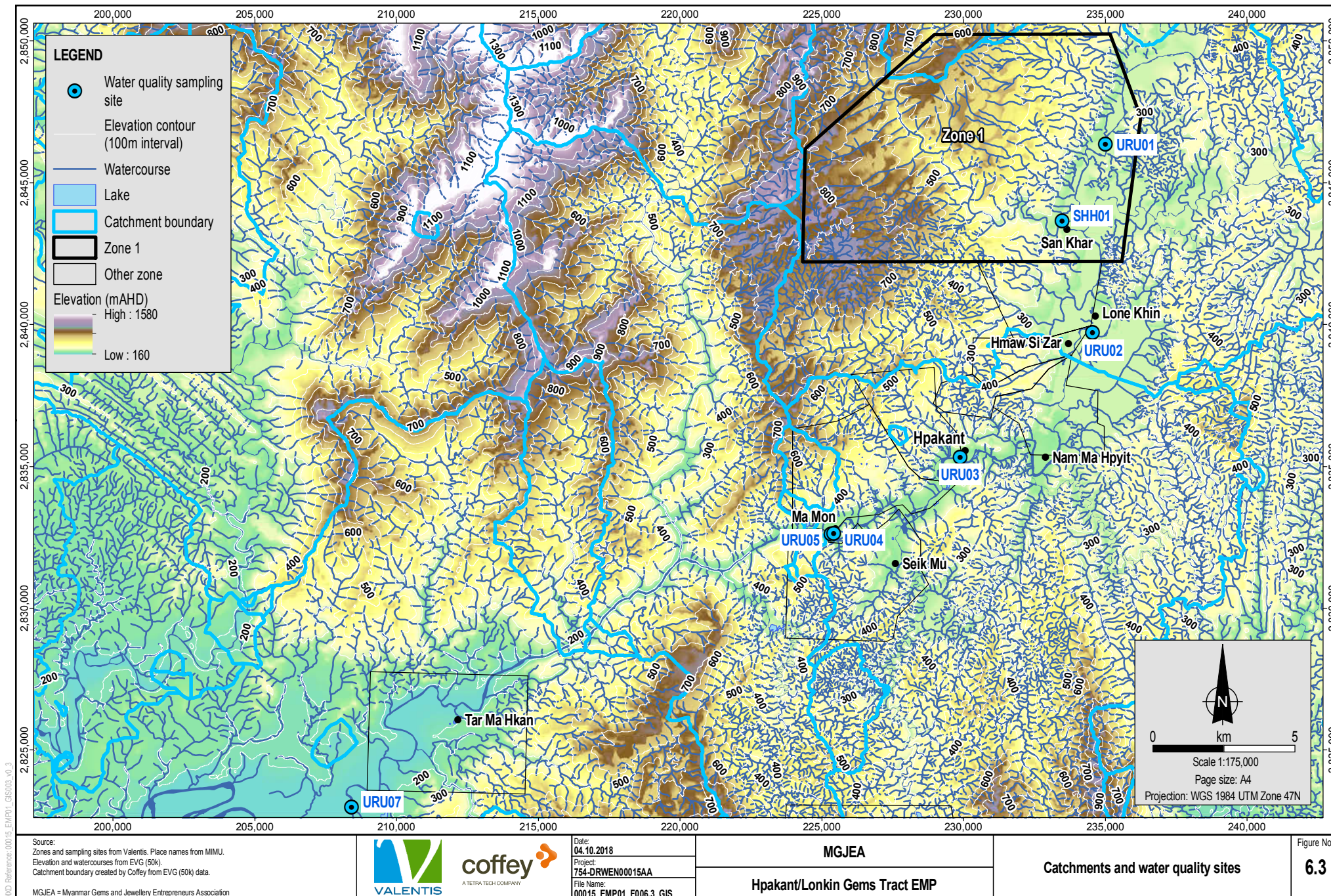
6.4 Water

The Hpakant/Lonkin Gems Tract is located within the Chindwin River Basin that covers more than 110,350 km². The basin originates in the Kachin plateau at approximately 3,800 m above sea level and joins the Ayeyarwady River some 900 km away at approximately 60 m above sea level. About 90% of the basin is heavily forested.

The Hpakant/Lonkin Gems Tract is bisected by the Uru Chaung (Uru Creek). The Uru Creek is a major tributary of the Chindwin River, which in turn is the largest tributary of Myanmar's largest river, the Ayeyarwady River. The source of the Uru Creek is in the Hukawng Valley. From there it flows in a southwesterly direction to join the Chindwin River near Homalin in Sagaing Region. The Hpakant/Lonkin Gems Tract is situated near the headwaters of the river.

Zone 1 is located within the Chindwin and Ayeyarwady (upper) catchments that drain the northern and western slopes into Uru Creek through a series of valleys of varying size. The largest watercourse is Uru Creek which flows 100 to 700 m away from the eastern boundary of Zone 1 in a north-south direction (Figure 6.3). Two smaller tributaries flow through this zone: the Sankha Chaung and Nam Sam stream. Sankha Chaung is 1700 m long and flows in a northwest to southeast direction. The Nam Sam stream flows from east to west. Both watercourses flow through the mining concessions before reaching Uru Creek. The streams are ephemeral and only flow during the wet season.

Watercourses in this zone are highly modified and are located within previously mined areas, active mining areas, and villages and settlements. A retaining wall has been constructed on the bank of Uru Creek (Plate 6.1) to constrain channel flows. Watercourse channels are cleaned out prior to the wet season to remove temporary crossings and debris from erosion and sedimentation. No permanent dams are located in Zone 1, although some former open mine pits have been flooded and are now permanently filled with water. Pit water is pumped out and discharged to the surrounding area at some sites.





Source: Valentis

Plate 6.1 Retaining wall constructed on the banks of Uru Creek

No erosion and sedimentation controls are in place. Catchment runoff generally flows into open pits, or is shed from disturbed surfaces eventually draining into watercourses. Erosion is extensive from mined faces and waste rock dumps. No cut-off drains were observed at the top of mine batters to divert surface water runoff away from mine batters. The Uru Creek and its two tributaries were observed to have high levels of suspended sediments and other debris, with infilling of the watercourse channel occurring. Sediment loads from Hpakan/Lonkin have migrated downstream to the Chindwin River and are affecting downstream users and aquatic habitats in Uru Creek and the Chindwin River.

The Directorate of Water Resources and Improvement of River Systems (DWIR) has prepared a master plan for Uru Creek. The plan details the reaches of the river where DWIR proposes works to improve channel flows and the navigability of the river through dredging, river training works and bank protection. The plan applies to the lower Uru Creek, with the most upstream works about 40 km river distance downstream of Zone 10.

Grey water and sewage from local communities is discharged through a canal to a storage pond which discharges to watercourses. Domestic wastes are disposed directly into watercourses. Several decades of artisanal mining and large-scale mining including direct disposal of overburden into watercourses has severely degraded watercourses.

In-situ water quality parameters that were collected during the site visit are presented in Table 6.3. Sample collection areas in Zone 1 (see Figure 6.3) showed visual evidence of foam and rubbish. Elevated suspended sediments and evidence of mining impacts were observed in water samples from other zones in the Hpakan/Lonkin Gems Tract.

Table 6.3 In-situ water quality Zone 1

Site	Latitude	Longitude	Watercourse and location	pH	Temp (°C)	EC (µS/cm)	DO (mg/L)	DO (% sat.)	Site conditions
SHH01	25° 41' 11.67" N	96° 20' 40.01" E	San Hka Hka. Downstream discharge from Zone 1.	8.24	32.1	161	5.8	83	Some water is blocked upstream, rubbish along the banks, stream flows parallel to road.
URU01	25° 42' 32.19" N	96° 21' 18.14" E	Uru Creek. Upstream of Zones 1 to 8 and 10.	8.25	25.8	127	5.8	72	Close to the road, local voluntary group (green land) cleans the creek and rock retaining wall, some foam on surface of water.
URU02	25° 39' 6.43" N	96° 21' 22.02" E	Uru Creek. Downstream of Zones 1 to 2, upstream of Zones 3 to 9 and 10.	8.23	29.9	152	5.32	80	Community area, rubbish along the banks, bathing place.
URU03	25° 36' 39.21" N	96° 18' 36.31" E	Uru Creek. Downstream of Zones 1 to 5, upstream of Zones 6 to 8 and 10.	6.89	29	168	8.1	102	Excavating the soil sediment from the creek and discharged waste near the bridge, rubbishes, close to community area, grass growing on banks.
URU04	25° 35' 6.81" N	96° 15' 58.21" E	Uru Creek. Upstream of weir between Zones 7 and 8. Downstream of Zones 1 to 6. Upstream of Zone 10.	7.15	28.7	192	6.5	85	Temporary bridges that are used for dry season. The creek is dredged to ensure stream flow is maintained. Rubbish observed.
URU05	25° 35' 7.05" N	96° 15' 57.66" E	Uru Creek. Downstream of weir between Zones 7 and 8. Downstream of Zones 1 to 6. Upstream of Zone 10.	7.41	30.7	221	6.9	93	Close to Zone 7 discharge point (muddy water). Rubbish observed.
URU07	25° 29' 36.68" N	96° 5' 59.36" E	Uru Creek. Near downstream limit of Zone 10. Downstream of Zones 1 to 8.	8.37	28.9	157	5.5	74	Boats anchored in the bank, water turbid.

Temporary stream crossings have been constructed along the watercourses to enable traffic movements. In Zone 1, a crossing for light vehicles and haul trucks is provided at the Sankha Chaung stream (Plate 6.2). Temporary crossings were reported to be removed by 15 May every year. Some watercourse diversions are in place as well as the complete removal of smaller watercourses.

Uru Creek and its tributary streams have higher flows during the wet season which causes flooding of lower lying areas in and downstream of the zone. No major flooding was reported in Zone 1, although water runoff may impact downstream areas of Uru Creek due to higher water flow during the rainy season.

Mines in this zone intersect the groundwater table. Water collected in the open pit is pumped from the pit to adjacent watercourses or drainage lines.



Source: Soe Moe Kyaw Win

Plate 6.2 Temporary culvert structure on the modified Sankha Chaung stream

6.5 Land use and biodiversity

Kachin State lies on the boundary of two of the world's most biologically rich and most threatened environments: the 'Indo-Burma', and 'Mountains of South Central China' hotspots.

The Northern Triangle Subtropical Forests [IM0140] are one of the least explored and scientifically known places in the world. The region's remote location, limited access, and rugged landscape have kept scientific exploration at a minimum. Yet what is known about these forests still ranks them as globally outstanding in their biological diversity.

Floristically, Kachin State in northern Myanmar is one of the most diverse regions in continental Asia, but it is also one of the least explored. The flora of the temperate forests is also extremely diverse, and the complex topography, together with moist conditions, has led to a high degree of plant endemism. This region consists primarily of the large area of subtropical broadleaf forest but includes small, sub-regional-scale patches of temperate broadleaf forests and sub-alpine conifer forests. The subtropical forests are distributed roughly between 500 and 1,600 m above sea level. *Magnoliaceae*, *Lauraceae*, and *Dipterocarpaceae* species make up the associations below 915 m (WWF, 2017).

Several threatened species that make up part of this ecoregion's mammal fauna are also of conservation importance. These species include the tiger (*Panthera tigris*), red panda (*Ailurus fulgens*), Asian elephant (*Elephas maximus*), takin (*Budorcas taxicolor*), southern serow (*Naemohedus sumatraensis*), pig-tailed macaque (*Macaca nemestrina*), Assamese macaque (*Macaca assamensis*), stump-tailed macaque (*Macaca arctoides*), capped leaf monkey (*Semnopithecus pileatus*), hoolock gibbon (*Hylobates hoolock*), Asiatic black bear (*Ursus thibetanus*), great Indian civet (*Viverra zibetha*), clouded leopard (*Pardofelis nebulosa*), red goral (*Naemohedus baileyi*), Irrawaddy squirrel (*Callosciurus pygerythrus*), and particolored squirrel (*Hylopetes alboniger*) (WWF, 2017). The bird fauna of the region exceeds 370 species including one near-endemic species, the rusty-bellied shortwing (*Brachypteryx hypertyra*). These species are unlikely to occur in the Hpakant/Lonkin Gems Tract due to unsuitable habitat and/or deforestation.

The Uru Creek is listed as a key biodiversity area with importance to birds and reptiles. The Uru Creek is an important conservation area for the green peafowl (*Pavo muticus*), the spot-billed pelican (*Pelecanus philippensis*) and the white-rumped vulture (*Gyps bengalensis*).

The key biodiversity area in this region is the Indawgyi Wildlife Sanctuary, a Ramsar site (Beffasti and Galanti, 2011). The sanctuary is located in the Nam Ting and Indaw rivers catchments. These catchments share a common watershed with the Uru Creek catchment. Zone 1 is located 43 km north of the watershed between these catchments.

A range of threatened and endemic fish species are located within the upper Chindwin River Basin. Meynell and Gregory (undated) studied the aquatic fauna with Uru Creek and recorded more than 50 fish species including 20 used for subsistence use and 23 molluscs (Table 6.4). They reported that external stress levels were expected to be high because of mining.

Table 6.4 Aquatic fauna in the Uru Creek

Taxonomic group	Non-threatened	Near threatened and Vulnerable
Fishes	47	6
Molluscs	23	0
Dragonflies and damselflies	117	1
Crabs, lobsters and shrimps	1	0

Near threatened and vulnerable fish species found in the Uru Creek include the shortfin eel (*Anguilla bicolor*), butter catfish (*Ompok bimaculatus*), pengba fish (*Osteobrama belangeri*), wallago catfish (*Wallago attu*), *Garra compressa* and tiger botia (*Syncrossus berdmorei*).

Bhagwat et al (2017) mapped forest cover in Myanmar using Landsat satellite imagery to assess the condition and spatial distribution of Myanmar's intact and degraded forests with special focus on changes in intact forest between 2002 and 2014. They found that Hpakant/Lonkin was a local hotspot for intact forest loss with the area losing 39,089 ha or 0.8% intact forest cover change each year between 2002 and 2014.

Large areas of Zone 1 are undisturbed by mining operations, particularly in the north and west and along the eastern bank of Uru Creek. In these areas, forest is fragmented and patchy with substantial non-mining human-related disturbance evident. Slash and burn farming, for example, occurs in some

surrounding hilly areas. Some animals such as snake, deer, and boar were reported to inhabit the forested areas.

Mining has occurred in the south and east of Zone 1, and continues there today (although to a lesser extent than previously). Forest ecosystems have been completely destroyed in areas that have been mined. Very limited and sparse vegetation occurs along the watercourses with only small trees and grasses present.

6.6 Social setting

Kachin State is the northernmost state of Myanmar. It is bordered by China to the north and east; Shan State to the south; and Sagaing Region and India to the west. The capital of the state is Myitkyina. Christianity is the main religion of Kachin State. Buddhism is the major religion among the Bamar immigrants and Shan people who live in Kachin State.

The Jingpho language was the traditional language of the area. The Bamar people were a minority in Kachin State before the independence of Burma from the British, but after 1948, groups of Bamar migrated to Kachin State to settle, which has caused a language shift and commenced the decline of the Kachin language. Some Kachin tribes speak and write their own language.

The economy of Kachin State is predominantly agricultural. The main products include rice, teak, sugar cane and opium. Mineral products include gold and jade.

Hpakant Township is the administrative centre of the Hpakant/Lonkin Gems Tract. The largest town in Hpakant Township is Kamaing, which is located approximately 40 km to the southeast of Hpakant. Based on the last census in 2014 (Wang and Myint, 2016), the total population of Hpakant Township was 312,278 (201,033 males and 111,245 females). These were classified as predominantly rural (252,155) with fewer people classified as urban (60,123). The number of reported conventional households was 33,134 (with 152,142 people) indicating a large proportion of the population (160,136) do not live in conventional households and are likely to be itinerant workers. There have also been reports that large numbers of people from other regions and states have migrated to the Hpakant/Lonkin Gems Tract.

There are three main villages in this zone. They are:

- Lone Khin.
- San Hkar.
- Ngo Pin.

San Hkar is located near the southeast boundary of Zone 1 (the eastern bank of Uru Creek). Demographic information for Zone 1 is provided in Table 6.5.

Table 6.5 Demographics of this zone

Area	Total	Permanent	Long term	Guest	Temporary
Houses/households	Not recorded	82	107	Not recorded	Not recorded
Villagers	934	418	421	Not recorded	95

Some residential properties are located a few metres away from the mine sites. Villagers reported that land stability is a key issue in the region and some houses were in danger of land erosion from the waste rock dump. A large waste rock dump site is located along the eastern section of Uru Creek.

The villagers' primary income is based on jade mining and jade scavenging through mine waste dumps.

Community infrastructure within this zone includes a school in the village next to San Hka and two private health clinics. Lone Khin provides more comprehensive health services. There are civil society organisations and groups such as Greenland which have helped with construction of the retaining wall along Uru Creek. The organisation Plaintiff discusses community issues with mining companies. Asian Harm Reduction Network and Medecins Sans Frontieres help run rehabilitation centres for drug users. A local fire brigade team composed of seven people and a social support team known as 'Myint Myat Thu' are trained in disaster relief efforts.

Several religious monuments are present within the zone. These include:

- Two churches.
- Two pagodas.
- One monastery.

Graveyards (which have been moved twice) are the most significant cultural feature in the zone.

Two archaeological sites are located in or near Zone 1. They are Kanchi and Minemaw-WayneKyum. Kanchi is located outside the zone, approximately 4 km northeast of the northern boundary of the zone. Artisanal and small-scale mining is occurring in the area around and Kanchi. Minemaw-WayneKyum is located in the northeastern corner of the zone and potentially exposed to disturbance from mining activities.

Kanchi, also known as Kansi, Ginsi and more recently Sengra, is the ruins of the grand haw or palace of the Ginsi (also known as Kansi) duwas near the town of Sengra. The haw consisted of 12 large magnificent brick buildings. They were built by Duwa Kansi La in 1897 and were a statement of the riches and power of the Ginsi jade lords who controlled the entire jade mining area at that time.

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7 Potential impacts and mitigation

The mining methods described above impact the physical, biological, social and cultural environments. The impacts of jade mining were identified by undertaking an environmental risk assessment. The risk assessment is presented in this section, along with a discussion of the key impacts and mitigation. Mitigation is presented as the plans that contain the measures to manage the impacts.

7.1 Environmental risk assessment

The key impacts were identified using accepted environmental risk assessment methods that identified the hazard and pathway leading to the impact, the consequence or severity of environmental harm caused by the impact, and the likelihood of environmental harm occurring. The impacts were assessed before and after the application of mitigation to determine the effectiveness of the proposed management measures or procedures in reducing the impacts to acceptable levels.

The definitions for consequence are provided in Table 7.1. Table 7.2 lists the definitions for likelihood.

Table 7.1 Definitions for consequence

Level	Definition
Insignificant	Localised impact that does not cause nuisance to people and/or affect their livelihoods and/or degrade the local environment.
Minor	Localised impact that affects people's amenity, their livelihoods and/or causes minor degradation of the local environment.
Moderate	Impact that causes harm to people's health and/or to their livelihoods and/or causes loss or degradation of the local environment.
Major	Large impact that harms people's health, seriously impacts people's livelihoods and/or the environment over a wider area.
Extreme	Severe impact on people and the environment that results in serious injury or fatalities, displacement of people and communities and/or permanent loss of environmental values.

Table 7.2 Definitions for likelihood

Level	Definition
Rare	The impact could occur but has not happened before.
Unlikely	The impact is unlikely to occur but has happened before.
Possible	The impact has occurred and is possible.
Occasional	The impact occurs occasionally; several times a year.
Frequent	The impact occurs very often; several times a month.

The risk of environmental harm is determined by applying consequence and likelihood in the matrix presented in Table 7.3.

Table 7.3 Risk matrix

		Likelihood				
		Rare	Unlikely	Possible	Occasional	Frequent
Consequence	Insignificant	Very low	Very low	Very low	Low	Moderate
	Minor	Very low	Low	Low	Moderate	Moderate
	Moderate	Low	Low	Moderate	High	High
	Major	Low	Moderate	High	Major	Major
	Extreme	Moderate	High	Major	Major	Major

The resulting risk is interpreted using the definitions in Table 7.4.

Table 7.4 Interpretation of risk assessment

Risk	Definition
Very low	The impact is temporary and may not need management.
Low	The impact can be managed by standard procedures and good practice.
Moderate	The impact can be managed by standard procedures and good practice.
High	The impact requires specific management to avoid or reduce the severity of the impact.
Major	Mining methods need to be redesigned to avoid the impact or strict controls put in place to reduce people's exposure to the hazard or the threat to the environment.

The environmental risk assessment presented in Table 7.5 identifies two major residual impacts and six high residual impacts. All other impacts can be managed with standard procedures and good practice.

Deforestation for mining and materials and as a result of waste rock dumps being constructed in valleys with intact vegetation is resulting in the loss and degradation of habitat for wildlife. Native animals are being displaced and native forests and plants are being replaced by exotic species. Protection of riparian corridors is a major priority to preserve and maintain wildlife linkages.

Unsafe mine sites and unsafe working practices, together with the large number of Yemasay illegally working in mines and on waste rock dumps, has and is likely to result in serious injury and death. This situation will continue until mines and waste rock dumps are properly constructed, safe work practices implemented and a mechanism developed to allow Yemasay and artisanal and small-scale miners to safely co-exist with large-scale mining operations.

Slope failure causing landslides and flooding from watercourses being infilled with sediment are major risks to people and property and will continue to be until open pits and waste rock dumps are properly constructed, and effective erosion and sediment control implemented.

Unsafe work practices and use of village roads by haul trucks exposes people to serious injury or death. The potential loss of human life remains a risk which can only be reduced by segregating haul trucks from village roads and improving work practices including providing appropriate personal protective equipment and training in the use of it.

Poor water quality is a high risk to people and ecosystems. Better waste management will reduce the incidence of contaminated water from chemicals and hazardous materials, and non-biodegradable waste including plastics.

Table 7.5 Environmental risk assessment

Hazard	Pathway/mechanism	Impact	Likelihood	Consequence	Risk	Controls	Likelihood	Consequence	Residual risk
Deforestation	Vegetation clearing for mining	Loss or degradation of terrestrial and aquatic biodiversity	Frequent	Moderate	High	<ul style="list-style-type: none">• Implement the Biodiversity Management Plan which manages deforestation by identifying threatened species and their habitat, and riparian corridors, and protecting them from mining activities including unnecessary clearing of vegetation.• Implement the Erosion and Sediment Control Plan which manages deforestation by describing the methods for capturing sediment that can smother vegetation and kill forests.• Implement the Rehabilitation Management Plan which manages deforestation by requiring mined areas and waste rock dumps to be revegetated to create self-sustaining ecosystems that help to protect adjacent forest.	Occasional	Moderate	High
Disturbed ground	Overland flow of water causing erosion and sedimentation of land and watercourses	Reduced water quality due to increased sediments (TSS) impacting downstream beneficial uses (e.g., aquatic ecosystems and communities); raised river beds due to deposited sediments increasing the likelihood of overbank flooding; deterioration of soil quality and fertility due to increased erosion.	Frequent	Major	Major	<ul style="list-style-type: none">• Implement the Erosion and Sediment Control Plan which manages disturbed ground by requiring surface water runoff to be managed to stop or significantly reduce erosion, and sediment-laden water to be captured and treated in sediment basins before being discharged to land and/or watercourses.• Implement the Mine Pit and Waste Rock Dump Management Plan which manages disturbed ground by requiring mine pits and waste rock dumps to be designed and constructed to reduce erosion of mining-disturbed areas and protect downstream watercourses from sedimentation.• Implement the Rehabilitation Management Plan which manages disturbed ground by requiring mine and waste rock dump batters and benches to be progressively rehabilitated and revegetated to stop surface water runoff causing erosion and sedimentation of watercourses and smothering of crops.	Possible	Moderate	Moderate
Disturbed ground	Removal of crops, plantations, buildings, structures and cultural heritage sites	Lost or damaged crops, plantations, buildings, structures and cultural heritage sites	Frequent	Major	Major	<ul style="list-style-type: none">• Implement the Code of Conduct which manages disturbed ground by requiring mining companies and their workers to act with care and integrity at all times and to comply with this EMP.• Implement the Land Access Management Plan with manages disturbed ground by requiring planning and community consultation before mining commences and by presenting guidelines for fair and equitable compensation for landowners.• Implement the Mine Pit and Waste Rock Dump Management Plan which manages disturbed ground by requiring a mine plan that sets out the mine and waste rock dumps design and guidelines on how to construct safe, stable landforms, and by requiring a minimum buffer distance between the mine or waste rock dump and villages.• Implement the Cultural Heritage Management Plan which manages disturbed ground by requiring worker training on the location and protection of cultural heritage sites, maintenance of a register of cultural sites at or adjacent to the mine site, and exclusion of mining activities from known cultural heritage sites in the vicinity of work areas wherever possible. If avoidance of a cultural heritage site is not possible, the plan provides guidelines for management as well as a procedure to follow in the event of a chance find.• Implement the Community Grievance Mechanism which manages disturbed ground by requiring the establishment of a community grievance mechanism for the community to raise complaints with mining companies including damage to or loss of crops, property and cultural heritage sites.• Implement the Community Support and Development Plan which manages disturbed ground by requiring the establishment of a CSR fund for investment in the social welfare program, which is designed to address the main issues of concern identified through public consultation. Also by requiring community reference groups to be established to provide a mechanism for the community to raise issues and concerns with mining companies.	Possible	Moderate	Moderate
Unstable mine faces	Slope failure	Pit wall failure resulting in landslide potentially causing the loss of life, crops and property; smothering of downslope environment causing the loss or degradation of terrestrial and aquatic biodiversity	Possible	Extreme	Major	<ul style="list-style-type: none">• Implement the Mine Pit and Waste Rock Dump Management Plan which manages unstable mine faces by requiring a mine plan that sets out the mine design and guidelines on how to construct mine pits safely to create stable landforms.• Implement the Erosion and Sediment Control Plan which manages unstable mine faces by requiring surface water runoff to be diverted away from faces and managed to reduce erosion; and sediment-laden water to be captured and treated in sediment basins before being discharged back into waterways.• Implement the Rehabilitation Management Plan which manages unstable mine faces by requiring mine batters and benches to be progressively rehabilitated and surfaces revegetated.	Unlikely	Extreme	High
Unstable waste rock dumps	Slope failure	Waste dump batter failure resulting in landslide potentially causing the loss of life, crops and property; smothering of downslope environment.	Occasional	Extreme	Major	<ul style="list-style-type: none">• Implement the Mine Pit and Waste Rock Dump Management Plan which manages unstable waste rock dumps by describing how to construct waste rock dumps safely and create stable landforms.• Implement the Erosion and Sediment Control Plan which manages unstable waste rock dumps by requiring surface water runoff to be diverted away from batters and managed to reduce erosion; and sediment-laden water to be captured and treated in sediment basins before being discharged back into waterways.• Implement the Rehabilitation Management Plan which manages unstable waste rock dumps by requiring waste rock dump batters and benches to be progressively rehabilitated and surfaces revegetated.	Unlikely	Extreme	High
Watercourse obstructions	Flooding	Flooding of villages and community infrastructure potentially causing the loss of life, crops and property; loss or degradation of biodiversity.	Occasional	Extreme	Major	<ul style="list-style-type: none">• Implement the Mine Pit and Waste Rock Dump Management Plan which manages watercourse obstructions by requiring a mine plan that avoids watercourses, requires mine pit and waste rock dumps to be stable; and requires surface water management to avoid sedimentation of watercourses.• Implement the Erosion and Sediment Control Plan which manages watercourse obstructions by requiring surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.• Implement the Rehabilitation Management Plan which manages watercourse obstructions by requiring mine batters and benches to be progressively rehabilitated and surfaces revegetated.• Implement the Water Management Plan which requires temporary bridges and causeways to be removed from Uru Creek and its major tributaries by May each year.	Possible	Extreme	Major

Table 7.5 Environmental risk assessment

Hazard	Pathway/mechanism	Impact	Likelihood	Consequence	Risk	Controls	Likelihood	Consequence	Residual risk
Washing jade ore	Runoff to watercourses causing erosion and sedimentation; runoff to mine voids causing stagnant water	Reduced water quality due to increased sediments (TSS) impacting downstream beneficial uses (e.g., aquatic ecosystems and communities); deposited sediments increasing the likelihood of overbank flooding. Increased prevalence of mosquito borne diseases	Frequent	Moderate	High	<ul style="list-style-type: none">Implement the Erosion and Sediment Control Plan which manages washing jade ore by requiring surface water runoff to be managed to stop or significantly reduce erosion of mine faces, waste rock dumps and ore stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.Implement the Erosion and Sediment Control Plan which manages washing jade ore and mosquito habitat by requiring water to be diverted away from mine faces and mine pits to sediment basins.	Unlikely	Minor	Low
Infill of river channel	Runoff to watercourses causing erosion and sedimentation of watercourse channels	Reduced access along navigable rivers for river transportation	Possible	Major	High	<ul style="list-style-type: none">Implement the Mine Pit and Waste Rock Dump Management Plan which manages infill of river channels by requiring a mine plan that avoids watercourses, requires mine pit and waste rock dumps to be stable; and requires surface water management to avoid sedimentation of watercourses.Implement the Erosion and Sediment Control Plan which manages infill of river channels by requiring surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to watercourses.Implement the Rehabilitation Management Plan which manages infill of river channels by requiring mine and waste rock dump batters and benches to be progressively rehabilitated and revegetated to stop surface water runoff causing erosion and sedimentation of watercourses.Implement the Mine Closure Management Plan which manages infill of river channels by requiring final landforms to be stable and revegetated to reduce erosion and sedimentation.	Unlikely	Moderate	Low
Hazardous materials (fuel, oils, chemicals, etc)	Spills and accidental leaks	Poor water quality; degraded aquatic ecosystems; contaminated soils	Occasional	Moderate	High	<ul style="list-style-type: none">Implement the Chemicals and Hazardous Materials Management Plan which manages hazardous materials (fuels, oils, chemicals, etc) by requiring spill response kits where chemicals and/or hazardous materials are used/stored, and requiring vehicles transporting chemicals and hazardous materials to park or refuel at least 50 m from a watercourse.	Possible	Minor	Low
Hazardous materials (fuel, oils, chemicals, etc)	Major spill from fuel containers on river barge	Poor water quality; degraded aquatic ecosystems; contaminated soils	Possible	Major	High	<ul style="list-style-type: none">Implement the Chemicals and Hazardous Materials Management Plan which manages hazardous materials (fuels, oils, chemicals, etc) by requiring vessels to be appropriately designed and constructed to carry bulk fuel, oil and chemicals, and by requiring vessels to carry spill response kits.Implement the Emergency Preparedness and Response Plan which manages hazardous materials (fuel, oils, chemicals, etc) by requiring appropriate emergency response equipment and by describing emergency response procedures to be followed in case of a major spill.Implement the Occupational Health and Safety Plan which manages hazardous materials (fuel, oils, chemicals, etc) by requiring that workers transporting fuel to be appropriately trained in the hazards and risks of transporting fuel and emergency response for fuel spills.	Possible	Moderate	Moderate
Dust	Breathing dust raised on haul roads and unpaved village roads	Human health impacts ranging from respiratory irritation and disease to allergies including asthma; reduced amenity of villages and settlements; and reduced plant health and productivity of food crops	Frequent	Major	Major	<ul style="list-style-type: none">Implement the Air Quality and Dust Suppression Management Plan which manages dust by requiring dust suppression using water, monitoring of local weather conditions, and avoiding work near villages and settlements.	Possible	Moderate	Moderate
Air pollution	Vehicle and mining equipment exhausts; gases from blasting	Human health impacts ranging from respiratory irritation and disease to allergies including asthma	Occasional	Moderate	High	<ul style="list-style-type: none">Implement the Air Quality and Dust Suppression Management Plan which manages air pollution by requiring monitoring of local weather conditions, avoiding work near villages and settlements, not burning cleared vegetation or other waste materials, and adequate servicing and maintenance of vehicles, plant and equipment.Implement the Occupational Health and Safety Plan which manages air pollution by requiring provision and training of all workers in the safe operation and maintenance of mining vehicles, plant and equipment, as well as safe blasting procedures.	Unlikely	Minor	Low
Blasting (vibration and noise)	Ground vibration and shockwaves	Damage to property, discomfort/annoyance to people and sleep disturbance	Frequent	Moderate	High	<ul style="list-style-type: none">Implement the Occupational Health and Safety Plan which manages blasting (vibration and noise) by requiring blasts to be designed and performed by a suitably qualified and experienced person, shallow bore holes and small charges near villages, and blasting at set times.Implement the Noise and Vibration Management Plan which manages blasting (vibration and noise) by requiring blasts to be conducted during daytime hours and by a suitably qualified and experienced person using correct charging and blasting ratios to avoid overuse of explosives.	Possible	Minor	Low
Noise	Proximity to people, villages and settlements	Discomfort/annoyance to people, sleep disturbance, disturbance to wildlife, decreased amenity in villages and settlements	Frequent	Minor	Moderate	<ul style="list-style-type: none">Implement the Noise and Vibration Management Plan which manages noise by requiring conduct of noisy activities only during daytime hours, use of natural topography and siting of facilities to act as noise buffers, limiting blasting activities to daytime hours and prescribed periods of the day, and using correct charging and blasting ratios to avoid overuse of explosives.	Possible	Minor	Low
Inappropriate waste disposal	Watercourses and vermin	Reduced soil and water quality due to inappropriate waste disposal; impacting downstream beneficial uses (e.g., aquatic ecosystems and communities); increased prevalence of diseases from disease vectors (e.g., rats); allergies from contact with or ingestion of toxic compounds	Frequent	Moderate	High	<ul style="list-style-type: none">Implement the Code of Conduct which manages inappropriate waste disposal by requiring mining companies and their workers to not litter and to dispose of all waste properly in containers or facilities.Implement the Non-hazardous Waste Management Plan which manages inappropriate waste disposal by requiring appropriate on-site collection, management and disposal of non-hazardous waste, including to landfills.Implement the Chemicals and Hazardous Materials Management Plan which manages inappropriate waste disposal by requiring appropriate disposal of chemicals and hazardous materials, as well as maintenance of spill response kits where chemicals and/or hazardous materials are used/stored.Implement the Air Quality and Dust Suppression Management Plan which manages inappropriate waste disposal by prohibiting burning of cleared vegetation or other waste materials.	Possible	Minor	Low

Table 7.5 Environmental risk assessment

Hazard	Pathway/mechanism	Impact	Likelihood	Consequence	Risk	Controls	Likelihood	Consequence	Residual risk
Disturbance of water source	Excavation of open pits	Loss of village or household water source; no access to drinking water	Possible	Major	High	• Implement the Water Management Plan which manages disturbance of water source by requiring identification and understanding of water resources used by the community before mining commences, and provision of an alternative watersource where village water resources are adversely affected by mining-related activities.	Unlikely	Major	Moderate
Contaminated water	Human consumption	Loss or degradation of terrestrial and aquatic biodiversity; health effects including gastrointestinal infections and allergies	Frequent	Major	Major	• Implement the Erosion and Sediment Control Plan which manages contaminated water by requiring surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, sediment-laden water to be captured and treated in sediment basins before discharge to watercourses, and stormwater runoff to be diverted around hazardous material and chemical storage areas. • Implement the Water Management Plan which manages contaminated water by requiring a 100-m-wide buffer to watercourses to protect water quality in rivers, creeks and streams. • Implement the Chemicals and Hazardous Materials Management Plan which manages contaminated water by requiring proper disposal of chemicals and hazardous materials and requiring spill response kits where chemicals and/or hazardous materials are used/stored. It also requires vehicles to be parked or refuelled at least 50 m from watercourses. • Implement the Non-hazardous Waste Management Plan which manages contaminated water by requiring proper waste disposal and requiring all non-hazardous waste storage areas to be located at least 50 m away from watercourses, and any pit toilets or septic systems to be located at least 100 m from watercourses and be constructed in a manner that allows effective infiltration through the soil. Landfills must be located at least 500 m away from any watercourse or water supply wells and be constructed in a manner that minimises risk of groundwater and surface water contamination.	Possible	Major	High
Mining equipment using village and settlement roads	Proximity to and interaction of people and mining equipment	Injury or death from being struck by vehicles and equipment	Possible	Extreme	Major	• Implement the Mine Pit and Waste Rock Dump Management Plan which manages mining equipment using village and settlement roads by requiring mining design to include a minimum buffer distance between the mine or waste rock dump and villages. • Implement the Code of Conduct which manages mining equipment using village and settlement roads by requiring mining companies and their workers to act with care and integrity at all times, and to comply with this EMP. • Implement the Occupational Health and Safety Plan which manages mining equipment using village and settlement roads by requiring all mine workers to be appropriately trained in vehicle use and be fit for work. Workers must obey speed limits and drive to the road conditions. • Implement the Emergency Preparedness and Response Plan which manages mining equipment using village and settlement roads by requiring designation of emergency assembly areas, and provision of appropriate emergency response equipment (first aid, firefighting equipment) and describing emergency response procedures to be followed in case of emergency. • Implement the Incident Reporting Procedure which manages mining equipment using village and settlement roads by describing the procedures for managing and reporting incidents.	Unlikely	Extreme	High
Unsafe mine sites and unsafe work practices	Interactions between people and mining equipment; exposure to unstable landforms; exposure to hazardous materials; unsafe work practices	Injury or death; health effects	Occasional	Extreme	Major	• Implement the Mine Pit and Waste Rock Dump Management Plan which manages unsafe mine sites and unsafe work practices by describing how to design mine pits and waste rock dumps to be constructed safely and to create stable landforms. • Implement the Code of Conduct which manages unsafe mine sites and unsafe work practices by requiring mining companies and their workers to act with care and integrity at all times and to comply with this EMP. • Implement the Occupational Health and Safety Plan which manages unsafe mine sites and unsafe work practices by medical checks for workers to ensure they are fit for work and requires mining companies to supply first aiders and first aid equipment and supplies, as well as training for all workers in safe mining practices and use of equipment. • Implement the Emergency Preparedness and Response Plan which manages unsafe mine sites and unsafe work practices by requiring designation of emergency assembly areas, and provision of appropriate emergency response equipment (first aid, firefighting equipment) and describes emergency response procedures to be followed in case of emergency. • Implement the Incident Reporting Procedure which manages unsafe mine sites and unsafe work practices by describing the procedures for managing and reporting incidents. • Implement the Community Grievance Mechanism which manages unsafe mine sites and unsafe work practices by requiring establishment of a community grievance mechanism for the community to raise complaints with mining companies. • Implement the Community Support and Development Plan which manages unsafe mine sites and unsafe work practices by requiring establishment of a CSR fund for investment in the social welfare program, which is designed to address the main issues of concern identified through public consultation. Community reference groups will also be established providing a mechanism for the community to raise safety issues and concerns with mining companies. • Implement the Worker Accommodation Management Plan which manages unsafe mine sites and unsafe work practices by requiring sufficient space for each worker, adequate sanitary and washing facilities, sufficient safe drinking water and medical and first aid facilities. • Implement the Chemicals and Hazardous Materials Management Plan which manages unsafe mine sites and unsafe work practices by requiring spill response kits where chemicals and/or hazardous materials are used/stored, and requires vehicles transporting chemicals and hazardous to be parked or refuelled at least 50 m from a watercourse.	Unlikely	Extreme	High

Table 7.5 Environmental risk assessment

Hazard	Pathway/mechanism	Impact	Likelihood	Consequence	Risk	Controls	Likelihood	Consequence	Residual risk
Increased population and demand for natural resources	Inmigration and increased demand for natural resources	Loss or degradation of terrestrial and aquatic biodiversity	Frequent	Major	Major	<ul style="list-style-type: none">• Implement the Biodiversity Management Plan which manages increased population and demand for natural resources by requiring vegetation clearance to be avoided where high biodiversity values are identified and to limit vegetation clearance to that required to safely undertake mining activities.• Implement the Community Support and Development Plan which manages increased population and demand for natural resources by requiring establishment of a CSR fund for investment in the social welfare program, which is designed to address the main issues of concern identified through public consultation. Community reference groups must also be established to provide a mechanism for the community to raise issues and concerns with mining companies.	Possible	Moderate	Moderate
Limited community services	Inmigration and competition for health and education services	Poor quality of life; poor health	Frequent	Moderate	High	<ul style="list-style-type: none">• Implement the Community Support and Development Plan which manages limited community services by requiring establishment of a CSR fund for investment in the social welfare program, which is designed to address the main issues of concern identified through public consultation. Community reference groups will also be established to provide a mechanism for the community to raise issues and concerns with mining companies.	Possible	Moderate	Moderate
Drugs, alcohol and other addictive substances	Use and exposure to waste administering products	Injury, disease and social unrest	Frequent	Moderate	High	<ul style="list-style-type: none">• Implement the Code of Conduct which manages drugs, alcohol and other addictive substances by requiring that workers not make, use or distribute drugs, alcohol or other addictive substances.• Implement the Occupational Health and Safety Plan which manages drugs, alcohol and other addictive substances by requiring that workers presenting for work must not be under the influence or in possession of alcohol, drugs or other addictive substances.• Implement the Incident Reporting Procedure which manages drugs, alcohol and other addictive substances by describing the procedures for managing and reporting incidents.• Implement the Community Grievance Mechanism which manages drugs, alcohol and other addictive substances by requiring establishment of a community grievance mechanism for the community to raise complaints about the use or distribution of drugs and alcohol by workers with mining companies.• Implement the Community Support and Development Plan which manages drugs, alcohol and other addictive substances by requiring establishment of a CSR fund for investment in the social welfare program, which is designed to address the main issues of concern identified through public consultation. Community reference groups are also required to be established providing a mechanism for the community to raise issues and concerns with mining companies.	Possible	Moderate	Moderate
Inequitable access to concessions	Conflict between Yemasay/ASM and LSM	Increased social unrest; financial stress	Occasional	Moderate	High	Amendments to the Second Amending Law of the Myanmar Gemstone Law (2016) and Myanmar Gemstone Rules 1995 to provide for a transparent and equitable bidding process for concessions are required to manage this impact.	Possible	Moderate	Moderate
Displacement of ASM by LSM	Amalgamation of concessions to enable more efficient mining	Lack of opportunities for mining and flow-on financial benefits for local people potentially leading to them becoming Yemasay.	Occasional	Major	Major	Amendments to the Second Amending Law of the Myanmar Gemstone Law (2016) and Myanmar Gemstone Rules 1995 to provide for a transparent and equitable bidding process for concessions are required to manage this impact.	Possible	Moderate	Moderate
Yemasay working in active large-scale mines	Proximity to mining equipment, mine faces and waste rock dumps	Injury or death from landslide or being struck by equipment	Occasional	Extreme	Major	<ul style="list-style-type: none">• Implement the Code of Conduct which manages Yemasay working in active large-scale mines by requiring mining companies and their workers to act with care and integrity at all times and to comply with this EMP.• Implement the Occupational Health and Safety Plan which manages Yemasay working in active large-scale mines by requiring mining companies to exclude all people from unstable areas and blast sites, sounding warning alarms when blast are about to occur, and requiring drivers and plant operators to be appropriately trained and obey speed restrictions on town, village and settlement roads.• Implement the Emergency Preparedness and Response Plan which manages Yemasay working in active large-scale mines by requiring designation of emergency assembly areas, and provision of appropriate emergency response equipment and by describing emergency response procedures to be followed in case of emergency.	Possible	Extreme	Major
Lack of local jade market	Market access	Financial stress through inability to sell jade at market rates	Frequent	Major	Major	Amendments to the Second Amending Law of the Myanmar Gemstone Law (2016) and Myanmar Gemstone Rules 1995 to provide for the establishment and administration of local gemstone markets are required to manage this impact.	Possible	Moderate	Moderate

7.2 Potential impacts and mitigation

7.2.1 Land disturbance

Vegetation clearing and earthworks expose soils and change landforms and drainage. Impacts will occur primarily where new ground disturbances occur, as a result of erosion of soils and sediment transport across land and to watercourses.

Sedimentation can be separated into impacts from coarse-grained and fine-grained sediment:

- Coarse-grained sediment delivery to watercourses as bed load, resulting in increased bed sediment transport, infilling of watercourse channels causing flooding and channel migration.
- Fine-grained sediment delivery to watercourses as washload, resulting in increased suspended sediment transport and increased suspended sediment concentrations and attendant turbidity.

In-stream sedimentation can result in smothering or infilling of stream-bottom habitats such as stony substrata of riffle reaches or woody debris. Freshwater fish and macroinvertebrate communities are likely to be more sensitive to smothering of riverbed habitat, rather than suspended sediment. Aquatic organisms vary in their level of tolerance to sedimentation and suspended sediment concentrations.

Potential impacts during mining from land disturbance and the mitigation to manage the impacts are:

- **Loss or degradation of terrestrial biodiversity by sediment covering vegetation** is managed by the:
 - **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce soil erosion, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.
 - **Rehabilitation Management Plan** which requires mine and waste rock dump batters and benches to be progressively rehabilitated and surfaces revegetated to stop surface water runoff causing erosion and sediment covering vegetation.
- **Loss or degradation of aquatic habitat by sediment smothering aquatic habitat and poor water quality from suspended sediment** is managed by the:
 - **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and water and sediment to be captured and treated in sediment basins before discharge to land and/or watercourses.
 - **Rehabilitation Management Plan** which requires mine and waste rock dump batters and benches to be progressively rehabilitated and revegetated to stop surface water runoff causing erosion and sediment covering vegetation.
 - **Water Management Plan** which requires a 100-m-wide buffer to watercourses where ground surfaces are not disturbed, and riparian vegetation to be retained to protect water quality in rivers, creeks and streams.
- **Poor water quality from turbidity caused by suspended sediment** is managed by the:
 - **Biodiversity Management Plan** which requires mining companies to only clear the land necessary for mining to reduce the area of disturbed land that could erode and cause sedimentation and poor water quality in downstream watercourses.

- **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and water and sediment to be captured and treated in sediment basins before discharge to land and/or watercourses.
- **Rehabilitation Management Plan** which requires mine and waste rock dump batters and benches to be progressively rehabilitated and revegetated to stop surface water runoff causing erosion and sediment covering vegetation.
- **Water Management Plan** which requires a 100-m-wide buffer to watercourses where ground surfaces are not disturbed, and riparian vegetation to be retained to protect water quality in rivers, creeks and streams.
- **Reduced revegetation success due to erosion of topsoil and/or lack of topsoil for rehabilitation due to topsoil being disposed with overburden** is managed by the:
 - **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and water and sediment to be captured and treated in sediment basins before discharge to land and/or watercourses.
 - **Rehabilitation Management Plan** which requires topsoil to be retained and protected in stockpiles for use in rehabilitation and revegetation of the mined areas, and requires sterile grasses to be used to protect the stockpiles from erosion.

7.2.2 Landslides

Landslides are naturally occurring environmental hazards that are classified as mass movements of rock, debris, and soil down a slope of land. Although there are many different causes of landslides, they all have two things in common. Firstly, they are the result of the failure of the soil and rock materials that make up the hill-slope, and secondly, they are driven by gravity. Landslides have been increasingly common in the Hpakant/Lonkin Gems Tract. These can be attributed to the following factors:

- Removal of forests which provide structural stability to soils.
- Creation of landforms with very steep slopes including mine faces and waste rock dumps. Increasing the slopes of the land increases the likelihood of landslides (Plate 7.1).
- Vibrations from blasting reducing the structural stability of unconsolidated soils.
- Altered watercourses that can undermine unconsolidated waste rock dumps causing slope failure.



Source: Soe Moe Kyaw Win

Plate 7.1 Kalamaw common waste dump and evidence of tension cracks

Natural events can further increase the likelihood of landslips:

- Earthquakes. Seismic activity has always been a main cause of landslides throughout the world. When tectonic plates move, rock and soil that covers those moves. Earthquakes in hilly and mountainous areas can trigger slope failure causing mass movements of rock and soil.
- Heavy rainfall. When exposed or denuded hill slopes and poorly drained waste rock dumps become saturated by heavy rainfall, lubrication of the soils can cause landslides.

Potential impacts during mining from landslides and the mitigation to manage the impacts are:

- **Loss or degradation of terrestrial biodiversity by sediment covering vegetation** is managed by the:
 - **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce soil erosion, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.
 - **Mine Pit and Waste Rock Dump Management Plan** which requires mine pits and waste rock dumps to be designed and constructed safely and to create stable landforms, to avoid or significantly reduce erosion of mining-disturbed areas and landslides.
 - **Mine Closure Management Plan** which describes the principles for mine closure and final rehabilitation once mining is complete, to provide for safe and geotechnically stable final landforms.
 - **Rehabilitation Management Plan** which requires mine and waste rock dump batters and benches to be progressively rehabilitated and surfaces revegetated to stop surface water runoff causing erosion and sediment covering vegetation.
- **Loss or degradation of aquatic habitat by sediment smothering aquatic habitat and poor water quality from suspended sediment** is managed by the:
 - **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.

- **Mine Pit and Waste Rock Dump Management Plan** which requires mine pits and waste rock dumps to be designed and constructed safely and to create stable landforms, to avoid or significantly reduce erosion of mining-disturbed areas and protect downstream watercourses from sedimentation.
- **Mine Closure Management Plan** which describes the principles for mine closure and final rehabilitation once mining is complete, to provide for safe and geotechnically stable final landforms and protect downstream watercourses.
- **Rehabilitation Management Plan** which requires mine and waste rock dump batters and benches to be progressively rehabilitated and revegetated to stop surface water runoff causing erosion and sediment discharging to watercourses.
- **Water Management Plan** which requires a 100-m-wide buffer to watercourses where ground surfaces are not disturbed, and riparian vegetation to be retained to protect water quality in rivers, creeks and streams.

7.2.3 Loss of biodiversity

Potential impacts on terrestrial biodiversity values may be caused by a variety of direct or indirect processes.

Potential impacts, which can be grouped into three broad types may occur at each scale. The mitigation to manage the impacts include:

- **Habitat loss from vegetation clearance and earthworks.** These impacts can be exacerbated indirectly by increased human populations (through in-migration and increased demand for natural resources; for example, building materials) and are managed by the:
 - **Biodiversity Management Plan** which requires vegetation clearance to be avoided where high biodiversity values are identified and requires vegetation clearance to be limited to that required to safely undertake mining activities.
 - **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.
 - **Rehabilitation Management plan** which requires planning and progressive rehabilitation of mine pits and waste rock dumps to stabilise the landscape and reinstate habitat.
- **Habitat degradation resulting from deposition of eroded sediments, colonisation by invasive species, or from contamination caused by accidental spills of hazardous materials.** Degradation may also occur indirectly as a result of increased use of natural resources, as a result of increased populations (through in-migration and improved access to forest areas) and is managed by the:
 - **Biodiversity Management Plan** which requires a riparian vegetation buffer zone of 100 m from the edge of watercourses to be maintained and clearing of riparian vegetation to be avoided or minimised.
 - **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.

- **Rehabilitation Management plan** which requires progressive rehabilitation to reduce erosion and sedimentation of watercourses, stabilise the landscape, reinstate habitat and control weeds.
- **Chemicals and Hazardous Materials Management Plan** which requires spill response kits where chemicals and/or hazardous materials are used/stored, and requires vehicles transporting chemicals and hazardous materials to be parked or refuelled at least 50 m from a watercourse.
- **Reduced abundance and/or diversity of flora and fauna populations** as a consequence of:
 - Changes to available habitat (including food sources, shelter and nesting or roosting sites) due to habitat loss or degradation.
 - Injury, death or displacement of flora and fauna from vegetation clearing and earthworks, collision with vehicles, or increased hunting in previously inaccessible areas or increased hunting pressure from increased human populations (through in-migration and improved access to forest areas).
 - Increased disturbance from noise and lighting disrupting the behaviour of fauna and potentially reducing reproductive success.

Reduced abundance and/or diversity of flora and fauna populations is managed by the:

- **Biodiversity Management Plan** which requires vegetation clearance to be avoided where high biodiversity values are identified and vegetation clearance to be limited to that required to safely undertake mining activities. Prohibits workers from hunting, collecting or harassing wildlife.
- **Code of Conduct** which requires mine workers to not harass, capture, keep as pets, sell or trade protected wildlife.
- **Rehabilitation Management Plan** which requires planning and progressive rehabilitation of mine pits and waste rock dumps to stabilise the landscape and reinstate habitat.
- **Noise and Vibration Management Plan** which requires compliance with the National Environmental Quality (Emissions) Guidelines (2012) and implementation of good practice measures such as using natural topography as a noise buffer and regular maintenance of equipment.

The impacts of biodiversity loss are most pronounced during the start of mining in new areas.

7.2.4 Changed hydrology

Excavation of open pits and dumping waste rock into valleys changes surface water drainage systems. Erosion and sedimentation can infill watercourse channels causing flooding of adjacent areas during the wet season. The extent of flooding is dependent on the topography (watercourse type and floodplain) and amount of infilling of the channel.

Potential impacts during mining from changed hydrology and the mitigation to manage the impacts are:

- **Loss or degradation of terrestrial biodiversity by sediment covering riparian vegetation or flooding affecting riparian habitat** is managed by the:

- **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.
- **Mine Closure Management Plan** which requires final landforms to be stable and revegetated to reduce erosion and sedimentation.
- **Mine Pit and Waste Rock Dump Management Plan** which requires a mine plan that sets out how mine pits and waste rock dumps are to be constructed to create safe, stable landforms, and to avoid or reduce erosion of mining-disturbed areas and protect downstream watercourses from sedimentation.
- **Rehabilitation Management Plan** which requires mine pit and waste rock dump batters and benches to be progressively rehabilitated and revegetated to stop surface water runoff causing erosion and sediment covering vegetation.
- **Water Management Plan** which requires a 100-m-wide buffer to watercourses where ground surfaces are not disturbed, and riparian vegetation to be retained to protect water quality in rivers, creeks and streams.
- **Loss or degradation of aquatic habitat** by:
 - Sediment smothering aquatic habitat.
 - Poor water quality.
 - Changed species abundance or composition due to restrictions on passage for migratory fish species.

Loss or degradation of aquatic habitat is managed by the:

- **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.
- **Mine Pit and Waste Rock Dump Management Plan** which requires a mine plan that sets out how mine pits and waste rock dumps are to be constructed to create safe, stable landforms, and to avoid or reduce erosion of mining-disturbed areas and protect downstream watercourses from sedimentation.
- **Water Management Plan** which requires a 100-m-wide buffer to watercourses where ground surfaces are not disturbed, and riparian vegetation is retained to protect water quality in rivers, creeks and streams.
- **Loss of life or property from flooding** is managed by the:
 - **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.
 - **Mine Closure Management Plan** which requires final landforms to be stable and revegetated to reduce erosion and sedimentation.
 - **Mine Pit and Waste Rock Dump Management Plan** which requires a mine plan that sets out how mine pits and waste rock dumps are to be constructed to create safe, stable landforms, and to avoid or reduce erosion of mining-disturbed areas and protect downstream watercourses from sedimentation.

- **Rehabilitation Management Plan** which requires mine pit and waste rock dump batters and benches to be progressively rehabilitated and revegetated to stop surface water runoff causing erosion and sediment covering vegetation.
- **Downstream impacts on Uru Creek** include increased sedimentation causing bed aggradation, affecting navigation and flood behaviour, and loss of aquatic habitat and biodiversity, which are managed by the:
 - **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses.
 - **Mine Closure Management Plan** which requires final landforms to be stable and revegetated to reduce erosion and sedimentation.
 - **Mine Pit and Waste Rock Dump Management Plan** which requires a mine plan that sets out how mine pits and waste rock dumps are to be constructed to create safe, stable landforms, and to avoid or reduce erosion of mining-disturbed areas and protect downstream watercourses from sedimentation.
 - **Rehabilitation Management Plan** which requires mine pit and waste rock dump batters and benches to be progressively rehabilitated and revegetated to stop surface water runoff causing erosion and sediment covering vegetation.
 - **Water Management Plan** which requires temporary bridges and causeways to be removed from Uru Creek and its major tributaries by May each year.

7.2.5 Contaminated water

Water can be contaminated by suspended sediment, waste, chemicals and hazardous materials. Contamination can occur from:

- Leaks or spills of hazardous materials including fuels, oils and chemicals during transport, handling or storage.
- Leaks or spills of bulk fuel being transported by barge up Uru Creek.
- Inappropriately disposed non-hazardous waste to watercourses or drainage lines where it is washed into watercourses.
- Increased concentrations of soluble nutrients such as fertilisers, stimulating algal growth and primary productivity in affected reaches of watercourses.

Potential impacts during mining from contaminated water and the mitigation to manage the impacts are:

- **Loss or degradation of terrestrial biodiversity by smothering or poisoning of riparian vegetation** is managed by the:
 - **Chemicals and Hazardous Materials Management Plan** which requires spill response kits where chemicals and/or hazardous materials are used/stored, and requires vehicles transporting chemicals and hazardous materials to be parked or refuelled at least 50 m from a watercourse.

- **Erosion and Sediment Control Plan** which requires surface water runoff to be managed to stop or significantly reduce erosion of mined surfaces, waste rock dumps and topsoil stockpiles, and sediment-laden water to be captured and treated in sediment basins before discharge to land and/or watercourses, and requires stormwater runoff to be diverted around hazardous material and chemical storage areas.
- **Mine Closure Management Plan** which requires final landforms to be stable and revegetated to reduce erosion and sedimentation.
- **Mine Pit and Waste Rock Dump Management Plan** which requires a mine plan that sets out how mine pits and waste rock dumps are to be constructed to create safe, stable landforms, and to avoid or reduce erosion of mining-disturbed areas and protect downstream watercourses from sedimentation.
- **Non-hazardous Waste Management Plan** which requires all non-hazardous waste storage areas to be located at least 50 m away from watercourses, and any pit toilets or septic systems to be located at least 100 m from watercourses and be constructed in a manner that allows effective infiltration through the soil. Landfills must be located at least 500 m away from any watercourse or water supply wells and be constructed in a manner that minimises risk of groundwater and surface water contamination.
- **Water Management Plan** which requires a 100-m-wide buffer to watercourses where ground surfaces are not disturbed, and riparian vegetation is retained to protect water quality in rivers, creeks and streams.
- **Loss or degradation of aquatic habitat by poisoning of aquatic plants, fish and macroinvertebrates, and reduced oxygen levels from algal blooms killing fish** is managed by the:
 - **Chemicals and Hazardous Materials Management Plan** which requires spill response kits where chemicals and/or hazardous materials are used/stored, and requires vehicles transporting chemicals and hazardous materials to be parked or refuelled at least 50 m from a watercourse.
 - **Non-hazardous Waste Management Plan** which requires all non-hazardous waste storage areas to be located at least 50 m away from watercourses, and any pit toilets or septic systems to be located at least 100 m from watercourses and be constructed in a manner that allows effective infiltration through the soil. Landfills must be located at least 500 m away from any watercourse or water supply wells and be constructed in a manner that minimises risk of groundwater and surface water contamination.
 - **Water Management Plan** which requires a 100-m-wide buffer to watercourses where ground surfaces are not disturbed, riparian and vegetation is retained to protect water quality in rivers, creeks and streams.
- **Health effects from contact with contaminated water including skin reactions and allergies** are managed by the:
 - **Chemicals and Hazardous Materials Management Plan** which requires spill response kits where chemicals and/or hazardous materials are used/stored, and requires vehicles transporting chemicals and hazardous materials to be parked or refuelled at least 50 m from a watercourse.

- **Non-hazardous Waste Management Plan** which requires all non-hazardous waste storage areas to be located at least 50 m away from watercourses, and any pit toilets or septic systems to be located at least 100 m from watercourses and be constructed in a manner that allows effective infiltration through the soil. Landfills must be located at least 500 m away from any watercourse or water supply wells and be constructed in a manner that minimises risk of groundwater and surface water contamination.
- **Water Management Plan** which requires identification and understanding of water resources used by the community before mining commences, and provision of an alternative water source where village water resources are adversely affected by mining-related activities.
- **Health effects from drinking contaminated water including gastrointestinal infections** are managed by the:
 - **Non-hazardous Waste Management Plan** which requires all non-hazardous waste storage areas to be located at least 50 m away from watercourses, and any pit toilets or septic systems to be located at least 100 m from watercourses and be constructed in a manner that allows effective infiltration through the soil. Landfills must be located at least 500 m away from any watercourse or water supply wells and be constructed in a manner that minimises risk of groundwater and surface water contamination.
 - **Water Management Plan** which requires identification and understanding of water resources used by the community before mining commences, and provision of an alternative water source where village water resources are adversely affected by mining-related activities.

7.2.6 Access to water

People traditionally rely on wells, springs or streams for water. Mining activities have rendered most streams and rivers unsuitable for human consumption and use. Wells have been dug to shallow aquifers to provide drinking water. Springs often associated with bedrock outcrops are another source of drinking water.

Excavation of deep open pits has intercepted shallow and deep aquifers causing wells to dry up and springs to stop flowing. Terrestrial and aquatic ecosystems associated with springs have been lost or seriously degraded.

Mitigation to manage reduced access to water, as a result of mining activity is:

- **Land Access Management Plan** which requires planning and community consultation before mining commences to ensure mining activity does not restrict access to natural resources including freshwater.
- **Mine Closure Management Plan** which requires remediation of soil and water contaminated by hazardous materials, as a result of mining activities, and maintenance of existing erosion and sediment control structures to continue to divert runoff around the mine pit.
- **Mine Pit and Waste Rock Dump Management Plan** which requires mine pit and waste rock dump design to avoid watercourses and riparian corridors, and include a minimum buffer distance of 100 m between the mine pit or waste rock dumps and villages.

- **Water Management Plan** which requires identification and understanding of water resources used by the community before mining commences, and provision of an alternative water source where village water resources are adversely affected by mining-related activities.

7.2.7 Inappropriate waste disposal

The disposal of waste may impact the environment and communities if not managed appropriately.

Waste that is discarded can be washed into watercourses. This can impact the structure, biology and chemical composition of these surface water features affecting aquatic ecosystems and people's health.

Wastes and chemicals may also harm plants when they take up the contamination through their roots. If humans eat plants and animals that have been in contact with such polluted soils, their health can be affected.

Incinerating waste also causes problems, because plastics tend to produce toxic substances, such as dioxins, when they are burnt. Gases from incineration may cause air pollution and contribute to acid rain, while the ash from incinerators may contain heavy metals and other toxins.

Mitigation to manage waste disposal associated with mining activity is set out in the following management plans:

- **Code of Conduct** which requires mining companies and their workers to act with care and integrity at all times, to comply with this EMP, and to not litter and dispose of all waste properly in containers or facilities.
- **Chemicals and Hazardous Materials Management Plan** which requires appropriate use, transport, storage and disposal of chemicals and hazardous materials, as well as maintenance of spill response kits where chemicals and/or hazardous materials are used/stored.
- **Non-hazardous Waste Management Plan** which requires appropriate on-site collection, management and disposal of non-hazardous waste, including to landfills.
- **Air Quality and Dust Suppression Management Plan** which prohibits burning of cleared vegetation or other waste materials.

7.2.8 Health effects

Diseases reported in the village surveys include:

- Drug-related diseases including hepatitis infections and HIV.
- Respiratory diseases such as asthma, bronchitis and pneumonia from inhalation of dust.
- Water-borne diseases such as diarrhoea and gastrointestinal infections.
- Mosquito-borne diseases such as malaria, dengue-fever and Japanese encephalitis.

The mitigation measures to manage health and the above diseases reported in villages are:

- **Community Health, Safety and Security Management Plan** which requires mining companies to support the Department of Health in conducting community health surveys, a community health risk assessment and to develop strategies for managing worker and community health and safety from mining activities.

- **Occupational Health and Safety Plan** which requires medical checks for workers to ensure they are fit for work and requires mining companies to supply first aiders and first aid equipment and supplies, as well as training for all workers in basic hygiene for disease prevention and establishment of appropriate infection control procedures.
- **Worker Accommodation Management Plan** which requires sufficient space for each worker, adequate sanitary and washing facilities, sufficient safe drinking water, adequate waste management, adequate ventilation, medical and first aid facilities, and separate facilities for sick workers to prevent the spread of communicable diseases among the occupants.

Dust is a common air pollutant generated by many different sources and activities. Dust particles vary in size. The smaller the particle, the longer it stays in the air and the further it can travel.

Large dust particles fall out of the air relatively close to where they are created. These particles form the dust layers you can see. Large dust particles tend to be trapped in the nose and mouth when you breathe them in and can be readily breathed out or swallowed harmlessly. Smaller or fine dust particles are invisible. Fine dust particles are more likely to penetrate deep into the lungs while ultrafine particles can be absorbed directly into the blood stream.

The World Health Organisation (WHO) indicates that numerous scientific studies have linked particle pollution exposure to a variety of health effects, including:

- Increased respiratory symptoms, such as irritation of the airways, coughing, aggravated asthma, development of chronic bronchitis, and breathing difficulty through decreased lung function.
- Premature death in people with heart or lung disease.
- Toxic effects by absorption of the toxic material into the blood (e.g., lead, cadmium, zinc).
- Irritation of mucous membranes (e.g., acid and alkali fumes).

Dust typically results in increased respiratory symptoms, such as irritation of the airways, coughing, aggravated asthma, development of chronic bronchitis, and breathing difficulty through decreased lung function.

Mitigation measures to manage the potential impacts from dust are:

- **Air Quality and Dust Suppression Management Plan** which requires provision of appropriate PPE, minimisation of extent and time that ground surfaces and stockpiles are exposed, dust suppression using water, monitoring of local weather conditions, avoiding work near villages and settlements, and not burning cleared vegetation or other waste materials.
- **Occupational Health and Safety Plan** which requires provision and training of all workers in use of PPE, contribution to maintenance of health clinic, provision of appropriate and hygienic facilities, and adequate ventilation in buildings used by people.
- **Rehabilitation Management Plan** which requires progressive rehabilitation, and revegetation of the final landform and application of matting, mulching or compost to prepared surfaces to minimise dust generation.
- **Worker Accommodation Management Plan** which requires worker accommodation to have sufficient ventilation and be regularly cleaned and serviced.

7.2.9 Amenity (noise and vibration)

Blasting is necessary for the recovery of jadeite. However, blasting can cause excessive noise and vibration, which can impact neighbouring communities. The two main impacts from blasting are overpressure (vibrations that travel through the air) and ground vibrations.

Blasting usually results in shock waves that travel through the ground and air. The latter commonly includes both audible noise and vibration known as airblast, which can cause objects to rattle and make noise. Excessive levels of structural vibration due to ground vibration from blasting can cause substantial damage to structures. People can detect vibration at much lower levels.

Annoyance and discomfort from blasting can occur when noise startles individuals or when airblast or ground vibration causes vibration. The degree of impact will therefore be influenced by the level of airblast and vibration, as well as factors such as the time of day, the frequency of occurrence and the sensitivity of individuals.

Other sources of noise emissions associated with mining may include noise from vehicle engines, loading and unloading of rock, power generation, and other sources related to construction and mining activities.

Impacts on the acoustic amenity, as a result of mining activities and the mitigation to manage the impacts are:

- **Noise disturbance.** This includes nuisance noise and background noise creep, which is when noise levels progressively become higher over time. This is managed by the:
 - **Noise and Vibration Management Plan** which requires appropriate use of PPE, conduct of noisy activities only during daytime, use of natural topography and siting of facilities to act as noise buffer, and limiting blasting activities to daytime hours and prescribed periods of the day, using correct charging and blasting ratios to avoid overuse of explosives.
 - **Occupational Health and Safety Plan** which requires appropriate use of PPE and safe operation and maintenance of mining vehicles, plant and equipment, as well as safe blasting procedures.
- **Vibration-induced human discomfort and structural damage** which is managed by the:
 - **Noise and Vibration Management Plan** which requires limiting blasting activities to daytime hours and prescribed periods of the day, and using correct charging and blasting ratios to avoid overuse of explosives.
- **Sleep disturbance** can occur from airblast and transient noise such as that from a truck engine at fast revving and vehicle reversing alarms, and is managed by the:
 - **Noise and Vibration Management Plan** which requires conduct of noisy activities only during daytime, use of natural topography and siting of facilities to act as noise buffer, and limiting blasting activities to daytime hours and prescribed periods of the day, using correct charging and blasting ratios to avoid overuse of explosives.
 - **Occupational Health and Safety Plan** which requires white noise reversing alarms, proper maintenance of all vehicles and adherence to speed limits.

7.2.10 Health and safety (mining/traffic accidents)

Mining is inherently dangerous if safe work practices are not adhered to and unauthorised people excluded from high risk areas. Exposure to hazards can result in injury or death, or health effects.

Injury or death can occur from:

- Vehicle accident (collision or rollover).
- Contact or collision with mining equipment (haul trucks and excavators).
- Mining equipment failure (compressor or drill rig malfunction).
- Uncontrolled or unexpected explosion.
- Contact with hazardous materials including acids, caustic solutions, solvents, etc.
- Fire caused by fuel spill or explosion.
- Electrocution from contact with live electrical wires.
- Landslides from mine wall collapse or waste rock dump slope failure.

Mitigation to manage the above risks of injury or death related to mining activity are:

- **Emergency Preparedness and Response Plan** which requires designation of emergency assembly areas, and provision of appropriate emergency response equipment (first aid, firefighting equipment) and describes emergency response procedures to be followed in case of emergency.
- **Incident Reporting Procedure** which describes the procedures for managing and reporting incidents.
- **Noise and Vibration Management Plan** which requires blasting to be conducted only by personnel who are trained and certified as competent in this activity, and the use of correct charging and blasting ratios to avoid overuse of explosives.
- **Occupational Health and Safety Plan** which requires all mine workers to be appropriately trained, inducted, provided with appropriate PPE and fit for work. Workers must not stand within the swing path of an excavator or behind reversing vehicles and haul trucks, and must obey speed limits and drive to the road conditions. Open pit walls and waste rock dumps must be regularly inspected for instability and appropriate measures taken if instability is identified. This plan also details the procedures for safely conducting blasting activities.
- **Worker Accommodation Management Plan** which requires provision of appropriate medical and first aid facilities, fire extinguishers, firefighting equipment and smoke detectors.

Health risks related to mining activity and the mitigation measures to manage the risks are:

- **Unsafe or contaminated drinking water from poor sanitation and/or polluted water causing gastrointestinal infections**, which is managed by:
 - **Non-hazardous Waste Management Plan** which requires all non-hazardous waste storage areas to be located at least 50 m away from watercourses, and any pit toilets or septic systems to be located at least 100 m from watercourses and be constructed in a manner that allows effective infiltration through the soil. Landfills must be located at least 500 m away from any watercourse or water supply wells and be constructed in a manner that minimises risk of groundwater and surface water contamination.
 - **Water Management Plan** which requires identification and understanding of water resources used by the community before mining commences, and provision of an alternative water source where village water resources are adversely affected by mining-related activities.

- **Exposure to hazardous substances and toxic chemicals causing burns, skin irritations, eye infections, and respiratory infections and diseases**, which is managed by:
 - **Chemicals and Hazardous Materials Management Plan** which requires spill response kits where chemicals and/or hazardous materials are used/stored, and requires vehicles transporting chemicals and hazardous materials to be parked or refuelled at least 50 m from a watercourse.
 - **Non-hazardous Waste Management Plan** which requires all non-hazardous waste storage areas to be located at least 50 m away from watercourses, and any pit toilets or septic systems to be located at least 100 m from watercourses and be constructed in a manner that allows effective infiltration through the soil. Landfills must be located at least 500 m away from any watercourse or water supply wells and be constructed in a manner that minimises risk of groundwater and surface water contamination.
 - **Water Management Plan** which requires identification and understanding of water resources used by the community before mining commences, and provision of an alternative water source where village water resources are adversely affected by mining-related activities.
- **Exposure to excessive dust causing respiratory infections and diseases**, which is managed by:
 - **Worker Accommodation Management Plan** which requires worker accommodation to have sufficient ventilation, and be regularly cleaned and serviced.
 - **Air Quality and Dust Suppression Management Plan** which requires provision of appropriate PPE, minimisation of extent and time that ground surfaces and stockpiles are exposed, dust suppression using water, monitoring of local weather conditions, avoiding work near villages and settlements, and not burning cleared vegetation or other waste materials.
 - **Occupational Health and Safety Plan** which requires provision and training of all workers in use of PPE, contribution to maintenance of health clinic, provision of appropriate and hygienic facilities, and adequate ventilation in buildings used by people.
 - **Rehabilitation Management Plan** which requires progressive rehabilitation, and revegetation of the final landform and application of matting, mulching or compost to prepared surfaces to minimise dust generation.
- **Exposure to excessive noise causing hearing loss**, which is managed by:
 - **Noise and Vibration Management Plan** which requires appropriate use of PPE, conduct of noisy activities only during daytime, use of natural topography and siting of facilities to act as noise buffer, and limiting blasting activities to daytime hours and prescribed periods of the day, using correct charging and blasting ratios to avoid overuse of explosives.
 - **Occupational Health and Safety Plan** which requires appropriate use of PPE and safe operation and maintenance of mining vehicles, plant and equipment, as well as safe blasting procedures.
- **Crowded accommodation and unhygienic living conditions potentially causing the spread of communicable diseases**, which is managed by:

- **Worker Accommodation Management Plan** which requires sufficient space for each worker, adequate sanitary and washing facilities, sufficient safe drinking water, adequate waste management, adequate ventilation, medical and first aid facilities, and separate facilities for sick workers to prevent the spread of communicable diseases among the occupants.
- **Occupational Health and Safety Plan** which requires medical checks for workers to ensure they are fit for work and requires mining companies to supply first aiders and first aid equipment and supplies, as well as training for all workers in basic hygiene for disease prevention and establishment of appropriate infection control procedures.
- **Administration and consumption of drugs, alcohol or other addictive substances**, which is managed by:
 - **Occupational Health and Safety Plan** which requires that workers presenting for work must not be under the influence or in possession of alcohol, drugs or other addictive substances.
 - **Code of Conduct** which requires that workers not make, use or distribute drugs, alcohol or other addictive substances.

7.2.11 Communities, livelihoods and community infrastructure

Mining activities directly and indirectly affect communities. The proximity of mines to towns, villages and settlements influences the type and scale of direct impacts experienced. In-migration exposes communities to a range of indirect impacts that affect their livelihoods.

Direct impacts include:

- Loss of access to traditional water sources.
- Loss of amenity from noise and vibration, and traffic.
- Restrictions on access to cultural heritage and religious sites.
- Structural damage to houses and buildings from blasting and subsidence.
- Loss of, or damage to property from landslides or flooding.
- Loss of property and livelihoods from resettlement.
- Loss of identity through exclusion from or damage to cultural heritage and religious sites.

Indirect impacts include:

- Reduced capacity to sustain livelihoods through competition for jobs, goods and services from increased population.
- Health effects and social issues associated with alcohol, drugs and other addictive substance use.
- Crime associated with drug trafficking and reduced capacity to sustain livelihoods.
- Reduced capacity to sustain livelihoods due to inequitable access to concessions.
- Displacement of artisanal and small-scale mining by large-scale mining.
- Reduced capacity to sustain livelihoods due to lack of a local jade market.
- Availability of and access to health and education services from increased population.

Mitigation to manage the potential community and livelihood impacts related to mining activity is set out in the following management plans:

- **Code of Conduct** which requires mining companies and their workers to comply with this EMP; respect and where required protect cultural heritage and religious sites from disturbance; not make, use or distribute drugs, alcohol or other addictive substances; and appropriately dispose of all waste.
- **Community Grievance Mechanism** which requires establishment of a community grievance mechanism for the community to raise complaints with mining companies.
- **Community Support and Development Plan** which requires establishment of a CSR fund for investment in the social welfare program, which is designed to address the communities' main issues of concern identified through public consultation. Community reference groups must also be established which provide a mechanism for the community to raise issues and concerns with mining companies.
- **Land Access Management Plan** which requires avoidance of resettlement and restricted access to resources (such as freshwater), and where resettlement/restricted access is unavoidable presents guidelines for compensation, including conduct of an independent completion audit of all resettlement and compensation activities.
- **Mine Closure Management Plan** which requires discussion and agreement with communities on final land use and preparation of a mine closure plan incorporating local community suggestions.
- **Mine Pit and Waste Rock Dump Management Plan** which requires a mine plan that sets out how mine pits and waste rock dumps are to be constructed to create safe, stable landforms, and to avoid or reduce erosion of mining-disturbed areas, protect downstream watercourses from sedimentation, and provide adequate separation from villages and settlements.
- **Noise and Vibration Management Plan** which requires conduct of noisy activities only during daytime, use of natural topography and siting of facilities to act as noise buffer, and limiting blasting activities to daytime hours and prescribed periods of the day, using correct charging and blasting ratios to avoid overuse of explosives.
- **Occupational Health and Safety Management Plan** which requires all blasting to be conducted by a suitably trained and experienced person, adequate safety zones to be enforced around blasts, and correct charging and blasting ratios to avoid overuse of explosives.
- **Water Management Plan** which requires identification and understanding of water resources used by the community before mining commences, and provision of an alternative water source where village water resources are adversely affected by mining-related activities.

7.2.12 Cultural heritage

Mining activities can damage or destroy ancient monuments and sites, cultural heritage regions, antiques, archaeological material and religious sites. Blasting can damage pagodas and other religious buildings and structures. Mining can isolate communities from cultural heritage and religious sites, and can adversely affect the amenity of the sites. Antiques and archaeological material can be lost during excavation if workers are not aware of its significance to the local community and Myanmar's heritage and history.

Direct impacts include:

- Loss or damage to cultural heritage and religious sites and values.
- Loss or damage to ancient monuments, antiques and archaeological materials.
- Loss or reduction of communities' cultural heritage.

Indirect impacts include:

- Denial or restricted access to cultural heritage and religious sites.

Mitigation to manage the potential for loss or damage of or restricted access to cultural heritage sites related to mining activity is set out in the following management plans:

- **Code of Conduct** which requires mining companies and their workers to respect and where required protect cultural heritage and religious sites from disturbance.
- **Community Grievance Mechanism** which requires establishment of a community grievance mechanism for the community to raise complaints with mining companies.
- **Community Support and Development Plan** which requires establishment of a corporate social responsibility (CSR) fund for investment in the social welfare program, which is designed to address the communities' main issues of concern identified through public consultation. Community reference groups must also be established which provide a mechanism for the community to raise issues and concerns with mining companies.
- **Cultural Heritage Management Plan** which requires worker training on the location and protection of cultural heritage sites, maintenance of a register of cultural sites at or adjacent to the mine site, and exclusion of mining activities from known cultural heritage sites in the vicinity of work areas wherever possible. If avoidance of a cultural heritage site is not possible, the plan provides guidelines for management as well as a procedure to follow in the event of a chance find.

7.3 Management plans

Management plans that contain the measures and procedures to mitigate the impacts of jade and alluvial gold mining in the Hpakant/Lonkin Gems Tract are listed in this section. The plans and procedures contain links to related plans, applicable legislation and regulation, and good practice international standards and guidelines. Performance criteria, and inspection and monitoring requirements are also set out in each plan.

Where relevant, plans include management measures and procedures that need to be implemented:

- Before mining – to ensure proper planning for environmental and social management of mining activities.
- During mining – to ensure mining activities avoid, minimise, reduce and compensate for environmental and social impacts.
- After mining – to ensure mine sites are properly rehabilitated, and the final land use has regard to community views.

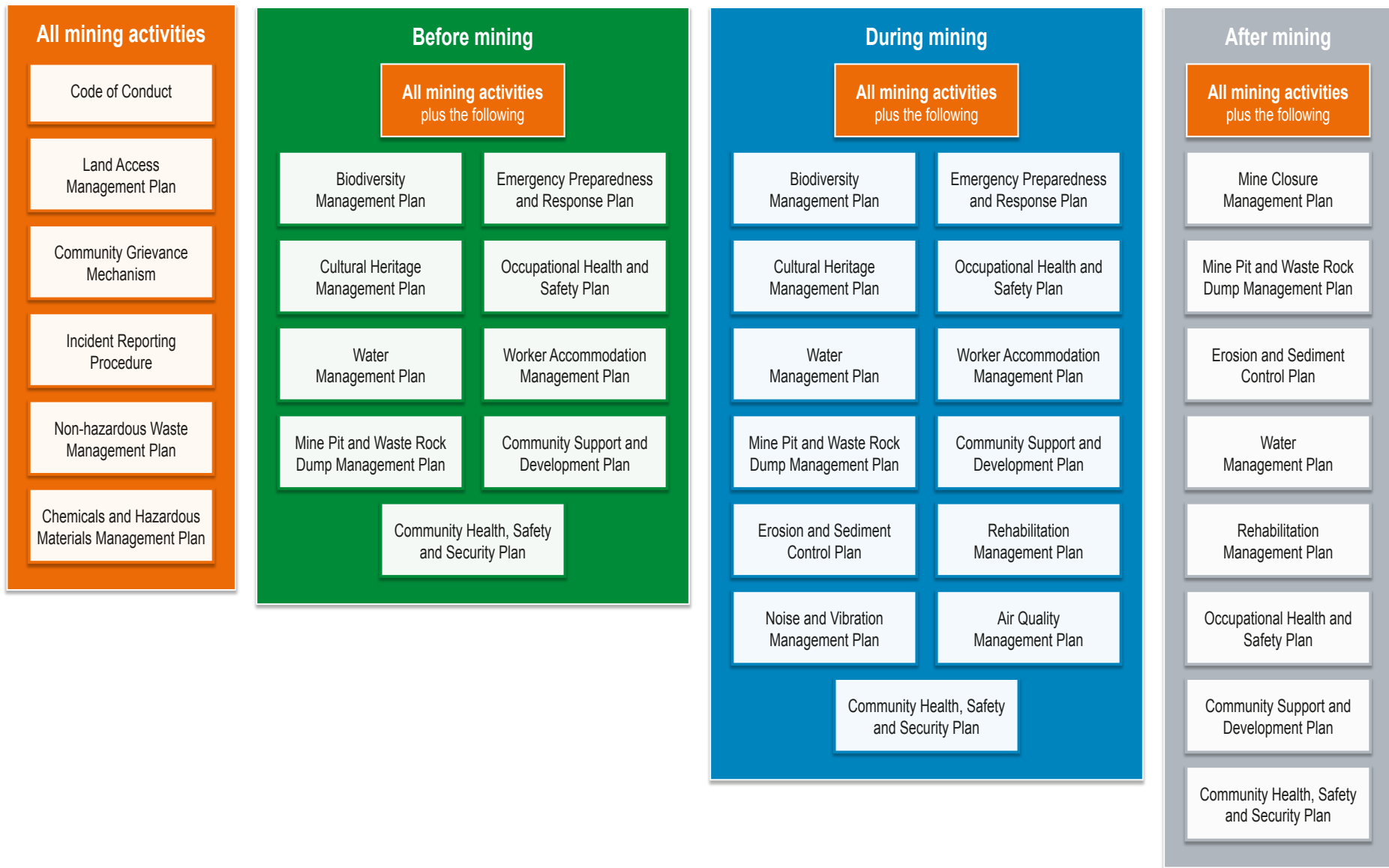
Figure 7.1 shows the application of the management plans and procedures to be implemented for all phases of large-scale mining and for each phase – before mining, during mining and after mining.

The management plans and procedures to be implemented and the specific plans or registers to be prepared and maintained under those plans and procedures are listed in Table 7.6 along with their location in this EMP.

Table 7.6 Management plans and procedures

Management plan or procedure (in alphabetical order)	Specific plan or register required by this plan	Location of this management plan or procedure in this EMP
Air Quality and Dust Suppression Management Plan	None	Appendix 1
Biodiversity Management Plan	Business and biodiversity offset program	Appendix 1
Chemicals and Hazardous Materials Management Plan	Chemicals and hazardous materials inventory	Appendix 1
Code of Conduct that sets out the expected behaviour and responsibilities of workers and mining companies, including towards the environment and local communities	None	Appendix 1
Community Grievance Mechanism	Grievances register	Appendix 1
Community Health, Safety and Security Management Plan	None	Appendix 1
Community Support and Development Plan	Social welfare program	Chapter 15
Cultural Heritage Management Plan	Register of cultural heritage sites	Appendix 1
Emergency Preparedness and Response Plan	None	Chapter 8
Erosion and Sediment Control Plan	Surface water management plan	Appendix 1
Incident Reporting Procedure	Record of incident reports	Chapter 13
Land Access Management Plan (including resettlement and compensation)	Record of land acquisition and compensation paid	Appendix 1
Mine Closure Management Plan	Mine closure plan	Chapter 16
Mine Pit and Waste Rock Dump Management Plan	Mine plan	Appendix 1
Noise and Vibration Management Plan	None	Appendix 1
Non-hazardous Waste Management Plan	Non-hazardous waste inventory	Appendix 1
Occupational Health and Safety Plan	Register of worker training and visitor inductions Worker grievance register Register of worker proof of age and health certificates	Appendix 1

Management plan or procedure (in alphabetical order)	Specific plan or register required by this plan	Location of this management plan or procedure in this EMP
	Record of explosive materials and detonators held and used	
Rehabilitation Management Plan	None	Appendix 1
Water Management Plan	None	Appendix 1
Worker Accommodation Management Plan	None	Appendix 1



8 Emergency plan

Jade mining exposes workers and communities to risks from unstable mine pits and waste rock dumps, blasting, excavators, haul trucks, and fuel, chemicals and hazardous materials spills. The Emergency Preparedness and Response Plan sets out how mining companies must plan for and respond to emergencies.

Hpakant/Lonkin Gems Tract Environmental Management Plan	
Emergency Preparedness and Response Plan	
Version: Rev 1	Date: 31 October 2018

1. Purpose

A range of emergency situations could occur directly as a result of mining activities, or indirectly due to natural hazards. Emergencies during mining typically relate to the failure of equipment and machinery, collisions or rollover, uncontrolled or unexpected explosions or blasts, and spills of hazardous materials. Emergencies may also be caused by hazards inherent to the environment, which may or may not be caused by people. These types of incidents commonly include landslides, flooding and fire. Whatever their cause, emergencies can cause injury or harm to people, or damage or loss of property, and/or harm to the environment.

Adequate and timely response to emergencies is critical to contain the situation and minimise harm to people, property and the environment. Mining companies and their workers must be appropriately prepared to handle any emergency situation that may develop.

The emergency preparedness and response plan (this plan) describes how emergency response for large-scale jade mining will be planned for and managed. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objective

The objectives of the emergency preparedness and response plan are to:

- Protect the health and safety of workers, visitors and the community.
- Protect the environment from serious adverse effects.
- Set out the actions that aim to minimise serious consequences of an emergency through timely, effective and coordinated response.

3. Definitions

Affected party – a person or persons or organisation impacted by mining activities.

Boom – a temporary barrier used to contain a spill.

Bund – a secondary containment system comprising a wall or container of sufficient capacity to contain all the stored liquid. Also a stone or earth formed into an embankment to hold back water or other liquid (in the case of a spill).

Community – a group of people who share a common sense of identity and interact with one another on an ongoing basis.

Emergency – a present or imminent event that requires prompt coordination of actions, or special regulation of persons or property, to protect the health, safety, or welfare of people or to limit damage to property and the environment.

Hazardous material – any solid, liquid or contained gaseous substance with properties that make it potentially dangerous or harmful to human health, safety and/or the environment. Hazardous properties might include the following:

- Flammable i.e., burns easily.
- Corrosive e.g., very high (alkaline) or low (acid) pH.
- Reactive e.g., explosive or toxic.
- Biological e.g., medical waste.

Incident – a specific event or sequence of events that result in unwanted or unintended impact on the environment, safety, security, health, the livelihoods of people and/or an impact on property, or on legal/regulatory compliance.

Material Safety Data Sheet (MSDS) – a document that provides health and safety information about products, substances or chemicals that are classified as hazardous or dangerous goods.

Mining company – a company, joint venture, cooperative, persons or person holding a permit to produce gemstone from a gemstone block or concession.

Natural hazard – a naturally occurring event that can have a negative effect on people, property or the environment. Natural hazards include earthquakes, landslides, storms, flooding and fire.

PPE – personal protective equipment. Refers to specialised clothing or equipment worn by employees for protection against health and safety hazards at a work site. As a minimum, PPE would include long trousers, long-sleeved shirt, boots, gloves, and where needed, a face mask.

Spill kit – a compilation of absorbent materials, cleaners and chemical neutralisers used to contain accidental spills.

Worker – any person working for a mining company including all mining company owners, employees, contractors, subcontractors and family members.

4. Associated plans and procedures

The emergency preparedness and response plan requires management measures in the following plans to be implemented:

- Incident Reporting Procedure.
- Chemicals and Hazardous Materials Management Plan.
- Mine Pit and Waste Rock Dump Management Plan.
- Occupational Health and Safety Plan.
- Rehabilitation Management Plan.

5. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to emergency response are listed in this section.

5.1 Laws, rules and guidelines

The laws that require emergencies to be appropriately managed are:

Constitution of the Republic of the Union of Myanmar, specifically:

- Article 21(a) Every citizen shall enjoy the right of equality, the right of liberty and the right of justice, as prescribed in this Constitution.
- Article 34 Every citizen is equally entitled to freedom of conscience and the right to freely profess and practise religion subject to public order, morality or health and to the other provisions of this Constitution.

The Indian Explosives Act (1884), specifically:

- Section 5 requires a licence to manufacture, possess, use, sell, transport and import explosives.
- Section 7(a) grants the government or local administration the right to enter any place to inspect and examine the manufacture, possess, use, sell, transport and import of explosives if they believe the licence conditions are not being met.

The Explosive Substance Act (1908), specifically:

- Section 3 prohibits unlawful or malicious use of explosives to harm people and prescribes the punishment for such acts.
- Section 4 prohibits unlawful or malicious intent to use explosives to harm people and prescribes the punishment for such acts.
- Section 5 prohibits persons having in their possession explosive substances for suspicious activities and prescribes the punishment for such acts.

The Petroleum and Petroleum Products Law (2017), specifically:

- Section 9 requires a licence from the Ministry of Transportation and Communication to transport petroleum and petroleum products in vehicles, boats, barges and trailers. It requires accidental leaks and spills to be cleaned up in accordance with current laws.
- Section 10 requires a licence from the Ministry of Natural Resources and Environmental Conservation for the storage of petroleum and petroleum products and for the transportation of petroleum and petroleum products.
- Section 11 requires dangerous petroleum and petroleum products to be clearly marked with appropriate signage.
- Section 31 outlines obligations of license holders to protect the environment from accidental leaks and spills of petroleum and petroleum products.

Myanmar Fire Department Law (2015), specifically:

- Section 25 requires owners of offices and accommodation facilities or a fire-prone industry to have fire-fighting capabilities and provide fire-fighting and safety equipment.

The Guideline on Public Participation in EIA Process requires that the EMP include an emergency plan to address the risks associated with accidents or emergencies during construction and operation. This emergency plan should be linked to other local emergency plans and in general should be prepared, and kept up-to-date in consultation with the project affected parties and other stakeholders. The plan should include:

- A description of the different potential situations that could arise.
- Pertinent information in case of emergency (e.g., coordinates of the responsible authorities, available equipment, and maps with prioritised routes).
- The command structure in case of an emergency and the mode of communication with the local or regional authorities.
- A list of priority actions in case of emergency (e.g., emergency calls, diverting of traffic, road signs, and methods of evacuation).

5.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) and Article 54(c) of The Second Amending Law of the Myanmar Gemstone Law (2016) for the Hpakant/Lonkin Gems Tract.

The notifications relevant to emergency preparedness and response are:

- Letter No. 121/99, October 4, 1999.
- Letter No. Ka-37/383/2016, May 23, 2016.
- Letter No. Ka-37/209/2017, February 16, 2017.

These notifications are attached to this EMP in Appendix 2.

6. Emergency preparedness and response

The actions detailed below incorporate the requirements of the notifications and legislation listed above and are to be implemented with the notifications.

6.1 Potential emergency situations

The potential emergency situations that could arise from jade mining activities are:

- Traffic accident involving collision between a vehicle and a person or persons.
- Traffic accident involving collision between a vehicle and a house or other building.
- Traffic accident involving collision between vehicles or mining equipment and vehicles.
- Traffic accident involving a vehicle, haul truck or excavator rollover.
- Accident involving people being struck by mining equipment.
- Accident caused by failure of mining equipment.
- Accident caused by premature detonation of explosive materials and detonators in transport to mine site.
- Accident caused by uncontrolled detonation of explosive materials and detonators storage.
- Major fuel spill and potential ignition causing uncontrolled fire.
- Major hazardous materials spill causing contamination of soil and water.
- Unexploded charges and delayed explosions.
- Landslide causing injury or damage to property or loss of life or property.

- Flooding causing injury or damage to property or loss of life or property.
- Uncontrolled fire causing injury or damage to property or loss of life or property.

6.2 Emergency preparedness

Preparation for emergency response will include providing safe refuge, emergency response procedures, appropriate equipment, and training. The mine manager is responsible for emergency preparedness.

Safe refuge

- a. Establish emergency assembly areas and clearly display maps showing their location and evacuation routes to the assembly areas. The maps will be displayed in the mine office, at the mine site and in all vehicles.
- b. Located emergency assembly areas will be away from fuel and hazardous materials storages and main access routes to the mine site so that people are safe and emergency access is not impeded.

Emergency response procedures

- c. Display emergency contact numbers at the mine office, maintenance workshop, fuel storage area and mine site. This will include a dedicated mobile phone number or UHF radio channel. The mobile phone number should be redirected to the mine manager or mine environmental and safety officer's mobile phone number.
- d. Display maps showing the location of emergency assembly areas, evacuation routes and fire extinguishers at the mine office, maintenance workshop, fuel storage area and mine site.
- e. Provide emergency contact numbers and maps showing the location of emergency assembly areas and evacuation routes in all vehicles.
- f. Display the incident reporting procedure at the mine office, maintenance workshop and at the mine site.
- g. Store Material Safety Data Sheets (MSDS) in a readily accessible location at the mine office and at the maintenance workshop.

Appropriate equipment

- h. Provide appropriate personal protective equipment (PPE) for workers responding to emergencies including protective clothing, gloves, safety glasses, face masks and breathing apparatus (where necessary).
- i. Provide first aid kits in the mine environmental and safety officer's vehicle, at the mine office, at the mine site and at all work areas e.g., maintenance workshop.
- j. Provide appropriate fire extinguishers in all buildings, work areas and vehicles.
- k. Provide firefighting equipment if a fire and rescue service is not provided by the local administration. As a minimum this will include a water tanker (minimum 1,000 L capacity) with high pressure pump, 100 m long 50 mm diameter hose (minimum) and combination nozzle (fog spray and jet).
- l. Provide traffic management equipment such as road cones, barriers and signage.

- m. Provide spill response kits as detailed in Chemicals and Hazardous Materials Management Plan.
- n. Inspect and maintain fire extinguishers and firefighting equipment at least once a month.
- o. Inspect and maintain spill kits at least once a month and replace used materials.

Training

- p. Ensure at least seven workers are trained first aiders including two at the mine office, two at the maintenance workshop, and three at the mine site.
- q. Train all workers in emergency response procedures, as relevant to their role at the mine site.
- r. Train relevant workers in the use of fire extinguishers and available firefighting equipment and conduct firefighting drills at least once every three months.
- s. Provide in depth training for all workers with specific responsibilities for responding to a fuel or chemical spill, including the proper use of available spill response kits.
- t. Conduct emergency response drills at least once every three months.

6.3 Coordination of emergency response

In the event of an emergency, the mine manager or the mine environmental and safety officer will become the emergency response officer. The mine manager or mine environmental and safety officer first receiving the emergency call will take initial responsibility for coordinating the response and will be the emergency response officer for the incident.

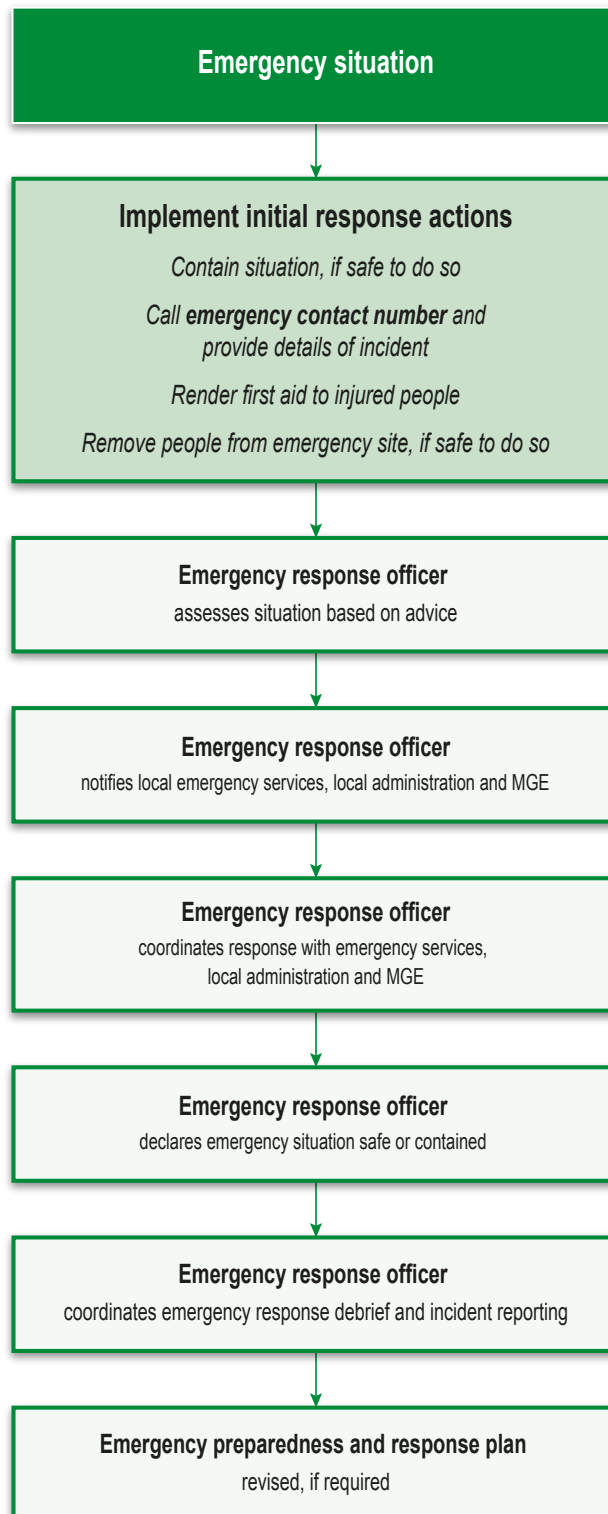
Where appropriate, the emergency response officer will transfer control of the incident to the responsible local emergency services officer, local administration official or Myanmar Gems Enterprise officer.

The emergency response officer will be responsible for all communications with the responsible local emergency services officer, local administration official or Myanmar Gems Enterprise officer.

The emergency response officer will have the authority to request the necessary resources and equipment and to direct the activities required to contain, respond to, clean up and investigate the incident.

6.4 Emergency response

The initial response to an emergency is important in containing and limiting the incident and its effect on people, property and the environment. The initial response includes identifying the resources and equipment necessary to respond to the emergency. The response should be appropriate to the risk posed by the emergency to people, property and the environment. The following sections set out the actions required to respond to an emergency situation. Figure 1 shows the response procedure.



Initial response to all incidents

Implement the following actions **for all incidents**:

- a. Immediately stop the associated activity and mining activity near the site of the incident.
- b. Secure the site and assess the situation for danger.
- c. Call the emergency contact number and provide the following details:
 - i. Location of incident.
 - ii. Type of incident.
 - iii. Number of people involved and their condition (injured, seriously injured, deceased).
 - iv. Assistance required to contain and respond to incident.
 - v. Any restrictions on access to site.
- d. Render first aid assistance to injured persons, if safe to do so.
- e. Arrange for safe evacuation of workers, visitors and community members from the situation.
- f. Implement the Incident Reporting Procedure.
- g. Follow the instructions of the emergency response officer.

Traffic accident

Implement the **initial response actions** and following actions in the event of a traffic accident:

- h. Protect the site of the accident from traffic using traffic management equipment.
- i. Ensure emergency vehicle access (police, ambulance and fire) is maintained and prioritised.
- j. Detour traffic along another route, where possible.
- k. Contain any fuel or chemical spills.
- l. Safely remove damaged vehicles and remediate the road surface cleaning up any fuel, oil or chemical spills.

Accidents involving mining plant and equipment

Implement the **initial response actions** and following actions in the event of an accident involving plant and equipment:

- m. Shutdown the plant or equipment if safe to do so.
- n. Ensure plant or equipment is stable and safe to approach and work around. Anchor or support unstable plant or equipment.
- o. Provide safe access for emergency response and emergency services personnel.
- p. Contain any fuel or chemical spills.
- q. Do not move damaged plant or equipment until incident investigation is completed.
- r. Safely remove damaged plant and equipment and clean up any fuel, oil or chemical spills.

Accidents involving explosive materials and detonators

Implement the **initial response actions** and following actions in the event of an accident involving explosive materials or detonators:

- s. Immediately establish and enforce a safety zone (at least 300 m) around the site of the incident. The zone will be large enough to protect people from any subsequent explosions.
- t. Do not approach the vehicle or storage facility.
- u. Seek the assistance of an explosives expert to assess the risk posed by the unexploded explosive material and detonators.
- v. Follow the directions of the explosives expert to separate and recover unexploded explosive material and detonators or arrange for the safe destruction of the remaining material and detonators.
- w. Clean up any contamination caused in the destruction of the unexploded explosive materials.

Fuel or chemical spill

Implement the **initial response actions** and following actions in the event of a fuel or chemical spill:

- x. Identify the spilt substance and the source.
- y. Refer to the relevant MSDS for instructions on the safe handling, management and disposal of the spilt substance.
- z. Isolate and control the source of the spill, if safe to do so and use appropriate PPE.
- aa. Establish and maintain a safety zone around the spilt substance to exclude people and animals. Do not leave the spill unattended.
- bb. Contain the spill with absorbent material (such as booms, socks or pillows found in the spill kits on site) or, if these are not available, with temporary earth or other bunds or absorbent material (such as sawdust).
- cc. Clean up the spill and remove contaminated materials and sorbents in appropriate containers or to a contained area.
- dd. Transport the used materials and any contaminated soil to a hazardous waste storage area until such time, as it can be properly disposed of as per the Chemicals and Hazardous Materials Management Plan.
- ee. Inform potentially affected communities of a significant spill and appropriate safety precautions, as soon as practicable.
- ff. Replace used spill kit materials.

Bulk fuel spill to watercourse

Implement the **initial response actions** and the following actions in the event of a bulk fuel spill to a watercourse:

- gg. Stabilise the vessel or tanks or containers to minimise release of fuel.
- hh. Control release of fuel by plugging breach or containing extent of spill, where practicable.
- ii. Decant remaining fuel to other tanks or containers.
- jj. Install booms downstream of location of spill to stop spilt fuel flowing downstream.

- kk. Collect spilt fuel trapped by booms and dispose in accordance with Chemicals and Hazardous Materials Management Plan.
- ll. Clean up the spill and remove contaminated soil to a contained area and treat in accordance with the Chemicals and Hazardous Materials Management Plan.
- mm. Inform potentially affected communities of bulk fuel spill and appropriate safety precautions, as soon as practicable.

Unexploded charge

Implement the **initial response actions** and the following actions in the event of an unexploded charge:

- nn. Establish and enforce a safety zone around the unexploded charge.
- oo. Evacuate all workers, visitors and community members within the vicinity of an unexploded blast hole to a safe distance (at least 300 m).
- pp. Put up a red flag on all access routes to the site of the unexploded charge to stop vehicles, plant, equipment and people entering the area.
- qq. Seek the assistance of an explosives expert to assess the risk posed by the unexploded charge.
- rr. Where a charge does not fully explode, follow the directions of the explosive expert to destroy any remaining ammonium nitrate and related materials with air or water.
- ss. If a charge does not detonate, follow the instructions of an explosives expert to drill another hole at least 0.3 m away from original hole to conduct another blast to destroy any unexploded explosive material.

Landslide

Implement the **initial response actions** and the following actions in the event of a landslide:

- tt. Establish and enforce a safety zone around the landslide.
- uu. Notify the mine engineer and arrange a geotechnical assessment of the landslide area focussing on ongoing instability and the potential for further landslides.
- vv. Check the mine sign on/sign off board and account for all workers and site visitors.
- ww. Notify potentially affected communities of any ongoing instability and any need for evacuation.
- xx. Install bunds to contain or control the landslide to protect villages, buildings and structures, and sensitive ecosystems including watercourses.
- yy. Clean up and rectify damaged property, assets and crops by removing and disposing of mud, silt and debris, repairing damaged buildings and structures, and compensating for property loss and lost production.
- zz. When safe to do so, stabilise the landslide by:
 - i. Reinstating and/or replacing erosion and sediment controls.
 - ii. Constructing terraces to reduce the potential for further landslides.
 - iii. Revegetating the landslide area as per the Rehabilitation Management Plan.

Flood or fire

Implement the **initial response actions** and the following actions in the event of a flood or fire:

- aaa. Evacuate people, vehicles and mobile plant and equipment from the area affected by flooding or fire, if necessary to the emergency assembly areas.
- bbb. Erect road closed signs on roads and access routes leading to flooded watercourse or area or area exposed to the fire front.
- ccc. Alert and keep communities updated on the emerging situation including:
 - i. Rising water levels and areas expected to be flooded.
 - ii. Spread of fire and areas expected to be affected.
 - iii. Need for evacuation to emergency assembly areas.
- ddd. Protect people and property, where possible, by:
 - i. Installing sand bags around houses to protect them from rising water levels.
 - ii. Prioritising firefighting efforts on protecting people, houses, hospitals and schools.
- eee. Support rescue efforts for stranded people and/or animals, if safe to do so.
- fff. Following flood, work with local administration to prevent the outbreak of water-borne infections and diseases including cholera.

6.5 Review of emergency preparedness and response

Following the incident and within the timeframes set out in the Incident Reporting Procedure, implement the following actions:

- a. Prepare an Incident Report, as per the Incident Reporting Procedure.
- b. Implement any corrective and/or preventative actions identified in the Incident Report.
- c. Review the effectiveness of the emergency response and incorporate lessons learned into emergency preparedness and training to prevent or better manage future incidents.

7. Performance criteria

The performance criteria for emergency preparedness and response are:

- All workers trained in emergency response procedures.
- All emergency incidents responded to.
- All spills to ground cleaned up.
- Incident reports completed and corrective and preventative actions implemented.

8. Inspection and monitoring requirements

Emergency preparedness and response procedures will be regularly reviewed to ensure their effectiveness. Compliance will be determined using the checklist attached to this plan.

The frequency of inspections is set out in Table 1.

Table 1 Frequency of inspections

Activity	Frequency
Emergency contact number displayed at mine office, maintenance workshop and mine site.	Monthly
Map showing emergency assembly areas and evacuation routes displayed at mine office, maintenance workshop and mine site.	Monthly
Emergency contact number and map showing emergency assembly area and evacuation routes in mine vehicles.	Monthly
MSDS available at mine office and maintenance workshop.	Monthly
Spill kits available and well stocked.	Monthly
Firefighting equipment available and maintained.	Monthly
Traffic management equipment available and maintained.	Monthly
Workers trained in first aid.	Quarterly
Workers trained in emergency response procedures.	Quarterly
Workers know what to do when an emergency occurs.	Adhoc; at least every three months
Emergency response drills conducted.	Quarterly
Incident reports completed for emergency events and corrective and preventative actions implemented.	Monthly

Emergency Preparedness And Response Plan

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y/N)
Emergency contact number displayed at mine office, maintenance workshop and mine site.	
Map showing emergency assembly areas and evacuation routes displayed at mine office, maintenance workshop and mine site.	
Emergency contact number and map showing emergency assembly area and evacuation routes in mine vehicles.	
MSDS available at mine office and maintenance workshop.	
Spill kits available and well stocked.	
Appropriate firefighting equipment available and maintained.	
Traffic management equipment available and maintained.	
Workers trained in first aid.	
Workers trained in emergency response procedures.	
Workers know what to do when an emergency occurs.	
Emergency response drills conducted.	
Incident reports completed for emergency events and corrective and preventative actions implemented.	

9 Public participation and consultation

This EMP has been informed by extensive consultation with a diverse range of stakeholders and the advisory group. The consulted stakeholders include governments, ministries, departments, organisations and people who are involved in the jade mining industry, who regulate the industry and who seek improved regulation and environmental and social performance.

9.1 Stakeholders

Formal briefings and meetings have been held with the following stakeholders:

Myanmar Government, ministries and departments

- Union Government Upper House Natural Resources Management Committee.
- Union Government Parliamentary Member for Hpakant.
- Kachin State Government Cabinet including Chief Minister.
- Kachin State Government Minister for Natural Resources and Environmental Conservation.
- Department of Mines (Nay Pyi Taw).
- Environmental Conservation Department (Nay Pyi Taw).
- Environmental Conservation Department (Myitkyina).
- Myanmar Gems Enterprise (Nay Pyi Taw).
- Myanmar Gems Enterprise (Myitkyina).

Jade mining organisation and mining companies

- Myanmar Gems and Jewellery Entrepreneurs Association.
- MGJEA members.

Non-government and civil society organisations and individuals

- Myanmar Centre for Responsible Business.
- Natural Resources Governance Institute.
- World Bank Extractive Industries Transparency Initiative.
- World Bank Extractive Industries Transparency Initiative (Mining tenure reform).
- Myanmar Alliance for Transparency and Accountability.
- Transparency and Accountability Network Kachin State.
- Kachin Development Networking Group.
- Karuna Mission Social Solidarity.
- Wildlife Conservation Society.
- Emma Irwin, Independent consultant.
- Matthew Baird, Environmental law advisor (to Environmental Conservation Department).

Foreign governments

- BGR Sustainable Development of the Mining Sector in Myanmar (mining inspector training).
- American Embassy.
- Australian Embassy.

Other organisations

- Kachin Independence Organisation (Technical Office, Myitkyina).
- Tatmadaw. Attempts to brief the Northern Commander-in-Chief have been unsuccessful. Information presented to the listed stakeholders has been sent to the Commander-in-Chief to keep him fully informed.

Hpakant/Lonkin local administration and communities

Representative members of local administration and villages were consulted during the environmental audit field trip to Hpakant/Lonkin. The people consulted in this zone are listed in Table 9.1.

Table 9.1 List of community members consulted in this zone

Name	Native	Nationality	Village	Designation	Resident since
Villager from Lone Khin	Not recorded	Kachin	Lone Khin	Head of Administration	Native
Villager from San Hkar	Not recorded	Myanmar	San Hkar	Head of 100-Households	1992
Villager from Ngo Pin	Not recorded	Myanmar	Ngo Pin	Head of 100-Households	1991

9.2 Stakeholder issues

The stakeholders consulted raised a wide range of issues and concerns, many outside the scope of this EMP. The issues relevant to the environmental and social performance of the jade mining industry are:

- Effective environmental management. Environmental management at Hpakant/Lonkin is ineffective despite numerous letters and notifications requiring environmental management of jade mining activities being issued by MGE.
- Environmental management mechanism. The mechanism or process for requiring and regulating environmental management is unclear leading to confusion about responsibilities and obligations.
- Capacity of MGE, Department of Mines and ECD to regulate environmental and social management of jade mining activities.
- Knowledge, experience and capacity of mining companies to implement environmental and social management of their mining activities.
- Significant impacts caused by large-scale and medium-scale mining activities. Legacy issues from small-scale and artisanal mining.
- Lack of environmental controls at mines leading to significant impacts on biodiversity and water resources and water quality through land clearing for mines and reclamation for waste rock dumps, and erosion and sedimentation of rivers, creeks and streams.
- Flooding as a result of infilling of watercourse channels with sediment, leading to loss of property and crop damage.

- Dust during the dry season contributing to health effects including respiratory infections.
- Property damage and sleep disturbance from blasting.
- Amenity and safety concerns about mining equipment using roads in villages and settlements.
- Inappropriate waste disposal contaminating soil and water and leading to health effects including gastrointestinal diseases, mosquito or rodent transmitted diseases, and other illnesses.
- Social impacts of drug use including crime and health effects.
- Social impacts associated with resettlement of villages and informal settlements.
- Mine closure and final land use.

The specific issues raised by village and community members in this zone are listed in Table 9.2.

Table 9.2 Summary of community views in this zone

Aspect	Summary of community views
Economic	<ul style="list-style-type: none"> • Jade mining is the main source of household income.
Social	<ul style="list-style-type: none"> • Drug use is the major issue. • Crime issues are related to drug use, e.g., theft. • Hearing loss associated with heavy blasting is a concern.
Safety	<ul style="list-style-type: none"> • Traffic and road accidents is the main concern.
Environment	<ul style="list-style-type: none"> • Land stability is the major issue as mine sites are close to residential areas. • Flooding is an issue especially in the rainy season as some tributaries are partially blocked by waste rock. • Dust is an issue during mining operations. • Community is concerned about the availability of water. • There have been past issues with pests and feral animals.

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10 Implementation

This section sets out the responsibility for implementation of this EMP, the transitional arrangements, monitoring and audit requirements including indicative budgets, and reporting requirements.

10.1 Responsibility for implementation of this EMP

Each mining company is responsible for the implementation of this plan and must adequately resource environmental management of the mining activities. All workers are responsible for ensuring that their work complies with the conditions of all relevant legislation, the management measures and procedures outlined in the EMP, and any relevant directive, notification, order or Environmental Compliance Certificate issued by ECD.

10.2 Transitional arrangements

This EMP is the first step towards improving the environmental and social performance of jade mining in the Hpakant/Lonkin Gems Tract. The EMP sets the minimum standards for managing the environmental and social impacts of large-scale jade mining. This EMP does not require full implementation of Myanmar National Environmental Quality (Emission) Guidelines or the international standards referred to in the management plans and procedures that form part of the EMP. The EMP instead focusses on those guidelines and standards that address the highest risks to the environment, communities and people.

This approach will allow Union Government ministries, departments and the MGE, the Kachin State Government ministries and departments, and importantly jade mining companies and their representative organisation – the MGJEA – to provide the necessary resources and receive the necessary training and support to implement and regulate the EMP.

The transitional arrangements for implementation of this EMP are:

- Year 1 – establish framework for implementation including resources and training.
- Years 2 to 5 – require implementation of the EMP.
- Year 6 – review mining company performance, regional monitoring and adequacy of EMP. Revise EMP to incorporate findings of regional monitoring and require full compliance with National Environmental Quality (Emission) Guidelines.
- Year 7 onwards – conduct five-yearly reviews of EMP.

Year 1 – establish framework for implementation of EMP

Procure the resources necessary to implement and regulate the EMP, and provide training.

Minimum resourcing requirements

For government ministries, departments and MGE the following resources are required:

Environment officers to:

- Conduct inspections, annual and ad hoc audits of mining operations.

- Review annual reporting by mining companies and recommend action where environmental and social performance is not demonstrated.
- Work with Community Reference Groups and mining companies to resolve community complaints and concerns.

Mine inspectors to regulate jade and alluvial gold mining in accordance with the requirements of The Myanmar Gemstone Law (enacted law).

The environment officers should be based in Hpakan/Lonkin or Myitkyina.

For mining companies, an environment and safety officer is to:

- Implement the EMP.
- Train all workers in the management measures and procedures set out in this EMP.
- Advise the mining company and workers on good environmental practice by keeping informed of changing requirements including any required through notifications and directives issued under The Myanmar Gemstone Law.
- Carry out the inspection and monitoring requirements set out in the management plans and procedures of this EMP.
- Prepare annual reports demonstrating the mining company's environmental and social performance.
- Respond to, and take control of emergency situations in accordance with the requirements of this EMP.

Minimum training requirements

Union Government and Kachin State Government environment officers will need to be trained in the implementation of this EMP. This will comprise:

- Comprehensive training in the EMP and how compliance is determined and enforced.
- Onsite instruction on the application of the skills learned in the comprehensive training.
- Annual refresher training.

Mining company workers will need to be trained. As a minimum, the following workers will undergo comprehensive training:

- Mine owner or owners.
- Mine manager.
- Mine environment and safety officer.
- Site supervisors (e.g., mine pit, workshops, worker accommodation, and administration office).

Training will comprise:

- Comprehensive training in the EMP and how compliance is determined and enforced.
- Onsite instruction on the application of the skills learned in the comprehensive training.
- Annual refresher training.

The mine environment and safety officer will be responsible for training all other workers in the implementation of this EMP, relevant to their tasks and responsibilities.

Years 2 to 5 – implement the EMP

Implementation of the EMP will be a requirement for jade mining. The mechanism for requiring implementation of the EMP will be determined and communicated to all mining companies.

During this period, regional monitoring will be done to establish a comprehensive baseline from which to determine the adequacy of the management measures and procedures in the EMP for managing environmental and social impacts.

Year 6 – review performance and the adequacy of the EMP

The findings of regional monitoring, annual reporting by mining companies, incident reports and government and independent audits will be used to review the adequacy of the EMP.

The EMP will be revised to address any deficiencies and changed regulatory requirements. It will be revised to require full compliance with relevant National Environmental Quality (Emission) Guidelines and in their absence relevant international standards and good practice.

Year 7 onwards – five yearly review

The EMP will be reviewed every five years to determine its adequacy and need for revision. See Section 13.

10.3 Indicative implementation budget

Implementation of the EMP requires allocation of funds for training and the activities required in the management plans and procedures attached to this EMP. An estimate of the funds required to train mine workers and supervisors in the EMP is presented in Table 10.1. This cost assumes training mine managers, supervisors and workers from several mines to make the training cost effective. The estimated cost to implement the EMP is presented in Table 10.2. The estimated costs do not include the cost of constructing facilities and structures such as sediment basins.

Table 10.1 Indicative budget for providing training in implementation of the EMP

Training	Location	Cost (USD)	Cost (Kyats)
Prepare training packages	Various	\$19,000 to \$22,000	25,978,320 to 30,080,160
Comprehensive training in EMP	Myitkyina	\$49,000 to \$56,000	66,996,720 to 76,567,680
Onsite training in application of EMP	Hpakant/Lonkin	\$37,000 to \$42,000*	50,589,360 to 57,425,760
Refresher training	Myitkyina	\$49,000 to \$56,000	50,589,360 to 57,425,760
Comprehensive training	Nay Pyi Taw	\$49,000 to \$56,000%	50,589,360 to 57,425,760
Refresher training	Nay Pyi Taw	\$49,000 to \$56,000	50,589,360 to 57,425,760

* If done in conjunction with comprehensive training i.e., in same trip

% Cost would be reduced if done in conjunction with other training i.e., in a single trip.

Table 10.2 Estimated cost to implement EMP

EMP component	Task	Responsibility/resource	Estimated cost USD	Estimated cost MMK*
EMP	Implementation of EMP; annual employment costs two officers for large mines	Mine manager Environment and safety officer	50,000	68,300,000
Air Quality and Dust Suppression Management Plan	Annual air quality monitoring; allowance for three monitoring periods at two sites	Environment and safety officer Air quality consultant	36,000	49,176,000
Biodiversity Management Plan	Ecological surveys of areas to be mined; once-off cost to map biodiversity at proposed mine site; assumes two surveys to cover seasonal variation	Environment and safety officer Experienced ecologists	12,000	16,392,000
Chemicals and Hazardous Materials Management Plan	Provision of separate storage areas; annual allowance for construction/purchase bundled containers	Environment and safety officer Workshop supervisor	1,000	1,366,000
Chemicals and Hazardous Materials Management Plan	Bundled fuel storage areas; annual allowance for design of bunds only	Environment and safety officer Workshop supervisor	2,500	3,415,000
Chemicals and Hazardous Materials Management Plan	Disposal of chemicals and hazardous waste; nominal annual allowance for collection and disposal by a suitably qualified contractor	Environment and safety officer Workshop supervisor Suitably qualified contractor	2,000	2,732,000
Chemicals and Hazardous Materials Management Plan	Clean up of fuel and oil spills using biopiles; annual allowance for purchase of fertiliser and tarps	Environment and safety officer Workshop supervisor	5,000	6,830,000
Code of Conduct	Included in duties of Environment and safety officers	Environment and safety officer Mine manager	-	-
Community Grievance Mechanism	Monthly meetings with communities to resolve disputes and grievances; allow USD250 per meeting for drinks and meeting materials, etc. Annual cost for 12 meetings.	Environment and safety officer Mine manager	3,000	4,098,000

EMP component	Task	Responsibility/resource	Estimated cost USD	Estimated cost MMK*
Community Health, Safety and Security Management Plan	Health survey of up to two villages, 30 households in each village and five people per household.	Environment and safety officer Mine manager	7,500	10,245,000
Community Health, Safety and Security Management Plan	Health risk assessment	Environment and safety officer Mine manager	5,000	6,830,000
Community Health, Safety and Security Management Plan	Six-monthly meetings with Department of Health and/or third-party health service providers. Allow USD250 per meeting for drinks and meeting materials, etc. Annual cost for two meetings.	Environment and safety officer Mine manager	500	683,000
Community Support and Development Plan	Monthly meetings with communities to agree CSR initiatives; cost of initiatives not included; allow USD250 per meeting for drinks and meeting materials, etc. Annual cost for 12 meetings.	Environment and safety officer Mine manager	3,000	4,098,000
Cultural Heritage Management Plan	Once-off cost of obtaining advice from archaeologist on significance of cultural material or sites in area to be mined; assumes survey to assess site or damage to site	Environment and safety officer Qualified archaeologist	5,000	6,830,000
Emergency Preparedness and Response Plan	Purchase of fire-fighting and first aid equipment; assumes once-off purchase of tanker, pumps and hoses, and fire extinguishers	Environment and safety officer	12,000	16,392,000
Emergency Preparedness and Response Plan	Six monthly emergency response training drills; annual allowance for trainers to travel to site and train workers	Environment and safety officer Mine supervisor Workshop supervisor Qualified safety trainers	5,000	6,830,000
Erosion and Sediment Control Plan	Preparation of Surface Water Management Plan; assumes plan revised every two years	Environment and safety officer Mine supervisor Qualified hydrologist	20,000	27,320,000

EMP component	Task	Responsibility/resource	Estimated cost USD	Estimated cost MMK*
Erosion and Sediment Control Plan	Design and siting of sediment basins; allowance for initial design of sediment basins	Environment and safety officer Mine supervisor Qualified civil engineer	30,000	40,980,000
Erosion and Sediment Control Plan	Monthly monitoring of water quality including water quality sampling consumables and laboratory costs for five sites and one field blank; six samples per month	Environment and safety officer Certified laboratory	7,200	9,835,200
Incident Reporting Procedure	Investigation of serious incident; allow USD1,000 for each serious incident investigation; allow for five incidents per year	Environment and safety officer Mine manager Mine or workshop supervisor	5,000	6,830,000
Land Access Management Plan	Cost of acquiring land dependent on land to be acquired and fair and equitable compensation; nominal once-off allowance for negotiation with landowners	Environment and safety officer Mine manager	-	-
Mine Closure Management Plan	Preparation of mine closure plan	Environment and safety officer Mine manager Mine supervisor Qualified mining engineer	10,000	13,660,000
Mine Closure Management Plan	Surface water management input to mine closure plan	Environment and safety officer Mine manager Mine supervisor Qualified hydrologist	10,000	13,660,000
Mine Closure Management Plan	Final landform design and input to mine closure plan	Environment and safety officer Mine manager Mine supervisor Qualified geotechnical engineer Rehabilitation expert	7,500	10,245,000

EMP component	Task	Responsibility/resource	Estimated cost USD	Estimated cost MMK*
Mine Pit and Waste Rock Dump Management Plan	Preparation of mine plan including design of mine	Environment and safety officer Mine manager Mine supervisor Qualified mining engineer	15,000	20,490,000
Mine Pit and Waste Rock Dump Management Plan	Geotechnical input to mine plan	Environment and safety officer Mine manager Mine supervisor Qualified geotechnical engineer	12,000	16,392,000
Noise and Vibration Management Plan	Annual noise monitoring to verify compliance with National Environmental Quality (Emission) Guideline values; assumes three monitoring campaigns per year	Environment and safety officer Qualified noise consultant	15,000	20,490,000
Non-hazardous Waste Management Plan	Once-off cost to provide bins etc to store and segregate waste	Environment and safety officer Workshop supervisor	1,000	1,366,000
Non-hazardous Waste Management Plan	Disposal of waste in landfill; monthly local administration cost to dispose of non-hazardous waste in landfill	Environment and safety officer Workshop supervisor	6,000	8,196,000
Non-hazardous Waste Management Plan	Contribution to construction of landfill; assumes a two yearly cost	Environment and safety officer Workshop supervisor	2,000	2,732,000
Occupational Health and Safety Plan	Once-off cost for fit for work medical check-up for all existing workers; assumes 500 workers; assumes USD100 per worker	Environment and safety officer Mine manager Qualified doctor	50,000	68,300,000
Occupational Health and Safety Plan	Annual cost for fit for work medical check-ups for new workers; assumes 50 new workers each year; assumes USD100 per worker	Environment and safety officer Mine manager Qualified doctor	5,000	6,830,000

EMP component	Task	Responsibility/resource	Estimated cost USD	Estimated cost MMK*
Occupational Health and Safety Plan	Once-off cost to provide PPE and train workers in its use; assumes 500 workers; assumes USD25 per worker	Environment and safety officer Workshop supervisor Mine supervisor	12,500	17,075,000
Occupational Health and Safety Plan	Annual cost to provide PPE and train new workers in its use; assumes 50 new workers each year; assumes USD25 per worker	Environment and safety officer Workshop supervisor Mine supervisor	1,250	1,707,500
Occupational Health and Safety Plan	Provision of first aid equipment and training in its use	Environment and safety officer Qualified doctor or nurse or ambulance officer	2,500	3,415,000
Occupational Health and Safety Plan	Blast design; allowance for annual wage and entitlements for mining engineer with blasting qualifications	Environment and safety officer Mine manager Qualified mining engineer with blasting qualifications	27,000	36,882,000
Rehabilitation Management Plan	Once-off cost to establish a nursery for propagation of plants for revegetation	Environment and safety officer Mine supervisor Nursery supervisor	15,000	20,490,000
Rehabilitation Management Plan	Annual cost of maintaining the nursery	Environment and safety officer Mine supervisor Nursery supervisor	15,000	20,490,000
Rehabilitation Management Plan	Procurement of Vetiver and other seeds and materials for revegetation	Environment and safety officer Mine supervisor Nursery supervisor	5,000	6,830,000
Rehabilitation Management Plan	Advice on suitable species and rehabilitation methods	Environment and safety officer Mine supervisor Nursery supervisor	10,000	13,660,000

EMP component	Task	Responsibility/resource	Estimated cost USD	Estimated cost MMK*
		Qualified botanist/revegetation expert		
Water Management Plan	Monthly monitoring of village and settlement wells (water depth only); nominal allowance for travel to villages and settlements	Environment and safety officer	6,000	8,196,000
Worker Accommodation Management Plan	Nominal allowance for inspection and reporting	Environment and safety officer Camp supervisor	6,000	8,196,000
		Estimated total once-off cost	161,000	219,926,000
		Estimated total annual cost	205,450	280,644,700
		Estimated total two yearly cost	79,000	107,914,000

* Average exchange rate from June 2017 to June 2018 USD1 = MMK1,366

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11 Monitoring requirements and budget

Specific inspection and monitoring requirements are set out in the individual management plans and procedures attached to this EMP, as well as the frequency of inspection and monitoring. The estimated costs of carrying out the inspection and monitoring are set out in the indicative implementation budget in Section 10.3.

The extent of existing mining and arrangement of mining activities, where there is no clear delineation of mining areas makes mine-specific monitoring difficult with exception of the nominated surface water and wastewater discharge point. It is important that the impact of jade mining is understood in the broader context to enable suitable guideline values to be set for key air and water quality criteria.

A regional monitoring network and program will provide the necessary data to develop a baseline from which to monitor future changes. The regional monitoring network should be designed to encompass the Hpakant/Lonkin Gems Tract including all zones. It should be sufficiently large to incorporate control and impact monitoring sites for key parameters. The minimum requirements for the networks, parameters to be monitored, and recommended frequency and duration of monitoring are discussed below along with an estimate of cost. The monitoring program should be designed and implemented by a suitably qualified scientist or scientist skilled in air and water quality monitoring and reporting.

11.1 Regional monitoring network

A regional monitoring network for air and water quality will be established and include control and impact monitoring sites, as described below.

Water quality

- Control sites in headwater streams and watercourses of undisturbed areas in the catchments in which mining is occurring and might occur.
- Control sites in adjacent undisturbed catchments that might provide a facsimile of the pre-mining conditions in the Uru Creek catchment.
- Impact sites in Uru Creek upstream and downstream of each zone.
- Impact sites in the major tributaries of Uru Creek draining each zone. The sites should be upstream of the mining area, and immediately upstream of the watercourses' confluence with Uru Creek.
- Impact sites in major pit lakes.
- Impact sites in a representative selection of village water supplies (wells or springs) in each zone.

Air quality

Representative sites in each zone i.e., sites that are exposed to a range of air pollutants and particles. For security of the instrumentation, this might include MGE and local administration compounds.

11.2 Monitoring parameters

The National Environmental Quality (Emissions) Guidelines set out the air quality and water quality parameters to be monitored for extractive industries. Water quality parameters and guideline values are listed in Table 11.1 and air quality parameters and guideline values in Table 11.2.

Table 11.1 Guideline values for discharge of runoff and wastewater

Parameter	Unit	Maximum concentration
Biological oxygen demand	mg/L	30
Chemical oxygen demand	mg/L	125
Oil and grease	mg/L	10
pH	S.U. ^a	6-9
Total coliform bacteria	100 mL	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

a: Standard unit

Table 11.2 General guideline values for air emissions

Parameter	Averaging period	Guideline value (µg/m³)
Nitrogen dioxide	1-year	40
	1-hour	200
Ozone	8-hour daily maximum	100
Particulate matter PM ₁₀	1-year	20
	24-hour	50
Particulate matter PM _{2.5}	1-year	10
	24-hour	25
Sulfur dioxide	24-hour	20
	10-minute	500

Source: WHO, 2005

PM₁₀ Particulate matter 10 micrometres or less in diameter

PM_{2.5} Particulate matter 2.5 micrometres or less in diameter

11.3 Frequency and duration of monitoring

Water quality samples should be collected monthly and continue for the duration of mining activity at Hpakant/Lonkin to establish a long-term record of water quality in the region.

Air quality samples should be collected continuously for two years to capture seasonal variation in the ambient air environment. Monitoring should be reviewed after two years, following an assessment of results to determine whether the program should be extended or ceased.

11.4 Estimated cost

The regional monitoring program should be managed by Environmental Conservation Department with support from MGE. Mining companies should collectively fund the program, as it negates the need for them to establish site-specific monitoring programs for their mines, other than the necessary monitoring of surface water and wastewater discharges. The indicative costs for the monitoring program are set out in Table 11.3.

Table 11.3 Indicative cost for implementing monitoring program

Item	Cost Range (USD) per month	Cost Range (MMK) per month
Environment officer	\$1,500 to \$2,000	2,050,920 to 2,734,560
Water quality sampling equipment (assumes 50 sites)	\$1,000 to \$2,000	1,367,280 to 2,734,560
Water quality laboratory costs including consumables (assumes 50 sites)	\$5,000 to \$7,000	6,836,400 to 9,570,960
Air quality sampling equipment	\$18,000 to \$25,000 per unit	24,611,040 to 34,182,000

Currency conversion 1 MMK = 0.00073 USD

11.5 Biodiversity monitoring

The Biodiversity Management Plan includes a requirement to conduct baseline terrestrial and aquatic biodiversity studies in undisturbed areas before mining commences. The results of those studies will determine the need for monitoring and the scope of that monitoring.

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12 Inspection and audit requirements

Article 99 of the EIA Procedure (2015) requires the project proponent to undertake continuous, proactive and comprehensive monitoring of its preconstruction, construction, operation, decommissioning, closure and post-closure activities to ensure compliance with the applicable laws, rules, the EMP and ECC.

In addition to the inspection and monitoring specified in the management plans, the following audits should be undertaken during mining:

- Annual audits by ECD or independent consultants to assess performance against this EMP.
- Ad hoc audits by ECD to assess performance against this EMP.
- Ad hoc audits by ECD following a serious incident such as a fatality, a landslide or major contamination event.

The results of audits will be discussed with the mine manager and mine environment and safety officer and actions and timeframes required to address any non-conformances agreed.

Compliance with this EMP will be assessed using the following information:

- Monitoring data demonstrating compliance with guideline values.
- Compliance checklists demonstrating appropriate inspection and monitoring, and achievement of the performance criteria.
- Incident reports demonstrating appropriate investigation of incidents and implementation of preventative and corrective actions.
- Community grievance register demonstrating acknowledgement, investigation and close out of community concerns and issues.
- Audit reports and implementation of corrective actions for identified non-conformances.

Mining companies will retain copies of all audit reports.

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13 Reporting requirements

The reporting requirements for this EMP are set out below.

13.1 Incident reporting

All incidents must be reported and investigated in accordance with the Incident Reporting Procedure.

13.2 Annual compliance report

The mining company will prepare an annual environmental compliance report that:

- Reviews performance against the requirements of this EMP.
- Summarises the inspection and monitoring results (compliance checklists) for that year.
- Summarises incident reporting for that year noting any notable corrective actions.
- Summarises the audits completed for that year.
- Provides an overview of major environmental achievements for that year.
- Provides a statement of overall environmental and social performance against the requirements of this EMP.

A copy of the annual environmental report will be provided to MGE and ECD for comment and review, and made available to the Community Reference Group(s).

Hpakant/Lonkin Gems Tract Environmental Management Plan	
Incident Reporting Procedure	
Version: Rev 1	Date: 31 October 2018

1. Purpose

A range of incidents could occur directly as a result of mining activities, or indirectly due to natural hazards. Incidents during mining typically relate to the failure of equipment and machinery, collisions or rollover, uncontrolled or unexpected explosions or blasts, and spills of hazardous materials. Incidents may also be caused by hazards inherent to the environment, which may or may not be caused by people. These types of incidents commonly include landslides, flooding and fire. Incidents, whatever their cause, may or may not cause injury or harm to people, or damage or loss of property, and/or harm to the environment.

Adequate and timely reporting is critical to ensure the appropriate resources are mobilised to deal with the incident. Reporting is important in understanding the causes, frequency and types of incidents that occur during mining, as well as any associated environmental and social impacts. Reporting provides valuable data from which to review existing procedures and to make any changes and revisions needed to prevent a recurrence of the incident.

Mining companies and their workers are required to report all incidents to their supervisor or the mine manager, including lesser severity and near miss incidents. All incidents should be investigated to gather information, identify causes and develop actions to prevent a recurrence.

The incident reporting plan (this plan) describes how incidents related to jade mining will be reported. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objective

The objectives of the incident reporting procedure are to:

- Provide the framework for reporting incidents associated with jade mining.
- Collect data and information to allow for effective review of the potential causes of incidents and their prevention (including the review and revision of the EMP).

3. Definitions

Corrective action – an action taken to correct a situation that has already occurred to improve a process or procedure to eliminate the causes of non-conformance and to prevent recurrence of incidents.

Incident – a specific event or sequence of events that result in unwanted or unintended impact on the environment, safety, security, health, the livelihoods of people and/or an impact on property, or on legal/regulatory compliance.

Mining company – a company, joint venture, cooperative, persons or person holding a permit to produce gemstone from a gemstone block or concession.

Natural hazard – a naturally occurring event that can have a negative effect on people, property or the environment. Natural hazards include earthquakes, landslides, storms, flooding and fire.

Near miss – an unplanned event that could have resulted in injury, illness, danger to health, environmental harm or property damage.

Non-conformance – non-fulfilment of a requirement of this EMP and/or applicable laws and rules.

Preventative action – an action taken before a situation has occurred to improve a process or procedure to eliminate the causes of non-conformance and to prevent recurrence of incidents.

Worker – any person working for a mining company including all mining company owners, employees, contractors, subcontractors and family members.

4. Associated plans, procedures and forms

The incident reporting procedure requires management measures in the following plans to be implemented:

- Emergency and Spill Response Plan.
- Hazardous Materials Management Plan.
- Mine Pit and Waste Rock Dump Management Plan.
- Occupational Health and Safety Plan.

5. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to incident reporting are listed in this section.

5.1 Laws, rules and guidelines

The laws, rules and guidelines relating to incidents and their reporting are:

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 15(b) requires the Ministry of Mines to issue a gemstone production permit if the applicant pays the determined price within the specified time.
- Section 15(c) requires the Ministry of Mines to determine the tenure and price of any extension of a small-scale gemstone production permit.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

The Explosive Substance Act (1908), specifically:

- Section 3 prohibits unlawful or malicious use of explosives to harm people and prescribes the punishment for such acts.
- Section 4 prohibits unlawful or malicious intent to use explosives to harm people and prescribes the punishment for such acts.
- Section 5 prohibits persons having in their possession explosive substances for suspicious activities and prescribes the punishment for such acts.

The Social Security Law (2012), specifically:

- Section 11(a) requires companies to register for the social security system and benefits contained in law if they employ a minimum or greater number of people determined by the Ministry of Labour.
- Section 15(a) outlines funds included in the social security fund including health and social care, family assistance, and invalidity, superannuation, survivors and unemployment benefits, and social housing plan.
- Section 18(b) require employers to deduct contributions from workers' wages and to pay that money and the employers contribution to the social security fund.
- Section 48 requires employers to have insurance for the employment injury benefit fund, and workers to submit a medical certificate when claiming against the fund.
- Section 49 states employees covered by the employment injury benefit fund under this law, cannot make claims under the Workmen's Compensation Act 1923.
- Section 75 sets out employers' obligations to maintain records of employee appointment, contact details, work, injuries and termination, and to make that information available to the social security offices on request.

The Electricity Law (2014), specifically:

- Section 59 requires a company or person holding a licence to do electricity-related work to compensate persons injured, disabled or killed by electrocution or fire caused by an electrical fault in accordance with the applicable labour compensation law or the provisions of this law.

5.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) for the Hpakant/Lonkin Gems Tract.

The notifications relevant to incident reporting are:

- Letter No. 121/99 – 4 October 1999.
- Letter No. Ka-37/383/2016 – 23 May 2016.
- Letter No. Ka-37/209/2017 – 16 February 2017.

These notifications are attached to this EMP as Appendix 2.

6. Incident reporting procedures

The procedures for managing and reporting incidents are described below and shown in the attached figure:

- a. Clearly display the incident reporting procedure at all work sites.
- b. Clearly display emergency contact numbers at the mine office and at work sites.
- c. Train workers in incident reporting requirements.
- d. When an incident occurs:
 - i. Take immediate actions to contain the incident if safe to do so.
 - ii. Notify emergency services (if available in the area).
 - iii. Immediately report the incident to the mine manager and/or mine environment and safety officer.
 - iv. Report the incident to the Chief Inspector (Director General of Department of Mines) within 24 hours of the incident occurring if the incident involves:
 - a. Death or severe injury
 - b. Explosion or fire.
 - c. Landslide.
 - d. Major discharge of water from mine site.
 - e. Major fuel or chemical spill.
 - v. Within seven (7) days of the incident occurring complete the Incident report form and submit to the mine manager and mine environment and safety officer.
 - vi. If the incident resulted in deaths or injuries, explosions or fire, landslide, major discharge of water or major fuel or chemical spill submit a copy of the Incident report form to the Chief Inspector and the Ministry of Labour.
 - vii. If the incident resulted in deaths or severe injuries from electrocution submit a copy of the Incident report form to the Chief Inspector (Electricity Law).
 - viii. If a worker has been missing for 48 hours or more submit a copy of the Incident report form to the Chief Inspector within seven (7) days of the end of the month in which the worker went missing from work.
 - ix. Review the Incident report form and undertake any corrective or preventative actions detailed in the form to avoid recurrence of the incident.
- e. Maintain a record of all incident reports and make the record available to the Chief Inspector, Ministry of Labour, Myanmar Gems Enterprise, Environmental Conservation Department, and independent auditors on request.
- f. Report the location and type of incidents annually to the Chief Inspector.

7. Performance criteria

The performance criteria for incident reporting are:

- All workers trained in incident reporting requirements.
- All incidents reported within the designated timeframes.
- No complaints about unreported incidents.

8. Inspection and monitoring requirements

Incident reporting will be regularly reviewed to ensure it is being implemented and the results of investigations are being implemented to reduce the potential for recurrence. Compliance will be determined using the checklist attached to this plan.

The frequency of inspections is set out in Table 1.

Table 1 Frequency of inspections

Monitoring measure	Frequency
Incident reporting procedures displayed at mine office and work sites	Monthly
Emergency contact numbers displayed at mine office and work sites	Monthly
Workers know about the Incident reporting procedure and what to do when an incident occurs	Monthly
Incident report records	Monthly
Evidence of timely reporting of incidents	Monthly
Evidence of issues raised in incident reports being addressed	Monthly
Record of location and type of incidents	Annually

9. Attachments

Incident Reporting Procedure – Compliance checklist

Incident Report Form

Incident Reporting Procedure

Incident Reporting Procedure

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y/N)
Incident reporting procedures displayed at mine office and work sites	
Emergency contact numbers displayed at mine office and work sites	
Workers know about the Incident reporting procedure and what to do when an incident occurs	
Incident report records	
Evidence of timely reporting of incidents	
Evidence of issues raised in incident reports being addressed	
Record of location and type of incidents	

Incident Report Form

This form is to be completed by the person involved in or witnessing the incident with the assistance of the mine manager or mine environment and safety officer. It shall be used for all incidents, near misses and non-conformances.

This incident report is for:

- | | |
|--|--|
| <input type="checkbox"/> Health and safety incident | <input type="checkbox"/> Health and safety near miss |
| <input type="checkbox"/> Environmental incident | <input type="checkbox"/> Environmental near miss |
| <input type="checkbox"/> Property damage incident | <input type="checkbox"/> EMP non-conformance |
| <input type="checkbox"/> Security incident (theft, invasion, riot, unrest) | |

1. Person reporting incident			
Name of person			
Contact number			
2. Person incident reported to			
Name of person			
Contact number			
3. Incident details			
Date and time of incident		Date and time incident reported	
4. Location of incident			
Concession/block		Village/settlement	
Township		District	
State/Division			
5. Incident classification			
Health and safety incident			
<input type="checkbox"/>	Explosion	<input type="checkbox"/>	Fire
<input type="checkbox"/>	Landslide	<input type="checkbox"/>	Other
<input type="checkbox"/>	Fatality	<input type="checkbox"/>	Serious injury
<input type="checkbox"/>		<input type="checkbox"/>	Traffic accident
<input type="checkbox"/>		<input type="checkbox"/>	Minor injury
Environmental incident			
<input type="checkbox"/>	Fuel or chemical spill	<input type="checkbox"/>	Contamination of watercourse
<input type="checkbox"/>	Unauthorised clearing of forest	<input type="checkbox"/>	Disturbance of cultural or religious site
<input type="checkbox"/>		<input type="checkbox"/>	Blocking of watercourse
<input type="checkbox"/>		<input type="checkbox"/>	Other
Property damage incident			
<input type="checkbox"/>	Equipment, building or house lost	<input type="checkbox"/>	Equipment, building or house damaged
<input type="checkbox"/>		<input type="checkbox"/>	Cracks in walls or floor of building or house
Security incident			
<input type="checkbox"/>	Theft of equipment	<input type="checkbox"/>	Invasion of mine site by unauthorised people
<input type="checkbox"/>		<input type="checkbox"/>	Fighting or civil unrest affecting mining operation

6. Description of incident
(attach photographs and drawings to assist with investigation of incident)

What was be done when the incident occurred?

What happened – describe the incident step by step?

What was immediately done to contain the incident?

How many people were involved in the incident and their names?

Describe the injuries people received or what caused their death?

Describe the damage to equipment, buildings and houses?

Describe what was done to resolve or clean up the incident.

7. Incident investigation

What caused or contributed to the incident?

Are corrective actions required to resolve or clean up the incident?

<i>Corrective action</i>	<i>By whom</i>	<i>By when</i>	<i>Date completed</i>

8. Non-conformance with EMP

What management plan or section of the EMP was breached?

--

Describe the non-conformance

--

What was done to manage adverse environmental and social impacts?

--

What caused or contributed to the incident or non-conformance?

--

Are corrective actions required to address the non-conformance?

<i>Corrective action</i>	<i>By whom</i>	<i>By when</i>	<i>Date completed</i>

What preventative actions should be taken to stop the non-conformance recurring?

<i>Corrective action</i>	<i>By whom</i>	<i>By when</i>	<i>Date completed</i>

Does the EMP need to be revised? If so, what section or plan?

9. Management review

Has this incident been properly investigated?

☐ Yes

☐ No

If no, provide reason

Have the proposed corrective and preventative actions been implemented?

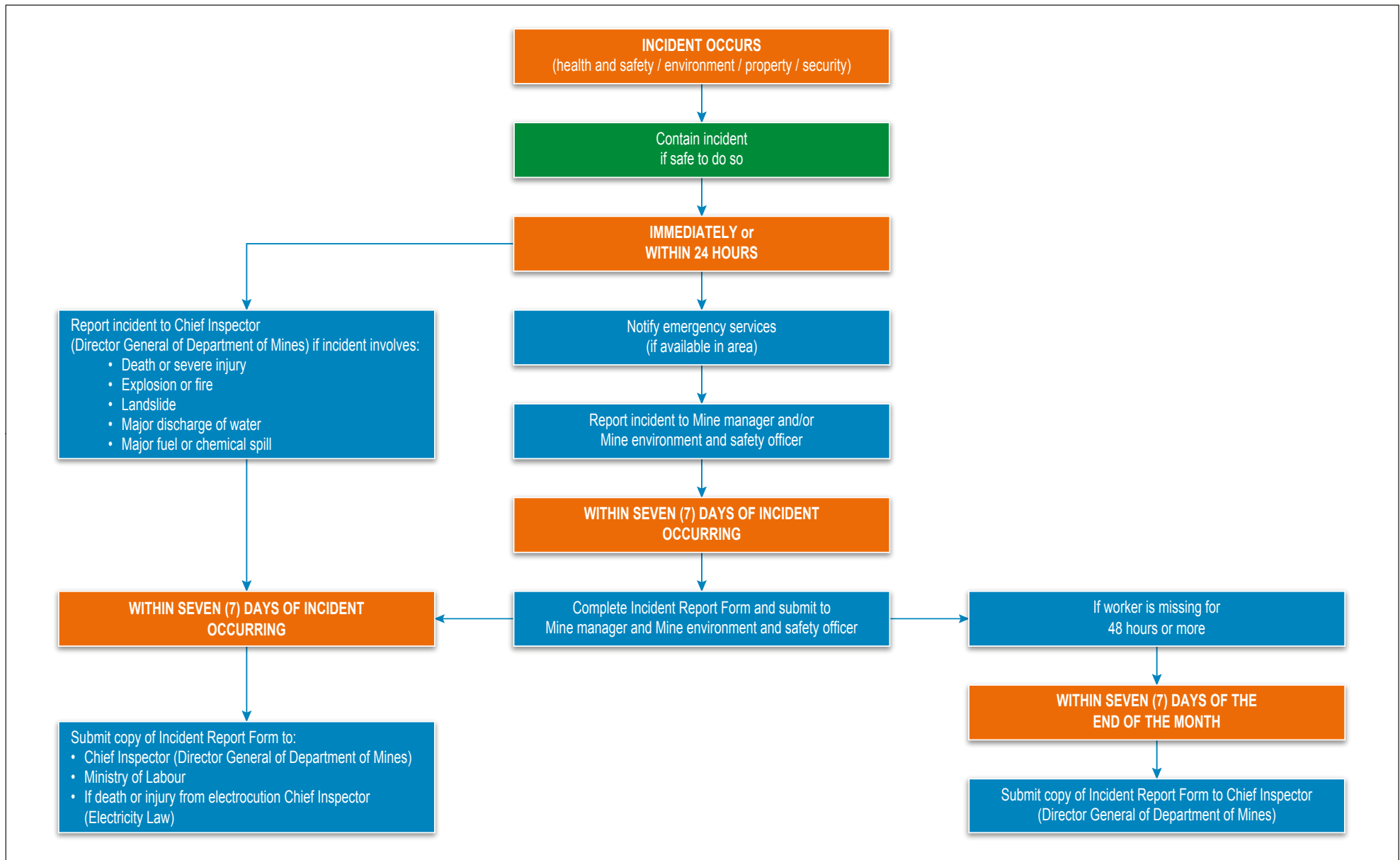
☐ Yes

☐ No

If no, provide reason

10. Endorsement

Mine owner (signature and date)	
Mine manager (signature and date)	
Mine environment and safety officer (signature and date)	



14 Review and revision of EMP

This EMP will be reviewed every five years to assess its effectiveness in managing the environmental and social impacts of jade mining. The five-yearly review will include:

- Laws, rules, guidelines and standards to ensure they are still current and applicable. Revoked or superseded laws, rules, guidelines and standards will be deleted and any new laws, rules, guidelines and standards added.
- Mining methods to ensure they accurately describe the type of mining being done.
- Hazards and impacts to ensure all hazards and impacts are identified and assessed.
- Management measures and procedures to ensure they remain valid and effective in managing the environmental and social impacts.

It is important that document control is applied in revising the EMP. This is version 1 or revision 1 (Rev 1) of the EMP. Subsequent versions will be acknowledged by sequential numbers. For example, the next version or revision will be Rev 2. Subsequent revisions must include the date they come into force and will supersede all previous versions. Superseded revisions must be removed from all sites and replaced with the current revision.

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15 Corporate social responsibility

Chapter 14, Section 46(c) of the Second Amending Law of the Myanmar Gemstone Law (2016) requires proponents to commit two percent of their investment to corporate social responsibility initiatives including health, education, transportation and other developments in communities. The Community Support and Development Plan sets out how mining companies are to engage with communities and to agree corporate social responsibility initiatives and their funding.

Disputes arise from mining activities impacting on communities and from lack of adequate compensation for land affected or bought to permit jade mining. The Community Grievance Mechanism sets out the procedure for resolving community concerns. The Land Access Management Plan sets out the procedures for fair and equitable compensation of persons who own or have a vested interest in land required for jade mining. The plan includes measures to support people displaced by mining and forced to resettle elsewhere.

Hpakant/Lonkin Gems Tract Environmental Management Plan	
Community Support and Development Plan	
Version: Rev 1	Date: 31 October 2018

1. Introduction

Jade mining activities can have a significant environmental, social and economic impact on local communities. Mining companies involved in this industry have a responsibility to support communities in the areas they are affecting. The growing global expectation is that extractive industries should share benefits with affected communities, including jobs and infrastructure, and contribute positively to their long-term development goals.

Community support and development includes helping people to link up and support each other through organisations and networks and working with governments and other groups to contribute to local services, enhance the local environment, strengthen local institutions, and support marginalised groups to help them participate more fully in the development of their community.

The focus should be on achieving long-term sustainable outcomes in collaboration with local communities. The local context should be taken into account when identifying community support and development initiatives, including the location of the community, the capabilities, needs and aspirations of its members, community priorities, the economic base of the community and the wider region, and the strength and capacity of other institutions in the area.

The community support and development plan (this plan) describes how mining companies will support communities in the areas that they mine. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objective

The objective of this plan is to identify how the mining companies will support the local communities in the Hpakant/Lonkin Gems Tract and improve opportunities for social development.

3. Definitions

Community Reference Group – a group formed of members of the community to facilitate communication between the jade mining industry and local residents, including for the community to raise issues and concerns, to inform the community about jade mining activity and social development progress, and to address issues related to involuntary resettlement and indigenous peoples.

Corporate social responsibility – corporate social responsibility (CSR) is a mining company's initiatives to assess and take responsibility for the environmental and social impacts of its activities.

CSR fund – as specified by The Second Amending Law of the Myanmar Gemstone Law (2016), a fund not less than two percent of the investment for health, education, transportation and other developments of the related work area.

Mining company – a company, joint venture, cooperative, persons or person holding a permit to produce gemstone from a gemstone block or concession.

Worker – any person working for a mining company including all mining company owners, employees, contractors, subcontractors and family members.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Community Grievance Mechanism.
- Land Access Management Plan.

5. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to the support and development of communities affected by mining activities are listed in this section.

5.1 Laws, rules and guidelines

Myanmar laws and guidance applicable to the provision of support for communities affected by mining activities are:

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 4(d) empowers the Ministry of Mines to acquire land or legally transfer land with the consent of the owner that is within a gemstone tract.
- Section 15(b) requires the Ministry of Mines to issue a gemstone production permit if the applicant pays the determined price within the specified time.
- Section 15(c) requires the Ministry of Mines to determine the tenure and price of any extension of a small-scale gemstone production permit.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.
- Section 46 requires a gemstone permit holder to not have social impact on the public in carrying out gemstone mining, and to raise a fund not less than two percent of the investment for health, education, transportation and other developments of the related work area.

5.2 International standards

Further guidance on community support and development is provided by several overarching international agreements and organisations and represents good international practice:

- International Finance Corporation - Strategic Community Investment: A Good Practice Handbook for Companies Doing Business in Emerging Markets (2010).

- World Bank Mining Community Development Agreements Source Book (2012).
- Extractive Industries Transparency Initiative Standard (2016).
- United Nations Principles for Responsible Investment (2016).

6. Management measures

The management measures below are based on good international practice for community support and development in a mining context and incorporate the relevant international guidelines above.

Before mining

The following management measures must be implemented:

- Establish a fund (CSR fund) of not less than two percent of the investment for health, education, transportation and other development of the related work area. The CSR fund will support the social welfare program (detailed below).
- Establish community reference groups in each zone. Community reference groups should meet monthly, and no less than quarterly. The functions of the community reference groups are to:
 - Provide a mechanism for the community to raise issues and concerns with mining companies.
 - Facilitate ongoing communication between the mining companies and local residents.
 - Provide a mechanism to inform the community about jade mining activity and progress with CSR initiatives.
 - Address issues related to involuntary resettlement and indigenous peoples.
- Hold public consultation meetings (through the community reference groups) to identify the main issues of concern for the community.
- Develop a social welfare program working with the community reference groups based on the main issues of concern identified through public consultation. Include details of timing, cost, target area(s) and people/communities, and activities. Examples of initiatives that could be included in a social welfare program are shown in Table 1.
- Regularly review the social welfare program and its effectiveness at each meeting of the community reference group, and revise the program as required.

Table 1 Examples of social welfare program initiatives

Focus area	Initiative
Health	Support the establishment of appropriately staffed health centres for mine workers and villagers, including artisanal miners and Yemasay.
Health	Provide safe drinking water supplies for villages where their drinking water source has been affected by mining activities or affected by poor water quality.
Education	Support the establishment of appropriately staffed schools for children of mine workers and villagers, including artisanal miners and Yemasay.
Education/economic	Provide training programs for local residents and mine workers in activities that are core to mining activity (e.g., trades training, administration, operating and maintaining machinery).

Economic	Participate in discussions regarding economic opportunities for local residents and Yemasay.
Economic	Where a mine is closing, consider other economic activity for mine workers, including work at other mines in the area.
Economic/environment	Consider community involvement and employment in rehabilitating mines including training and assistance with establishing seed banks and plant nurseries, and by providing opportunities for communities to be employed to carry out revegetation works.
Environment	Provide domestic waste collection and disposal for local villages (in conjunction with mining-related waste disposal).
Environment	Support community initiatives to clean up and restore riparian zones along watercourses.
Environment	Develop a plan to address climate change (i.e., emissions reduction, carbon offsets).
Safety	Provide adequate and safe worker transportation between the mine sites and villages.
Economic/social	Rebuild community infrastructure (i.e., churches, pagodas) damaged by mining activity.

During mining

The following management measures must be implemented:

- f. Implement the social welfare program.
- g. Hold monthly meetings of community reference groups and report on progress with implementation of the social welfare program.

After mining

The following management measures must be implemented:

- h. Develop a handover plan for the social welfare program including new roles, responsibilities and budgets required to maintain the social welfare program initiatives, as required after mining is complete. The social welfare program will be handed over to the local community, with assistance from local administration and/or non-governmental organisations, as appropriate for each village or zone.
- i. Implement the Mine Closure Management Plan.

7. Performance criteria

The performance criteria for community support and development are:

- Regular meetings of community reference group (monthly, or at minimum quarterly).
- Implementation of the social welfare program.
- Review of the effectiveness of the social welfare program.

8. Inspection and monitoring requirements

The community reference groups will be responsible for inspection and monitoring of the social welfare program. The specific activities and frequencies will be determined by the community

reference groups, as part of the social welfare program. The frequency for review of the social welfare program is set out in Table 2.

Table 2 Frequency of inspection and monitoring

Activity	Frequency
Review of implementation of social welfare program initiatives.	Two yearly
Review of CSR fund and social welfare program budget.	Two yearly

Community Support and Development Plan

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Community reference groups formed	
Community reference group meetings held and attended	
CSR fund and program budgets allocated and properly managed	
Social welfare program implemented	
Implementation of social welfare program reviewed	

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16 Mine closure

The Mine Closure Management Plan sets out the tasks to be completed in preparing to close a jade mine including engaging communities in the final land use and design and construction of stable landforms. The plan requires a competent mining engineer with input from qualified hydrologists and geotechnical engineers to prepare a mine closure plan.

Hpakant/Lonkin Gems Tract Environmental Management Plan	
Mine Closure Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Purpose

Jade mining involves the excavation of large amounts of soil and rock creating large open pits to access jade. The excavated material (overburden) is disposed of in large waste rock dumps. A key environmental and social risk of this mining method is that no, or incomplete rehabilitation is carried out of disturbed areas once mining is complete. Risks relate primarily to ongoing erosion and instability of such areas without adequate rehabilitation, which can lead to long-term environmental and social impacts.

This plan describes the general principles for mine closure and final rehabilitation once mining is complete. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

Early consideration of mine closure is essential to avoid or minimise adverse, long-term environmental and social impacts and environmental management at closure.

The overarching objectives for mine closure are:

- Provide a process for the planning and execution of decommissioning and rehabilitation activities.
- Provide for safe and geotechnically stable final landforms.
- Establish resilient and self-sustaining vegetation.
- Ensure beneficial use of water resources for existing downstream users and aquatic ecosystems is not compromised.
- Provide local communities with long-term, sustainable opportunities following mine closure.

3. Definitions

Closure – the process of closing a mine once operations and decommissioning are finished. Closure involves the final rehabilitation of the mine and monitoring to evaluate progress against closure objectives.

Competent waste rock – is rock and subsoil that will not slump or erode to such an extent that the effectiveness of the constructed landform is reduced.

Decommissioning – the process of preparing a mine for closure. It begins at the end of mining and involves demolition and disposal of all unwanted infrastructure and services.

Direct seeding – the sowing of a mix of seeds harvested from local species to promote a structurally diverse ecosystem that has components of the pre-clearing native vegetation.

Overburden – rock or soil overlying a mineral deposit or gemstone bearing formation.

Progressive rehabilitation – the process of rehabilitating disturbed areas (for example, mine batters) that are no longer necessary for mine operation.

Rehabilitation – the process of stabilising and revegetating disturbed areas (for example, mine batters) to create a stable landform, stable drainage and self-sustaining vegetation.

Rehabilitation – the process of stabilising and revegetating disturbed areas (for example, mine batters) to create a stable landform, stable drainage and self-sustaining vegetation.

Relevant authority – the Ministry of Natural Resources and Environmental Conservation or its delegated authority for jade mining, as set out in The Myanmar Gemstone Law.

Revegetation – the act or process of preparing disturbed land to establish the right soil conditions to encourage a new vegetative cover by natural processes such as plant colonisation and succession, or through human intervention to actively accelerate natural processes, such as direct seeding, or seed propagation and planting.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Erosion and Sediment Control Plan.
- Rehabilitation Management Plan.
- Mine Pit and Waste Rock Dump Management Plan.
- Chemicals and Hazardous Materials Management Plan.
- Occupational Health and Safety Management Plan.
- Community Support and Development.
- Water Management Plan.

5. Hazards and impacts

Jade mining activities impact the environment as a result of physical disturbance to extract jade and establish infrastructure. These activities can alter the movement, distribution, and quality of water (hydrology) in local watercourses, and remove and degrade habitat for aquatic and terrestrial biodiversity. If not rehabilitated, cleared and disturbed ground can contribute to ongoing erosion, sedimentation of watercourses, impacts on surrounding vegetation, and people's property and amenity.

The sources of impact (hazard), impact pathway, impact and receptors are described in Table 1.

Table 1 Hazards and impacts

Hazard (source of impact)	Pathway	Impact / receptor
Unstable landforms (open pits and waste rock dumps).	Heavy rain and storms causing landslides with mass movement of rock, debris, and soil downslope. Overland flow causing erosion and sedimentation of land and watercourses.	Loss of life or property in affected villages and settlements, and loss of life to Yemasay working in mines and on waste rock dumps. Degradation or loss of biodiversity in surrounding areas and downstream of the mine site.

Hazard (source of impact)	Pathway	Impact / receptor
Watercourse obstructions and/or build-up of the riverbed from sediment runoff.	Flooding over riverbanks.	Loss of life or property in affected villages and settlements. Degradation or loss of biodiversity in surrounding areas and downstream of the mine site.
Unsuccessful rehabilitation of disturbed areas.	Overland flow causing erosion and sedimentation of land and watercourses.	Loss of life or property in affected villages and settlements. Degradation or loss of biodiversity in surrounding areas and downstream of the mine site.
Land and water contaminated by hazardous materials (fuel, oils, chemicals etc.)	Rain and overland flow transporting contaminated soil and water to uncontaminated land and water.	Degraded aquatic ecosystems and reduced soil productivity in surrounding land and downstream of mine site. Health effects on people from local communities from exposure to contaminated water and soil.
Discarded machinery and abandoned infrastructure.	Unrestricted access to machinery and infrastructure.	Injury (or death) of people from the local community through use of discarded machinery and abandoned infrastructure.

6. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to mine closure are listed in this section.

6.1 Laws, rules and guidelines

The laws, rules and guidelines relating to mine closure are:

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

Environmental Conservation Rules (2014), specifically:

- Rule 68, requires owners of small enterprises to obtain the Environmental Conservation Department's advice regarding impacts of its business before applying for a licence to operate the business.

National Environmental Quality (Emission) Guidelines set out noise, air emission and water discharge criteria for protecting human and ecosystem health.

The Conservation of Water Resources and Rivers Law (2006), specifically:

- Section 8 prohibits persons doing works on watercourses or changing watercourse channels that ruin or cause waste of the water resources.
- Section 11(c) prohibits persons from disposing of soil and other materials from mining into watercourses or waterbodies or gullies which flow to watercourses or waterbodies.
- Section 22 requires persons to obtain permission to stockpile materials on river banks and waterfronts.

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 15(b) requires the Ministry of Mines to issue a gemstone production permit if the applicant pays the determined price within the specified time.
- Section 15(c) requires the Ministry of Mines to determine the tenure and price of any extension of a small-scale gemstone production permit.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

6.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) and Article 54(c) of The Second Amending Law of the Myanmar Gemstone Law (2016) for the Hpakant/Lonkin Gems Tract.

The notifications relevant to mine closure are:

- Letter No. Ka-37/078/2014, September 4, 2015.
- Letter No. Ka-37/146/2016, January 26, 2016.
- Letter No. Ka-37/295/2017.

6.3 International guidelines

The International Finance Corporation (IFC) has published a guideline that provides general guidance on mine closure. The relevant guideline is:

- Environmental, Health and Safety Guidelines for Mining. December 2007. IFC/World Bank.

The Australian Government has developed leading practice guidelines for the mining industry. The following publications provide valuable guidance on the factors contributing to and the requirements for successful closure and rehabilitation of mine sites.

- Mine closure. Leading Practice Sustainable Development Program for the Mining Industry. September 2016. Australian Government.
- Mine rehabilitation. Leading Practice Sustainable Development Program for the Mining Industry. September 2016. Australian Government.

7. Management measures

The application of best practice mine closure generally consists of four stages:

- Agreement on final landform and final land use.
- Decommissioning including the management of any remaining hazardous materials.
- Landform design and reconstruction of a stable land surface.
- Revegetation (or development of an alternative land use) on the reconstructed landform.

The management measures detailed below incorporate the requirements set out in the notifications listed above, and are to be implemented alongside the notifications to minimise potential risks and impacts relating to incomplete or no final rehabilitation.

Measures in this plan must be implemented by the responsible mining company with input and assistance of third party specialists as necessary to meet the objectives.

7.1 Before mining ends

Management measures that must be implemented before mining ends are:

- a. Meet with relevant authorities at least six months before the end of mining or end of concession, whichever is sooner, to present the plan for mine closure.
- b. Meet with local communities to discuss and agree final land use. The discussions should include:
 - i. The potential for ongoing mining activity by artisanal miners.
 - ii. The final landform including retention of any pit lakes.
 - iii. Local tree species that might have value as a timber resource and are suitable for final revegetation.
 - iv. The timeframe for closure activities and monitoring to determine successful closure.
- c. Prepare a mine closure plan incorporating local community suggestions, the requirements of relevant authorities, and the advice of technical specialists including qualified geotechnical engineers registered under The Myanmar Engineering Council Law (2013) or recognised international law or institution, environmental chemists, and rehabilitation experts. The mine closure plan will include:
 - i. Final landform design.
 - ii. Final rehabilitation design.
 - iii. Timeframe for completion of closure activities.
 - iv. Anticipated timeframe for successful final rehabilitation.

7.2 Decommissioning

Once mining operations have ceased, decommissioning will commence and will involve the removal of infrastructure, facilities, equipment and services, unless otherwise agreed with stakeholders.

Following the cessation of operations, the following steps will be undertaken:

Removal, reuse, recycling and disposal of mining equipment and infrastructure

- a. Remove mobile equipment.
- b. Dismantle or demolish remaining equipment, infrastructure and services.
- c. Remove and dispose of salvageable materials (e.g., steel tanks) in accordance with the Non-hazardous Waste Management Plan.
- d. Remove and dispose of non-salvageable and non-contaminated materials in designated landfills in accordance with the Non-hazardous Waste Management Plan, such as concrete foundations, miscellaneous building materials, and vehicle tyres.
- e. Fracture remaining concrete structures and foundations to promote infiltration and cover with at least 1 m of clean rock and/or soil.

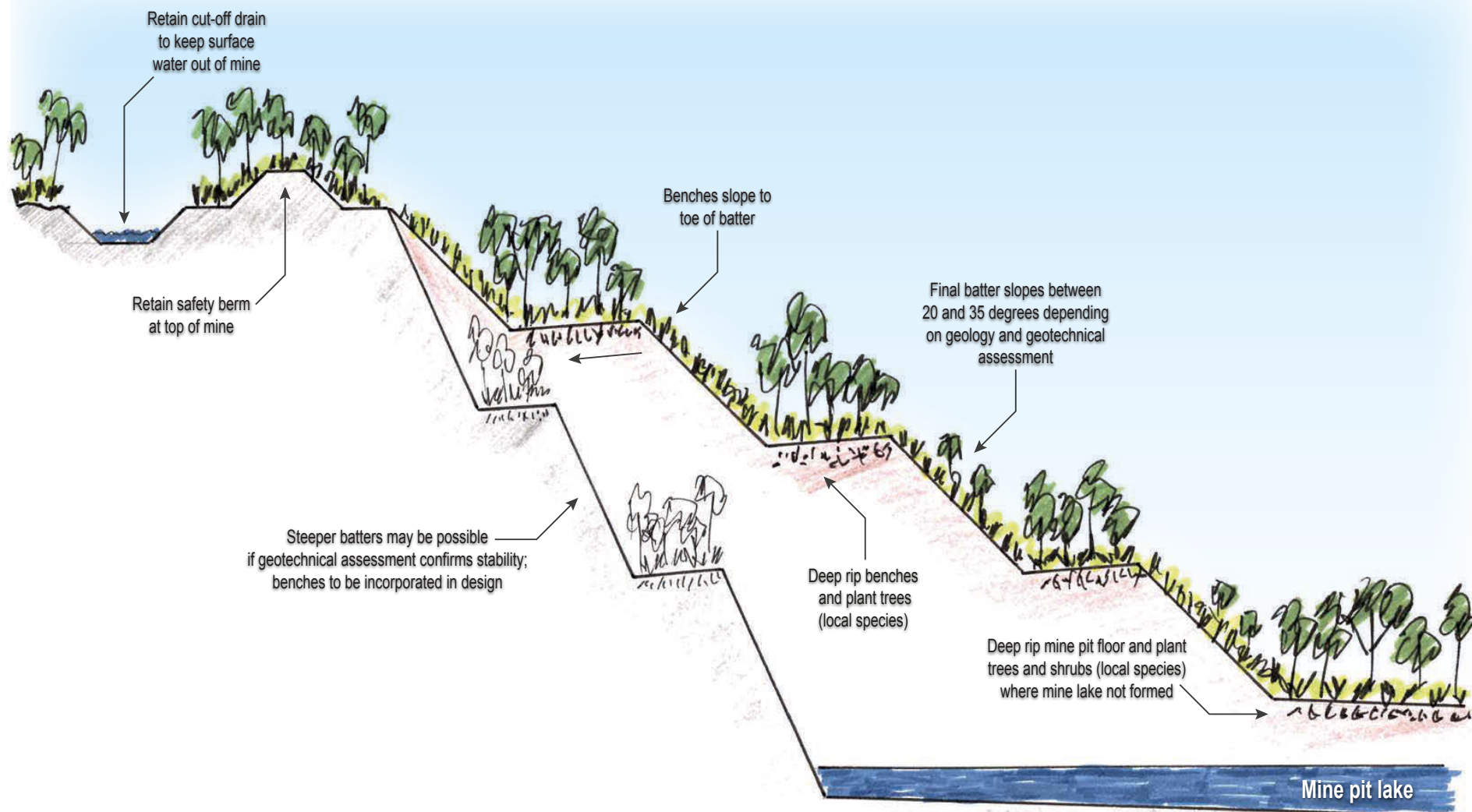
Clean-up of contaminated land and water

Soils and water contaminated by hazardous material, such as waste hydrocarbons (fuels) and chemicals used during mining activities, may cause pollution if not properly cleaned up. Pollution of the land and watercourses can impact on the health of employees and people from surrounding communities. At mine decommissioning, hazardous materials and any contamination on or surrounding the site will be managed in accordance with the Chemicals and Hazardous Materials Management Plan.

7.3 Final landform design

Successful closure of a mine requires stable landforms to be created that are safe for people and animals. The landform must also be able to be successfully revegetated to reduce erosion and sedimentation, and promote recolonisation by native plant species. Figure 1 illustrates the general concept for achieving mine closure final rehabilitation. The management measures to be implemented to achieve a stable final landform are:

- a. Design the final landform in consultation with local communities and regulatory authorities having regard to:
 - i. The stability of the final surfaces including batters, benches, terraces and drains.
 - ii. Management of internal and external drainage.
 - iii. Re-establishment of native vegetation.
 - iv. Public safety.
- b. Where possible backfill completed mine pits with overburden from other mining areas to create a safe and stable final landform.
- c. If the pit cannot be backfilled:
 - i. Make mine batters and waste rock dump slopes stable, as described in the Mine Pit and Waste Rock Dump Management Plan.
 - ii. Construct abandonment bunds around each open pit to reduce the likelihood of inadvertent access by the public and livestock. Competent waste rock will be used to construct the abandonment bunds, to be located at least 10 m out from the potentially unstable zone of the pit edge.



- d. Maintain existing erosion and sediment control structures (cut-off drains, sediment traps and sediment basins) to continue to divert runoff around the pit.
- e. Render mine access roads and tracks impassable to prevent use following mine closure, through for example, constructing berms across the road or track.
- f. For shallow mines, re-profile the ground surface to original or stable contours and reinstate surface drainage lines where possible.
- g. Design all constructed landforms to be safe and stable, including during construction, recognising the locally steep terrain and high rainfall of the area.
- h. Where practicable, design final landform including any retained mine voids to be free draining.

7.4 Surface water management

The primary objective for surface water management at mine closure is stable drainage of the mine pit, waste rock dumps and mine infrastructure areas to minimise erosion and sedimentation of downstream watercourses. The management measures to be implemented to achieve effective surface water management are:

- a. Review and revise the surface water management plan (see Erosion and Sediment Control Plan) to incorporate the final mine pit and waste rock dump features.
- b. Implement the Erosion and Sediment Control Plan until erosion and sedimentation are controlled.
- c. Rehabilitate the final landform in accordance with the Rehabilitation Management Plan.

7.5 Final rehabilitation

Final rehabilitation will be undertaken in accordance with the management measures set out in the Rehabilitation Management Plan.

8. Performance criteria

The performance criteria for successful mine closure and final rehabilitation are:

- Evidence of relevant authorities being consulted on the intention to close the mine.
- Evidence of relevant authorities and local communities being consulted on mine closure, final rehabilitation and final land use, including stakeholder consultation records and agreement on closure plans.
- Mine closure plan.
- No evidence of abandoned mining equipment and infrastructure, or non-hazardous waste.
- No evidence of soil or water contamination, and records of clean up and disposal of contaminated soil and water.
- Final landform is as agreed, is safe and is geochemically and geotechnically stable.
- Erosion and sediment control structures are in place, are being maintained, and are effective in controlling erosion and in capturing, treating and discharging sediment-laden water.
- Water quality guidelines are met at the nominated discharge point from the mine site.
- Revegetation is achieved of mine site including open pit, waste rock dumps, haul roads, and mine workshop, administration and infrastructure areas.

- Remedial works are carried out for ineffective and incomplete rehabilitation.
- Agreed final land use and/or successful final rehabilitation has been achieved within the agreed timeframe. Final successful rehabilitation will be determined by:
 - Landforms and drainage systems that are stable.
 - No significant erosion resulting in gullies and/or downstream sedimentation.
 - No large areas of bare ground.
 - No areas of contaminated soils or contaminated water.
 - Healthy cover of sterile or native grasses.
 - Evidence of natural regeneration of plants.
 - Maturing native vegetation comprising ground cover plants, low and tall shrubs, and trees.
 - Layer of organic matter comprising leaf litter and rotting vegetation.
 - No weed infestations.

9. Inspection and monitoring requirements

Mine closure activities will be inspected monthly by the responsible mining company to check that the mine closure plan is being properly implemented within agreed timeframes. Inspection of works required as part of closure will be in accordance with the relevant management plan; for example the Erosion and Sediment Control Plan and Rehabilitation Management Plan.

Four compliance checks will also be made to determine the success of mine closure. They are:

- At the end of mining and before closure activities commence.
- At the completion of mine closure activities.
- Annually (after each wet season) following completion of mine closure activities to determine the need for remedial works to repair eroded areas, and/or areas where revegetation has been ineffective or is incomplete (defects and liability period).
- At the end of the agreed timeframe for mine closure and successful final rehabilitation.

The compliance checklists are attached to this plan.

If the mine closure objectives have not been met in the agreed timeframe, the scope of additional works and the timeframe for determining successful closure will be negotiated and agreed with the relevant authority.

Mine Closure Plan

Compliance checklist – mine closure plan

Maw and Concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Evidence of relevant authorities being advised of intention to close mine.	
Evidence of relevant authorities and local communities being consulted on mine closure, final rehabilitation and final land use including stakeholder consultation records and agreement on closure plans.	
Mine closure plan has been prepared.	

Mine Closure Plan

Compliance checklist – completion of mine closure activities

Maw and Concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
No evidence of abandoned mining equipment and infrastructure, or non-hazardous waste.	
No evidence of soil or water contamination and records made of treatment and disposal of contaminated soil and water.	
Final landform is as agreed, is safe, and is geochemically and geotechnically stable.	
Erosion and sediment control structures are in place, are being maintained and are effective in controlling erosion and in capturing, treating and discharging sediment-laden water.	

Mine Closure Plan

Compliance checklist – defects and liability period

Maw and Concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Erosion and sediment control structures are in place, are being maintained and are effective in controlling erosion and in capturing, treating and discharging sediment-laden water.	
Water quality guidelines are met at the nominated discharge point from the mine site.	
Revegetation completed of the mine site including open pit, waste rock dumps, haul roads, and mine workshop, administration and infrastructure areas.	
Remedial works completed for ineffective and incomplete rehabilitation.	

Mine Closure Plan

Compliance checklist – fulfilment of mine closure obligations

Maw and Concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Erosion and sediment control structures are in place and are effective in controlling erosion and in capturing, treating and discharging sediment-laden water.	
Water quality guidelines are met at the nominated discharge point from the mine site.	
Revegetation completed of mine site including open pit, waste rock dumps, haul roads, and mine workshop, administration and infrastructure areas.	
Remedial works completed for ineffective and incomplete rehabilitation.	
Agreed final land use and/or successful final rehabilitation has been achieved within the agreed timeframe.	

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Appendix 1

Management plans

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Hpakant/Lonkin Gems Tract Environmental Management Plan	
Air Quality and Dust Suppression Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Introduction

Mining activities can degrade ambient air quality through the generation of dust and combustion of fuel in engines. Dust becomes an issue when land is cleared and bare soils are exposed, either permanently or temporarily. The movement of vehicles and equipment on unsealed roads, soil stripping, transport and stockpiling, and wind erosion from stockpiles and exposed soils can all generate dust. The exhaust emissions from vehicles, plant and equipment contain carbon dioxide and small amounts of carbon monoxide, sulfur dioxide and nitrous oxides. Burning waste, either in the open or in incinerators, can also degrade air quality by creating smoke containing particulate matter and other emissions (including carbon dioxide, carbon monoxide, nitrous oxides and mercury), depending on the type of waste being burned.

Human health and amenity can be adversely affected by poor air quality. Reduced visibility due to dust can also increase the risk of vehicle accidents, and direct inhalation of dust may present a risk to human health. Dust can also coat the leaves of plants and trees, leading to poor plant health and reduced productivity of food crops in adjacent areas.

The air quality and dust suppression management plan (this plan) describes how air quality and dust associated with large-scale jade mining will be managed. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objectives of air quality management are to:

- Reduce adverse impacts of air emissions on human health and amenity.
- Reduce the generation of dust and other harmful emissions during mining activities.

3. Definitions

Ambient air quality – the quality of the outside air environment.

Guideline values – maximum concentrations or specified ranges of concentrations of a pollutant that should not be exceeded.

PPE – personal protective equipment. Refers to specialised clothing or equipment worn by employees for protection against health and safety hazards at a work site. As a minimum, PPE would include long trousers, long-sleeved shirt, boots, gloves, and where needed, a face mask.

Worker – any person working for a mining company including all mining company owners, employees, contractors, subcontractors and family members.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Community Grievance Mechanism.
- Rehabilitation Management Plan.

5. Hazards and impacts

Air quality is degraded by dust and emissions generated through land disturbance, fuel combustion or burning waste. Sources of dust are exposed earth and haul roads. Emission sources are vehicle exhausts, uncontrolled burning of vegetation and waste, and gases from blasting. Potential impacts are listed in Table 1.

Table 1 Air quality hazards and impacts

Hazard	Pathway	Impact
Dust	People breathing in dust raised on haul roads and unpaved village roads.	Human health impacts ranging from respiratory irritation and disease to allergies including asthma.
	Mobilisation, suspension and deposition of dust raised on haul roads and unpaved village roads.	Amenity of villages and settlements. Deteriorating plant health and reduced productivity of food crops.
Combustion emissions	Vehicle and mining equipment exhausts. Uncontrolled burning. Gases from blasting.	Human health impacts ranging from respiratory irritation and disease to allergies including asthma.

6. Applicable laws, rules, guidelines and standards

The Myanmar regulatory requirements applicable to air quality and dust are:

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

National Environmental Quality (Emission) Guidelines set out noise, air emission and water discharge criteria for protecting human and ecosystem health.

The National Environmental Quality (Emissions) Guidelines encourage operators of projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, to prevent or minimise impacts by ensuring that:

- Emissions do not result in pollutant concentrations that reach or exceed ambient air quality guidelines and standards, or in their absence the current World Health Organization (WHO) Air Quality Guidelines.
- Emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards (i.e., not exceeding 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same air shed.)

Guideline values for air emissions as set out in the National Environmental Quality (Emissions) Guidelines (for ambient air quality) are shown in Table 2.

Table 2 General guideline values for air emissions (ambient air quality)

Parameter	Averaging Period	Guideline Value $\mu\text{g}/\text{m}^3$
Nitrogen dioxide	1 year	40
	1 hour	200
Ozone	8 hour daily maximum	100
Particulate matter PM_{10}	1 year	20
	24 hour	50
Particulate matter $\text{PM}_{2.5}$	1 year	10
	24 hour	25
Sulfur dioxide	24 hour	20
	10 minute	500

The following standards and guidelines represent good international practice and should be applied where Myanmar guidelines do not include a particular pollutant or aspect of air quality management:

- WHO Air Quality Guidelines (2005).
- IFC Environmental and Social Performance Standard 3. Resource Efficiency and Pollution Prevention (2012).
- IFC Environmental, Health and Safety General Guidelines (2007).
- IFC Environmental, Health and Safety Guidelines for Mining (2007).

7. Management measures

Good practice air quality management is based on controlling dust generation and combustion emissions, implementing dust suppression measures, and minimising the potential for producing harmful pollutants.

Air emissions must not exceed guideline values listed in the National Environmental Quality (Emissions) Guidelines (2012), as presented in Table 2. Compliance with the guideline values is achieved through air dispersion modelling, scheduling mining activities and real-time monitoring of particulates (dust and exhaust particles). During the transitional period for this EMP, the good practice measures listed below will be implemented. They will reduce the risk of health effects from dust and particulates if properly implemented.

Before mining

The following management measures must be done before mining commences:

- a. Choose fuel efficient and/or low emissions vehicles, plant and equipment when purchasing vehicles, plant and equipment for mining.
- b. Train workers in the dust suppression measures in this plan.
- c. Identify water sources for dust suppression and seek approval to use the water sources. Avoid using saline groundwater or contaminated wastewater for dust suppression.
- d. Provide appropriate personal protective equipment (PPE), including face masks for workers exposed to dusty conditions.

During mining

The following management measures will be implemented to manage dust and exhaust emissions:

Managing dust

- e. Clear only the area of land required to safely undertake mining activities.
- f. Minimise the extent, and time, that ground surfaces and stockpiles are exposed through staged works wherever possible.
- g. Minimise topsoil stockpiles and where possible, position stockpiles in locations sheltered from strong winds.
- h. If stockpiling topsoil for longer than three months, plant sterile grasses to bind the soil and increase resistance to wind erosion.
- i. Rehabilitate cleared land as soon as practicable as per the Rehabilitation Management Plan.
- j. Maintain heavily trafficked unpaved roads in good condition to reduce dust generation.
- k. Enforce speed limits on roads carrying mine traffic to minimise dust generation.
- l. Suppress dust using water. Apply at regular intervals to stop dust being generated but not in a manner that causes a safety hazard to haul road and village road users.
- m. Monitor local weather for conditions that contribute to dust generation – dry season, high temperatures and wind. Avoid work near villages and settlements and increase dust suppression activities during high risk periods.

Managing emissions

- n. Regularly inspect, maintain and service vehicles, plant and equipment ensuring exhausts are fitted and in good working order.
- o. Do not burn cleared vegetation or other waste materials.
- p. Do not blast when wind will blow blast gases over villages or settlements.

After mining

- q. Revegetate exposed areas as soon as practicable, in accordance with the Rehabilitation Management Plan.

8. Performance criteria

The performance criteria for air quality and dust suppression management are:

- Community grievances related to air quality and dust are resolved.
- No burning of vegetation and waste associated with mining activities.

9. Inspection and monitoring requirements

Monitoring weather conditions and visual inspections for dust will be conducted on a regular basis, particularly during extended dry periods. Ongoing liaison with local communities about air quality issues related to mining activities will be conducted, particularly dust-related nuisance. Complaints will be recorded and addressed in accordance with the Community Grievance Mechanism.

The frequency of inspections is set out in Table 3.

Table 3 Frequency of inspection and monitoring

Activity	Frequency
Weather conditions and visual inspections for dust (within and adjacent to the mine site).	Daily.
Ongoing liaison with local communities.	Monthly, and in response to complaints. Refer to Community Grievance Mechanism.
Servicing and maintenance of vehicles, plant and equipment.	In accordance with manufacturer's specifications or when excessive smoke from exhausts observed.

Air quality and dust suppression

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Evidence of weather observations and visual inspections.	
Evidence of dust suppression using water.	
Vehicle, plant and equipment exhausts in good working order.	
Complaints register (complaints recorded and closed out).	
No burning of vegetation or waste associated with mining activities.	

Hpakant/Lonkin Gems Tract Environmental Management Plan	
Biodiversity Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Purpose

Mining activities can degrade biodiversity including through vegetation clearance, earthworks, alteration to watercourses and disturbance from, for example noise, as well as through pollution arising from the accidental spills of hazardous materials and poor waste disposal practices.

Habitat alteration, and potential impacts on the organisms (plants, animals, micro-organisms) that live there, is one of the most significant risks to biodiversity associated with mining. Habitat can be lost from vegetation clearance and earthworks, with resulting changes to the hydrology of watercourses. Degradation of habitat can result from eroded sediments smothering vegetation and being deposited in watercourses, establishment of invasive and pest species, or from contamination caused by accidental spills of hazardous materials. Populations of plants and animals could decline in numbers (abundance) and/or diversity due to loss or changes to available habitat, injury, death or displacement from cleared areas, collision with vehicles, and increased hunting. Wildlife can also be disturbed from high noise activities such as blasting and move away from an area, either temporarily or permanently.

The human population in and around mines may also increase through the movement of people into the area seeking employment and other mining-related benefits. Increased population density could lead to indirect impacts on terrestrial biodiversity through, for example, increased vegetation clearance, hunting and other uses of natural resources.

The biodiversity management plan (this plan) describes how potential adverse changes to biodiversity associated with large-scale jade mining will be managed. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objective of this biodiversity management plan is to avoid and reduce where practicable, direct and indirect adverse impacts on terrestrial and aquatic biodiversity values.

3. Definitions

Aquatic – in respect of biodiversity, refers to plants and animals living or found in or near water.

Biodiversity – the variety among all living things including the different plants, animals and micro-organisms, the genetic information they contain, and the ecosystems that they form.

Habitat – the area or natural environment in which an organism (plant, animal, micro-organism) or population of organisms naturally grows or lives, and includes physical (e.g., soils, climate) and biological (e.g., vegetation, food sources) aspects of that environment.

Rehabilitation – the process of stabilising and revegetating disturbed areas (for example, mine batters) to create a stable landform, stable drainage and self-sustaining vegetation.

Revegetation – the act or process of preparing disturbed land to establish the right conditions to encourage a new vegetative cover by natural processes such as plant colonisation and succession, or manmade/active accelerated processes such as direct seeding or seed propagation and planting.

Riparian – relating to the area adjacent to or situated on the banks of a watercourse or waterbody, for example river banks and or lake shores.

Vegetation – a group or assemblage of plants growing in a certain area or a specific region.

Watercourse – a naturally occurring river, creek or stream that exists before mining commences.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Air Quality and Dust Suppression Management Plan.
- Noise and Vibration Management Plan.
- Erosion and Sediment Control Plan.
- Non-hazardous Waste Management Plan.
- Chemicals and Hazardous Materials Management Plan.
- Rehabilitation Management Plan.
- Community Grievance Mechanism.

5. Hazards and impacts

Biodiversity is impacted through habitat degradation and loss, and direct or indirect disturbance of wildlife through for example noise. Potential hazards and impacts are listed in Table 1.

Table 1 Hazards and impacts on biodiversity

Hazard (source of impact)	Pathway	Impact / receptor
Ground disturbance, earthworks	Vegetation clearing for mining	Loss or degradation of terrestrial and aquatic habitats and biodiversity; reduced area of habitat and/or fragmentation of habitats.
Ground disturbance, earthworks	Runoff causing erosion of soils and deposition of sediments on land and into watercourses	Loss or degradation of terrestrial and aquatic habitats and biodiversity by eroded sediments smothering vegetation and degrading soil and water quality; silting up watercourses and altering flows and flooding patterns.
Watercourse obstructions	Altered stream flows with localised pooling of water, flooding over riverbanks	Loss or degradation of aquatic habitats through changed habitat condition and sedimentation.
Hazardous materials (fuel, oils, chemicals)	Spills and accidental leaks	Loss or degradation of terrestrial and aquatic habitats through contaminated soils affecting plant health and growth, and pollution affecting water quality.
Inappropriate waste disposal	Watercourses and vermin	Degraded terrestrial and aquatic habitat from smothering and contamination of vegetation and soils, and poor water quality in polluted watercourses.

6. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards applying to the management of biodiversity are listed in this section.

6.1 Laws, rules and guidelines

The laws, rules and guidelines applicable to the management of biodiversity are:

The Protection of Wildlife and Conservation of Natural Areas Law (1994), specifically:

- Section 36 makes it an offence to kill, hunt, wound, possess, or sell normally protected wild animals, extract, collect or destroy wild plants; destroy an ecosystem or any natural area, or interfere with the boundary of a natural area without permission from the Director General of the Forest Department.
- Section 37 makes it an offence to kill, hunt, wound, or sell completely protected wild animals, or export a completely protected wild animal or protected wild plant and any part thereof without permission from the Director General of the Forest Department.

Freshwater Fisheries Law (1991), specifically:

- Section 36 requires permission from the Department of Fisheries to construct, maintain or use a dam, bank or weir on freshwater fishery waters.
- Section 40 prohibits persons from harassing fish or aquatic organisms or polluting their habitat.
- Section 41 prohibits persons from affecting water quality and quantity in a leasable or reserved fishery and the rivers and creeks supplying water to that fishery.

The Conservation of Water Resources and Rivers Law (2006), specifically:

- Section 8 prohibits persons doing works on watercourses or changing watercourse channels that ruin or cause waste of the water resources.
- Section 11(c) prohibits persons from disposing of soil and other materials from mining into watercourses or waterbodies or gullies which flow to watercourses or waterbodies.
- Section 22 requires persons to obtain permission to stockpile materials on river banks and waterfronts.

The Conservation of Water Resources and Rivers Rule (2013) prohibits dumping of rubbish and dangerous materials in rivers.

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.

- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

The Second Amending Law of the Myanmar Gemstone Law (1995), specifically:

- Section 15(b) requires the Ministry of Mines to issue a gemstone production permit if the applicant pays the determined price within the specified time.
- Section 15(c) requires the Ministry of Mines to determine the tenure and price of any extension of a small-scale gemstone production permit.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

The Forest Law (1992), specifically:

- Section 4 empowers the Minister for Forests to reserve forest for the protection of watersheds and catchments, and conservation of the environment and biodiversity.
- Section 5 empowers the Minister for Forests to declare areas outside reserved forests for the protection of water and soil, conservation of dry-zone forests, the environment and biodiversity.

6.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) and Article 54(c) of The Second Amending Law of the Myanmar Gemstone Law (2016) for the Hpakant/Lonkin Gems Tract.

The notifications relevant to biodiversity are:

- Letter No. 121/99, October 4, 1999.
- Letter No 85/2004, May 12, 2004.
- Letter No. Ka-37/078/2014, September 4, 2015.
- Letter No. Ka-37/078/2014, September 4, 2015.
- Letter No. Ka-37/146/2016, January 26, 2016.

These notifications are attached to this EMP in Appendix 2.

6.3 International standards

The following standards and guidelines represent good international practice and should be applied where Myanmar guidelines do not include a particular aspect of biodiversity management:

- International Finance Corporation Environmental and Social Performance Standard 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012).
- International Finance Corporation Environmental, Health and Safety Guidelines for Mining (2007).

7. Management measures

Good practice biodiversity management is based on minimising potential impacts from their source, removing impact pathways and maximising the chances of rehabilitation of disturbed areas following mining. Therefore a key part of minimising potential impacts on biodiversity is the successful implementation of measures of associated plans and procedures (see Section 4 of this plan).

The management measures detailed below incorporate the notifications listed above and are to be implemented with the notifications.

Before for mining

The following management measures must be done before mining commences:

- a. Identify any high biodiversity values within the concession and in downstream watercourses by engaging a suitably qualified specialist (zoologist, botanist and/or aquatic ecologist) to undertake terrestrial and aquatic ecology field surveys.
- b. Design mine infrastructure to, where possible, avoid areas of high biodiversity value.
- c. Avoid clearing vegetation or disturbing watercourses where high biodiversity values are identified, where practicable.
- d. Site infrastructure to limit the extent of vegetation clearance required.
- e. Train workers in the protection and management of biodiversity as set out in this plan.
- f. Design and implement business and biodiversity offset program for unavoidable loss of protected or reserved forests, threatened species habitat and threatened species.

During mining

The following management measures will be implemented to manage biodiversity during mining:

- g. Clear only the area of land required to safely undertake mining activities.
- h. Physically demarcate the boundaries of areas to be cleared and not cleared, to prevent any accidental disturbance, or unplanned clearing of high biodiversity areas.
- i. Maintain a riparian vegetation buffer zone of 100 m from the edge of watercourses.
- j. Where clearing of riparian vegetation is required, limit to the minimum width required to safely accommodate roads, and watercourse crossings.
- k. Stockpile cleared vegetation at least 100 m away from watercourses or surface water drainage lines, where practicable.
- l. Use stockpiled vegetation in rehabilitation/revegetation activities and erosion control measures, where practicable.
- m. Prohibit hunting, collecting, or harassing of wildlife, keeping wildlife as pets and/or the possession and/or transport of wildlife products by workers.
- n. Limit the time food waste generated at work sites is stored on site before being transported to a designated waste management area, so as not to attract pests.

After mining

Revegetate exposed areas as soon as practicable, in accordance with the Rehabilitation Management Plan.

8. Performance criteria

The performance criteria for biodiversity management are:

- Biodiversity values are assessed and considered in mine planning.
- No vegetation clearance outside marked or demarcated boundaries.
- Evidence of revegetation of available areas.
- Business and biodiversity offset program.

9. Inspection and monitoring requirements

Areas of biodiversity and revegetated areas will be regularly inspected and monitored. Compliance will be determined using the checklist attached to this plan.

The frequency of inspections is set out in Table 2.

Table 2 Frequency of inspection and monitoring

Activity	Frequency
High biodiversity areas identified, demarcated and protected.	Monthly.
Vegetation clearance within marked or demarcated boundaries.	Daily when vegetation clearing in progress.
Vegetation buffers along watercourses.	Monthly.
Workers are aware of their obligations regarding wildlife.	Adhoc and at least monthly.
No evidence of workers hunting, keeping or trading in wildlife.	Monthly.
Monitoring of rehabilitation works.	In accordance with the Rehabilitation Management Plan.
Business and biodiversity offset program prepared and being implemented	Prior to mining commencing and annually until completion of business and biodiversity offset program.

Biodiversity Management Plan

Compliance checklist

Maw and Concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Evidence of biodiversity assessment.	
No evidence of vegetation clearance beyond demarcated area.	
Vegetation buffers are retained along watercourses.	
Workers aware of their obligations regarding wildlife.	
No evidence of hunting, keeping or trading in wildlife.	
Progressive rehabilitation of mined out areas is occurring.	
Business and biodiversity offset program being implemented.	

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Hpakant/Lonkin Gems Tract Environmental Management Plan	
Chemicals and Hazardous Materials Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Introduction

Mining activities require the use of chemicals and hazardous materials such as fuels, oils, lubricants, hydraulic fluids, solvents and explosive materials. These chemicals and materials have the potential to cause significant harm to public amenity, public health, ecological health and water quality if not properly managed.

This chemicals and hazardous materials management plan details procedures to be followed for the safe handling, transport, transfer and storage, and disposal of chemicals and hazardous materials during mining. It also provides procedures for the prevention of chemical and hazardous material spills.

The Chemicals and Hazardous Materials Management Plan (this plan) describes how chemicals and hazardous materials associated with large-scale jade mining will be managed. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objectives of chemicals and hazardous materials management are to:

- Ensure chemicals and hazardous materials required for mining activities are identified, handled, stored, transferred, transported and disposed of in an environmentally responsible manner.
- Minimise the risk of hydrocarbon spills.
- Minimise environmental and social impacts in the case of a spill.

3. Definitions

Bund – a secondary containment system comprising a wall or container of sufficient capacity to contain all the stored liquid. Also stone or earth formed into an embankment to hold back water or other liquid (in the case of a spill).

Chemical – a compound that has been artificially produced and occurs in solid or liquid form.

C:N:P – ratio of carbon, nitrogen and phosphorous in fertiliser.

Firebreak – an obstacle to the spread of fire, such as a strip of open space in a forest or a strip of bare land in a grassed area.

Greywater – wastewater generated at worker accommodation camps and offices from sinks, showers/baths, laundry and other domestic appliances.

Hazardous material – any solid, liquid or contained gaseous substance with properties that make it potentially dangerous or harmful to human health, safety and/or the environment. Hazardous properties might include the following:

- Flammable i.e., burns easily.
- Corrosive e.g., very high (alkaline) or low (acid) pH.
- Reactive e.g., explosive or toxic.
- Biological e.g., medical waste.

Hazardous waste – any unwanted or unusable hazardous material.

Landfill – a system of rubbish disposal in which waste is buried in an excavated hole in the ground. A landfill may be unlined, or where practical, lined with an impermeable material such as clay or geotextile fabric.

Material Safety Data Sheet (MSDS) – a document that provides health and safety information about products, substances or chemicals that are classified as hazardous or dangerous goods.

Non-hazardous waste – any unwanted or unusable solid, liquid or gaseous substance that does not pose an immediate hazard to human health, safety and/or the environment.

PPE – personal protective equipment. Refers to specialised clothing or equipment worn by workers for protection against health and safety hazards at a work site. As a minimum, PPE would include high-visibility clothing or vest, long trousers, long-sleeved shirt, boots and gloves. Where needed, PPE would include a safety helmet, safety glasses, ear muffs, a face mask and breathing apparatus.

Watercourse – a creek, stream, river or other water channel, either natural or man-made, temporary or permanent.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Non-Hazardous Waste Management Plan.
- Emergency Preparedness and Response Plan.
- Incident Reporting Procedure.
- Erosion and Sediment Control Plan.

5. Hazards

Potential impacts to the environment and people from the inappropriate management of chemicals and hazardous materials from mining activities are listed in Table 1.

Table 1 Potential hazards, pathways and impacts related to inappropriate chemicals and hazardous materials management

Hazard (source of impact)	Pathway	Impact and receptor
Transport, storage, use and disposal of chemicals and hazardous materials (fuel, oils, solvents etc.)	Spills and accidental leaks	Poor water quality. Degraded aquatic ecosystems. Contaminated soils. Risk to worker's health.

6. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relevant to the management of chemicals and hazardous materials are listed in this section.

6.1 Laws, rules and guidelines

The laws, rules and guidelines relevant to chemicals and hazardous materials management are:

Freshwater Fisheries Law (1991), specifically:

- Section 40 prohibits persons from harassing fish or aquatic organisms or polluting their habitat.
- Section 41 prohibits persons from affecting water quality and quantity in a leasable or reserved fishery and the rivers and creeks supplying water to that fishery.

The Conservation of Water Resources and Rivers Law (2006), specifically:

- Section 22 requires persons to obtain permission to stockpile materials on river banks and waterfronts.

The Conservation of Water Resources and Rivers Rule (2013) prohibits dumping of rubbish and dangerous materials in rivers.

The Petroleum and Petroleum Products Law (2017), specifically:

- Section 9 requires a licence from the Ministry of Transportation and Communication to transport petroleum and petroleum products in vehicles, boats, barges and trailers. It requires accidental leaks and spills to be cleaned up in accordance with current laws.
- Section 10 requires a licence from the Ministry of Natural Resources and Environmental Conservation for the storage of petroleum and petroleum products and for the transportation of petroleum and petroleum products.
- Section 11 requires dangerous petroleum and petroleum products to be clearly marked with appropriate signage.
- Section 31 outlines obligations of license holders to protect the environment from accidental leaks and spills of petroleum and petroleum products.

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

National Environmental Quality (Emission) Guidelines set out noise, air emission and water discharge criteria for protecting human and ecosystem health.

6.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) for the Hpakant/Lonkin Gems Tract.

The notification relevant to chemicals and hazardous materials management is:

- Notification letter No. 121/99, October 4, 1999.

6.3 International standards

The following standards and guidelines represent good international practice:

- International Finance Corporation Environmental, Health and Safety General Guidelines (2007).
- International Finance Corporation Environmental, Health and Safety Guidelines for Mining (2007).

7. Chemicals and hazardous materials management

The procedures detailed below incorporate relevant Myanmar legislation and international good practice in hazardous materials management and should be implemented in conjunction with the other related plans detailed in Section 4 of this management plan.

General procedures

The general procedures for managing chemicals and hazardous materials are:

- a. Use mining processes or materials that avoid or minimise the generation of hazardous materials.
- b. Allocate primary responsibility for chemicals and hazardous materials management to the mine manager and mine environment and safety officer.
- c. Train all workers in procedures for the safe handling, transport, storage and disposal of chemicals and hazardous materials.
- d. Provide workers with appropriate personal protective equipment (PPE) required for handling chemicals and hazardous materials.
- e. Train all relevant workers in spill response for hydrocarbons and chemicals, including proper use of spill response equipment.
- f. Procure and maintain spill response kits as necessary at chemicals and/or hazardous materials storage facilities and on vehicles, plant and equipment that contain chemicals and/or hazardous materials. Spill response kits should be appropriate to the type and volume of chemicals and/or hazardous materials.
- g. Clearly define and communicate emergency contacts and communication systems for responding to spills.
- h. Follow all procedures detailed in the Incident Reporting Procedure and Emergency Preparedness and Response Plan in the event of a spill or other release of chemicals and/or hazardous materials.
- i. Do not dispose of chemicals and/or hazardous materials with any non-hazardous waste, waste rock or overburden.
- j. Maintain an inventory of chemicals and hazardous materials including:
 - i. Type of chemical or hazardous material.

- ii. Volume or quantity of chemical or material.
- iii. Management or disposal of chemical or material.
- iv. Person responsible for management or disposal.
- v. Records of the type and volume of chemicals and hazardous materials transported off-site.

Transporting chemicals and hazardous materials

The procedures for transporting chemicals and hazardous materials are:

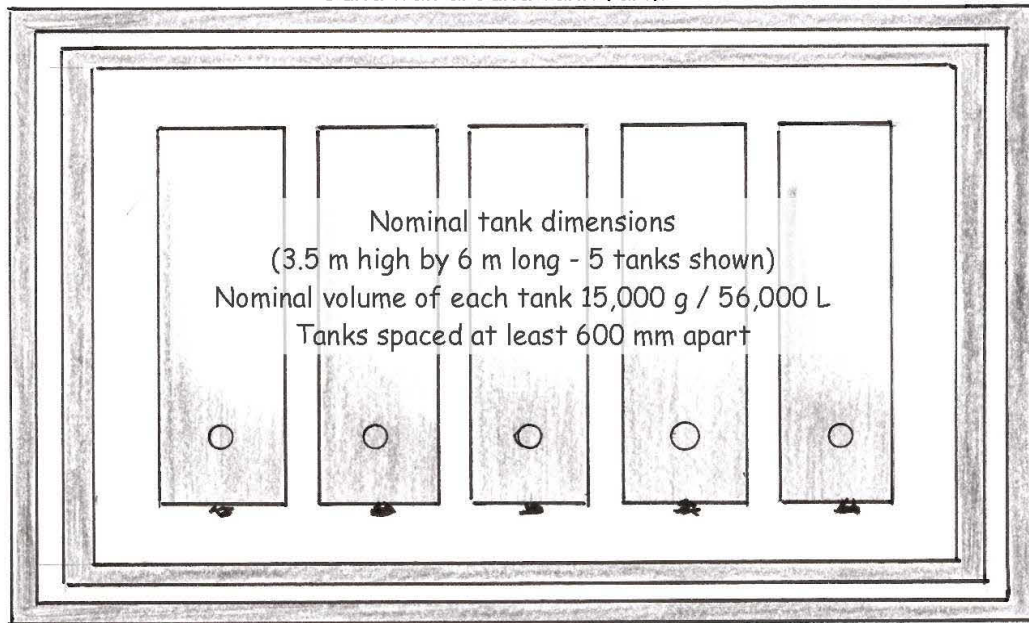
- k. Transport all dangerous goods in accordance with manufacturer guidelines.
- l. Ensure chemicals and hazardous materials packaging is of the appropriate volume, nature and integrity for the type and quantity of chemicals and hazardous material being transported and for the mode of transport. This includes the carriage of ammonium nitrate in designated containers.
- m. Document the transport of all chemicals and hazardous materials and wastes appropriately.
- n. Inform contractors of the requirement to park vehicles transporting chemicals and hazardous materials at least 50 m from a watercourse in the event of an unplanned stop during transit.

Storing chemicals and hazardous materials

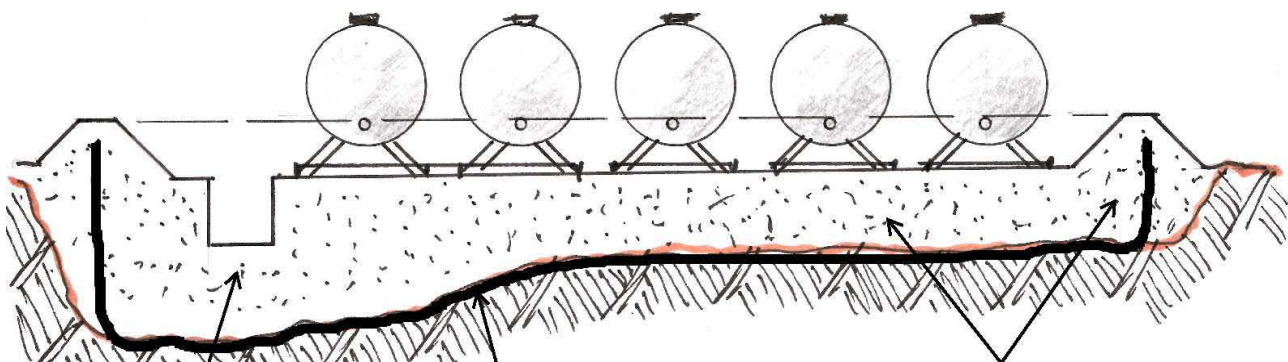
The procedures for storing chemicals and hazardous materials are:

- o. Store and use chemicals and hazardous materials only as specified in the relevant Material Safety Data Sheet (MSDS) and information contained on the product or container label.
- p. Provide adequate secondary containment (e.g., bunds) for fuel, oil and hydraulic fluid storage tanks as illustrated in Figure 1. The secondary containment should be capable of containing 110% of the capacity of the largest tank. Fuel collecting in the sump should be recovered and reused or appropriately disposed. Water collecting in the sump should be pumped out and appropriately disposed.
- q. Store all chemicals and hazardous materials in designated bunded facilities. Chemicals and hazardous materials (including ammonium nitrate) shall not be stored at or near worker accommodation facilities or in villages.
- r. Chemicals and Hazardous materials storage areas must have lightning conductors installed.
- s. Store chemicals and hazardous materials in cleared areas away from standing vegetation (surrounded by an adequate firebreak).
- t. Store containers holding chemicals and hazardous materials of 250 L or less that are not located in a bunded facility on spill trays of appropriate capacity (110% of volume of largest container) to contain and recover spills.
- u. Keep storage containers closed at all times unless materials are being added.
- v. Do not stack or store chemicals and hazardous materials storage containers on top of one another.
- w. Display appropriate warning signs when storing, handling or using chemicals and hazardous materials.
- x. Store incompatible chemicals and hazardous materials (e.g., acids, bases, flammables, oxidizers) in separate areas and within containment facilities separating material storage areas.

Bund wall around tank farm



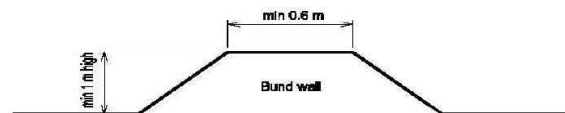
Bund wall at least half height/diameter of largest tank from tanks all round



Bund floor to be sloped and drain to sump capable of holding spilt liquids for recovery

HDPE liner
between clay pad
and natural soil

Bund wall and floor to be of impervious material (reinforced concrete or compacted clay). Minimum thickness of compacted clay 300 mm



Nominal height of bund wall:
2 tanks - 1.3 metre high
>2 tanks - 1 metre high
Bund crest minimum 0.6 m wide
(based on nominal tank dimensions)

- y. Provide material-specific storage areas for extremely hazardous or reactive materials (i.e., ammonium nitrate and detonators). Detonators shall be stored in a locked cabinet.
- z. Use materials compatible with stored products for all parts of storage systems. Do not reuse tanks for different products without first ensuring material compatibility.
- aa. Prohibit all sources of ignition from areas near flammable liquids storage tanks.
- bb. Store flammable materials and other chemicals separately and label to alert workers of the contents and safety precautions.
- cc. Divert stormwater runoff around storage areas in accordance with the Erosion and Sediment Control Plan.

Handling chemicals and hazardous materials

The procedures for handling chemicals and hazardous materials are:

- dd. Maintain a chemicals and hazardous materials handling log recording material, amount of chemical or material being taken, person responsible for chemical or material.
- ee. Maintain records of use of all chemicals and hazardous materials (including ammonium nitrate).
- ff. Ensure handling of ammonium nitrate and related materials is done by a suitably qualified person (not under the age of 18). The person handling ammonium nitrate shall be registered in hazardous materials handling log. All blasts shall be conducted by a suitably qualified person (not under the age of 18).

Refuelling vehicles, plant and equipment

The procedures for refuelling vehicles, plant and equipment are:

- gg. Refuel vehicles only at designated refuelling stations or sites, at least 50 m from watercourses.
- hh. When refuelling, take all necessary measures to prevent spills; use pumps, spouts and funnels.

Spill prevention and response

Implement the Emergency Preparedness and Response Plan to prevent and respond to spills.

Disposal

The procedures for disposing of chemicals and hazardous materials are:

- ii. Arrange transport of all hazardous wastes to designated sorting yards for disposal as often as practicable to prevent waste stockpiling at work sites.
- jj. Arrange collection and safe transport of liquid and solid hydrocarbon wastes (e.g., lubricating oils, oily sludges, oily rags, hessian and oil filters) in secure containers to the bunded hazardous materials storage area for treatment and disposal.
- kk. Arrange collection and safe transport of liquid chemical wastes (e.g., solvents and paints) and solid chemical wastes (e.g., batteries) in secure containers to designated waste management areas for disposal.
- ll. Retain records documenting disposal of chemicals and hazardous materials.

- mm. At the completion of mining:
- i. Ensure any remaining chemicals and hazardous materials are stored or disposed appropriately.
 - ii. Clean up and remediate all hydrocarbon contaminated soils.
 - iii. Implement closure and rehabilitation procedures as detailed in the Mine Closure Management Plan.

Clean-up and disposal of hydrocarbon contaminated soil

The procedures for cleaning up and disposing of hydrocarbon contaminated soils are:

- nn. Excavate and safely transport hydrocarbon contaminated soil from mine site, maintenance workshop and vehicle, plant and equipment parking areas to designated treatment area.
- oo. Treat hydrocarbon contaminated soil at the designated treatment area using biopiles (refer to Attachment 1).

8. Performance criteria

The performance criteria for chemicals and hazardous materials management are:

- Current records for all chemicals and hazardous materials on site and kept in mine office.
- Current records of visual inspections of chemicals and hazardous materials storage and spill response kits.
- MSDSs are current, kept on site and readily accessible.
- All known or suspected contaminated sites identified, reported and remediated within specified project timelines.

9. Inspection and monitoring requirements

Regular inspections shall be carried out at all mining and worker accommodation areas to verify that chemicals and hazardous materials management measures are being implemented.

The frequency of inspections is set out in Table 2.

Table 2 Frequency of inspection and monitoring

Activity	Frequency
Visual inspection of chemicals and hazardous materials storage areas and facilities.	Weekly
Visual inspection for contaminated land.	Weekly
Visual inspections of spill response kits.	Weekly
Visual inspection of remediation (biopile) sites	Monthly
MSDS library.	Monthly
Chemicals and hazardous materials inventory.	Monthly

Chemicals and Hazardous Materials Management Plan

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
MSDS available and up to date	
Chemicals and hazardous materials inventory records	
Records of weekly visual inspections having been carried out	
Bunds/secondary containment constructed, functional and maintained	
Spill kits available and well stocked	
All chemicals and hazardous materials stored and handled according to MSDS	
Evidence of worker training and supply and use of appropriate PPE	
All spills to ground cleaned up appropriately	
Hydrocarbon contaminated soil treated in biopiles	
Treated soil disposed of appropriately	

Chemicals and Hazardous Materials Inventory

Chemical / hazardous material	Volume/quantity	Where stored	Volume/quantity used	Disposal method	Disposed where

Attachment 1

On-site remediation of hydrocarbon contaminated land

Introduction

Biopiles can be used to remediate soil contaminated with hydrocarbons. The biopile remediation method uses naturally occurring microbes to break down the hydrocarbons.

Remediation occurs most effectively under the following conditions:

- Neutral pH (between 6 and 8).
- Moisture content between 40% and 80% field capacity.
- Temperature between 10°C and 45°C.

Biopiles are not suitable for remediation of soils that are grossly contaminated with hydrocarbons (i.e., greater than 50,000 mg/kg) or heavy metals (i.e., greater than 2,000 mg/kg).

Biopile construction

Biopiles need to be constructed on a free-draining (i.e., sloping), impermeable pad so rainwater can drain to low points and be collected for treatment and disposal. Compacted clay (30 to 50 cm deep) makes a good pad. Heavy duty plastic is not preferred as it can be punctured. Berms made from impermeable material are also required around the pad to prevent uncontaminated runoff entering the area. Figure 2 shows a typical cross-section of a biopile pad.

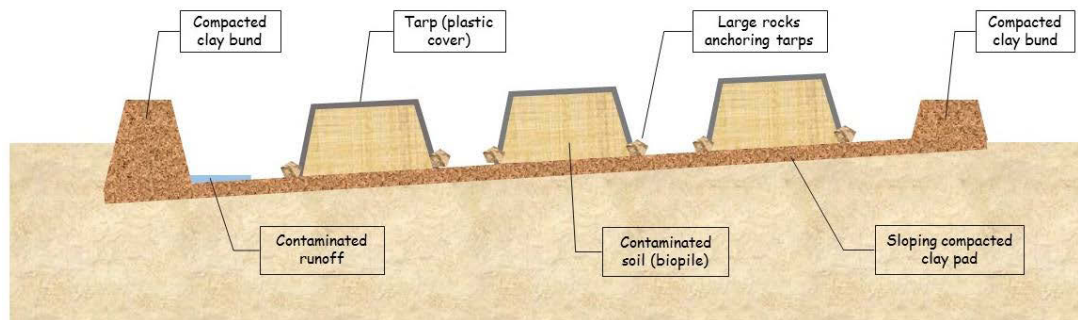


Figure 2 Typical cross-section of a biopile pad

Biopile set up and management

- Deposit contaminated soil onto the compacted pad.
- Take a soil sample and send to a laboratory for analysis to determine the total petroleum hydrocarbons (TPH) concentration and pH. Sampling density should be at least three samples for smaller stockpiles (<50 m³), with one additional sample per every 25 m³ - up to a maximum of ten samples for stockpiles > 250 m³.

- If the pH is greater than 6 or less than 8 (that is, it is within the neutral range*), calculate the quantity of fertiliser to be added to the biopile using the following formulae:

Bulk density (kg/m³) = dry weight of soil (kg) / volume of soil (m³)

Soil mass (kg) = volume of soil (m³) X bulk density of soil (kg/m³)

Contaminant mass (kg) = soil mass (kg) X TPH concentration of contaminated soil (mg/kg) / 1,000,000

(*Note – in the unlikely event that the pH was significantly outside of this range, buffering products such as lime (for acid soils) or elemental sulfur (for alkaline soils) could be applied).

- Apply fertiliser to the biopile at the rate C:N:P ratio of 100:10:1, where the contaminated mass from the above formula is the carbon content of the soil (an accepted approximation). As a “rule of thumb”, diammonium phosphate nutrient addition of 0.75 kg per cubic metre of stockpiled soil is recommended.
- Manually mix the soil to evenly distribute the hydrocarbons (and any added fertiliser or water) through the soil and loosely place into stockpiles (i.e., biopiles) approximately 1 m to 1.5 m high. The soil should not be compacted as aeration is required, and should appear moist, but not wet.
- Cover the biopiles with a tarp during the wet season to prevent the soil becoming too wet when it rains. Weight the sides of the tarp down with large rocks to prevent it blowing away in the wind.
- Label the biopile with a unique identification code. This could be done using a labelled picket.
- Regularly collect water that pools in the low point of the pad and dispose of it as a hazardous substance. During the wet season (May to September), the water should be collected daily.
- Turnover the soil in each biopile monthly to aerate and mix the soil.
- Record the following information for each stockpile:

BIOPILE RECORD SHEET	
Biopile identification code:	<i>e.g., BP001</i>
Description of where the contaminated soil originated:	<i>e.g., haul road near southwest pit</i>
Substance/s that the soil is contaminated with (including volumes if known):	<i>e.g., diesel, approximately 10 L.</i>
Brief description of the event that led to soil contamination:	<i>e.g., Tanker truck was refuelling excavator and tank overflowed – see incident report number EI457.</i>
Approximate volume of soil to be treated:	<i>e.g., 2 m²</i>
A description of the soil type:	<i>e.g., limestone</i>
Hydrocarbon contamination (TPH):	<i>e.g., 1,000 mg/kg</i>
pH of soil:	<i>e.g., 7.4</i>
Date soil added to biopile facility:	<i>e.g., 17 May 2017</i>
Quantity of fertiliser added to adjust pH:	<i>e.g., 20 kg</i>
Dates that the soil is turned over:	<i>e.g., 20 June 2017, 19 July 2017, 20 August 2017, etc</i>
Date remediated soil left biopile facility:	<i>e.g., 5 September 2019</i>
Location where remediated soil disposed:	<i>e.g., western waste rock dump</i>

Determining completion of remediation process

Remediation of soils in biopiles may take up to three years. Implement the following procedures to determine if bioremediation is complete and the soils suitable for disposal.

- Inspect biopiles monthly for:
 - Hydrocarbon odour.
 - Visible sheen on water pooling at the low point of the pad.
- If no visible sheen on water and no hydrocarbon odour, test hydrocarbon concentration (TPH) in biopiles. Sampling density should be at least three samples for smaller stockpiles (<50 m³), with one additional sample per every 25 m³ – up to a maximum of ten samples for stockpiles > 250 m³.
- If all TPH results are within the guideline value of 1000 mg/kg, appropriately dispose of soil to a dry open pit or waste rock dump. Revegetate soils to allow plants to absorb any residual hydrocarbons.

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Hpakant/Lonkin Gems Tract Environmental Management Plan	
Code of Conduct	
Version: Rev 1	Date: 31 October 2018

1. Purpose

Mining companies and their workers are responsible for avoiding and minimising the environmental and social impacts of jade mining. This code of conduct sets out the standards and behaviours expected of mining companies and their workers. The code forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objectives of this plan are to:

- Ensure mining activities are undertaken in an environmentally and socially responsible manner.
- Ensure mining companies and their workers behave in a manner that protects the health, safety, rights and culture of communities.

3. Definitions

Mining company – a company, joint venture, cooperative, persons or person holding a permit to produce gemstone from a gemstone block or concession.

Worker – any person working for a mining company including all mining company owners, employees, contractors, subcontractors and family members.

4. Associated plans and procedures

The code requires management measures in the following plans to be implemented:

- Occupational Health and Safety Plan.
- Community Complaints and Grievances Management Plan.
- Cultural Heritage Management Plan.
- Waste Management Plan.

5. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to the conduct of mining companies and their workers are listed in this section.

5.1 Laws, rules and guidelines

The laws, rules and guidelines that set out mining companies' and their workers' responsibilities are:

Myanmar citizens' rights

Constitution of the Republic of the Union of Myanmar, specifically:

- Article 21(a) Every citizen shall enjoy the right of equality, the right of liberty and the right of justice, as prescribed in this Constitution.
- Article 34 Every citizen is equally entitled to freedom of conscience and the right to freely profess and practise religion subject to public order, morality or health and to the other provisions of this Constitution.

Regulating gemstone production

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 4(d) empowers the Ministry of Mines to acquire land or legally transfer land with the consent of the owner that is within a gemstone tract.
- Section 15(b) requires the Ministry of Mines to issue a gemstone production permit if the applicant pays the determined price within the specified time.
- Section 15(c) requires the Ministry of Mines to determine the tenure and price of any extension of a small-scale gemstone production permit.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

Protecting the environment

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

Environmental Conservation Rules (2014), specifically:

- Rule 68, requires owners of small enterprises to obtain the Environmental Conservation Department's advice regarding impacts of its business before applying for a licence to operate the business.

Environmental Impact Assessment Procedure (2015), specifically:

- Articles 102 to 110 set out a project proponent's legal and financial obligations, and obligations to monitor its preconstruction, construction, operation, decommissioning, closure and post-closure activities, and to comply with applicable laws, rules, standards, the EMP and ECC.
- Article 113 requires a project proponent to grant the Ministry or its representatives access to its sites for monitoring and inspection purposes.
- Article 115 requires a project proponent to grant immediate access to its site in event of emergency or where there is a risk of non-compliance with environmental and social requirements.
- Article 117 requires a project proponent to grant the Ministry rights of access to the proponent's contractors and subcontractors.

National Environmental Quality (Emission) Guidelines set out noise, air emission and water discharge criteria for protecting human and ecosystem health.

The Foreign Investment Law (2012), specifically:

- Section 4(c) restricts or prohibits businesses established with foreign capital which cause damage to the natural environment and ecosystems.

Protecting biodiversity

The Protection of Wildlife and Conservation of Natural Areas Law (1994), specifically:

- Section 36 makes it an offence to kill, hunt, wound, possess, or sell normally protected wild animals, extract, collect or destroy wild plants; destroy an ecosystem or any natural area, or interfere with the boundary of a natural area without permission from the Director General of the Forest Department.
- Section 37 makes it an offence to kill, hunt, wound, or sell completely protected wild animals, or export a completely protected wild animal or protected wild plant and any part thereof without permission from the Director General of the Forest Department.

The Forest Law (1992), specifically:

- Section 4 empowers the Minister for Forests to reserve forest for the protection of watersheds and catchments, and conservation of the environment and biodiversity.
- Section 5 empowers the Minister for Forests to declare areas outside reserved forests for the protection of water and soil, conservation of dry-zone forests, the environment and biodiversity.

Protecting rivers, water resources and fisheries

The Conservation of Water Resources and Rivers Law (2006), specifically:

- Section 8 prohibits persons doing works on watercourses or changing watercourse channels that ruin or cause waste of the water resources.

- Section 11(c) prohibits persons from disposing of soil and other materials from mining into watercourses or waterbodies or gullies which flow to watercourses or waterbodies.
- Section 22 requires persons to obtain permission to stockpile materials on river banks and waterfronts.

The Conservation of Water Resources and Rivers Rule (2013) prohibits dumping of rubbish and dangerous materials in rivers.

Freshwater Fisheries Law (1991), specifically:

- Section 36 requires permission from the Department of Fisheries to construct, maintain or use a dam, bank or weir on freshwater fishery waters.
- Section 40 prohibits persons from harassing fish or aquatic organisms or polluting their habitat.
- Section 41 prohibits persons from affecting water quality and quantity in a leasable or reserved fishery and the rivers and creeks supplying water to that fishery.

Protecting cultural heritage

The Protection and Preservation of Antique Objects Law (2015), specifically:

- Section 12 requires anyone who finds an antique object to notify the relevant ward or village tract administrator.

The Protection and Preservation of Ancient Monuments Law (2015), specifically:

- Section 15(f) requires a person to obtain prior permission from the Department of Archaeology and National Museum to dig, quarry or mine within the specified area of an ancient monument which includes buildings, religious buildings and structures, natural and manmade caves, and other manmade structures and features.

The Protection and Preservation of Cultural Heritage Regions Law (1998), specifically:

- Section 13 requires a person to obtain prior permission from the Department of Archaeology for work within an ancient monument site or zone, on a building within a zone, in a cultural heritage region, and to construct a bridge, canal or embankment, or carry out an archaeological excavation.
- Section 22 requires buildings in cultural heritage regions to be constructed in accordance with conditions set by the Ministry of Culture.

Protecting public and worker health

Public Health Law (1972), specifically:

- Section 3(1) requires the government to advise, inspect and supervise activities for a healthy environment including garbage disposal, drinking water, pollution and building construction and maintenance.
- Section 3(4) requires the government to prevent and eliminate contagious diseases including through public vaccination programs.
- Section 4 empowers the government to form, direct and advise groups and government ministries and departments on public health matters set out in this law.

- Section 5 grants organisations appointed by the government to carry out inspections of workplaces, shops and buildings regarding environmental health matters including food, products, housing and private clinics.

The Prevention and Control of Communicable Diseases Law (2015), specifically:

- Section 3 requires the Department of Health to immunise children against communicable diseases and educate people about these diseases to prevent outbreaks.
- Section 4 requires the Department of Health to control the spread of an outbreak of a principal epidemic disease or notifiable disease through immunisation and other measures.
- Section 9 requires households to report communicable disease outbreaks to the nearest health department office or hospital.
- Section 11 outlines the measures a health officer may take to prevent and control the spread of communicable diseases including inspections and medical examinations.

The Control of Smoking and Consumption of Tobacco Product Law (2016), specifically:

- Section 9 requires non-smoking areas to be designated, clearly marked and supervised.

Protecting workers' rights

Myanmar Investment Law (2016), specifically:

- Section 51 requires investors to employ qualified people as senior managers, and technical and operational experts, and to ensure they have the entitlements and rights of labour laws and rules.
- Section 73 requires the investor to obtain and maintain the type of insurances stipulate in the rules.

Minimum Wages Act (2013), specifically:

- Sections 12 and 13(a) to (g) which set out the duties of an employer to pay minimum wages.

Payment of Wages Law (2016), specifically:

- Sections 3 to 5 which set out the methods and timeframes for payment of wages.
- Sections 7 to 10 which set out the wage deductions employers are entitled to make.
- Section 14 which set out the requirement for employers to pay overtime wages in accordance with the law.

The Leave and Holidays Act (1951) sets out worker's entitlements to public holidays and annual leave.

Employment and Skill Development Law (2013), specifically

- Section 5 requires an employment agreement and sets out the content of the agreement.
- Section 14 requires an employer to train employees in the type of work they are being employed to do.
- Section 30(a) and (b) requires employers to make monthly payments to a training fund not less than 0.5% of total wages for the company.

The Labour Organisation Law (2011), specifically:

- Section 17 permits labour organisations to draw up their constitution and rules, and gives them the right to negotiate with employers.
- Section 18 grants a labour organisation the right to request an employer reappoint employees if their dismissal relates to their membership of a labour organisation.
- Section 19 gives labour organisations the right to represent workers in settling a dispute before the Conciliation Body.
- Section 20 gives labour organisations the right to participate in discussions with the government, employers and complaining workers on their rights.
- Section 21 gives labour organisations the right to participate in collective bargaining in accordance with the labour laws.
- Section 22 requires labour organisations to conduct their activities peacefully.

The Settlement of Labour Disputes Law (2012), specifically:

- Section 38 requires employers to negotiate a complaint within prescribed period.
- Section 39 does not allow employers to alter a worker's conditions during or after a dispute that is before an arbitration body or tribunal.
- Section 40 prohibits employers locking out workers or workers striking over a dispute without seeking to negotiate or seek conciliation or arbitration by an arbitration body or tribunal.
- Section 51 requires employers to compensate workers whose benefits are reduced as a result of a dispute.

The Social Security Law (2012), specifically:

- Section 11(a) requires companies to register for the social security system and benefits contained in law if they employ a minimum or greater number of people determined by the Ministry of Labour.
- Section 15(a) outlines funds included in the social security fund including health and social care, family assistance, and invalidity, superannuation, survivors and unemployment benefits, and social housing plan.
- Section 18(b) require employers to deduct contributions from workers' wages and to pay that money and the employers contribution to the social security fund.
- Section 48 requires employers to have insurance for the employment injury benefit fund, and workers to submit a medical certificate when claiming against the fund.
- Section 49 states employees covered by the employment injury benefit fund under this law, cannot make claims under the Workmen's Compensation Act 1923.
- Section 75 sets out employers' obligations to maintain records of employee appointment, contact details, work, injuries and termination, and to make that information available to the social security offices on request.

The Workmen's Compensation Act (1923), sets out an employer's obligations to arrange for injured workers to be treated and compensated for injuries sustained while working.

The Electricity Law (2014), specifically:

- Section 59 requires a company or person holding a licence to do electricity-related work to compensate persons injured, disabled or killed by electrocution or fire caused by an electrical fault in accordance with the applicable labour compensation law or the provisions of this law.

Managing dangerous goods and products

The Indian Explosives Act (1884), specifically:

- Section 5 requires a licence to manufacture, possess, use, sell, transport and import explosives.
- Section 7(a) grants the government or local administration the right to enter any place to inspect and examine the manufacture, possess, use, sell, transport and import of explosives if they believe the licence conditions are not being met.

The Explosive Substance Act (1908), specifically:

- Section 3 prohibits unlawful or malicious use of explosives to harm people and prescribes the punishment for such acts.
- Section 4 prohibits unlawful or malicious intent to use explosives to harm people and prescribes the punishment for such acts.
- Section 5 prohibits persons having in their possession explosive substances for suspicious activities and prescribes the punishment for such acts.

The Petroleum and Petroleum Products Law (2017), specifically:

- Section 9 requires a licence from the Ministry of Transportation and Communication to transport petroleum and petroleum products in vehicles, boats, barges and trailers. It requires accidental leaks and spills to be cleaned up in accordance with current laws.
- Section 10 requires a licence from the Ministry of Natural Resources and Environmental Conservation for the storage of petroleum and petroleum products and for the transportation of petroleum and petroleum products.
- Section 11 requires dangerous petroleum and petroleum products to be clearly marked with appropriate signage.
- Section 31 outlines obligations of license holders to protect the environment from accidental leaks and spills of petroleum and petroleum products.

Managing road transport and motor vehicles

Motor Vehicle Law (2015) requires motor vehicles to be registered and drivers to be licensed for particular types of vehicles. It aims to provide a safe and efficient road network and to reduce pollution from motor vehicles.

Providing emergency response capability

Myanmar Fire Department Law (2015), specifically:

- Section 25 requires owners of offices and accommodation facilities or a fire-prone industry to have fire-fighting capabilities and provide fire-fighting and safety equipment.

Using appropriately qualified experts

The Myanmar Engineering Council Law (2013), specifically:

- Sections 20 to 25 allow suitably qualified persons to apply for registration as a graduate technician or technician, and the Myanmar Engineering Council to issue a certificate of registration.
- Sections 26 to 30 allow suitably qualified persons to apply for registration as a registered engineer, and the Myanmar Engineering Council to issue a certificate of registration.
- Section 31 grants registered graduate technicians, technicians and engineers the right to practice their relevant discipline or area of expertise and requires them to abide by the laws, rules and procedures issued under the law.

5.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) for the Hpakant/Lonkin Gems Tract.

The notifications relevant to mining companies' and their workers' responsibilities regarding conduct and behaviour are:

- Notification Letter No. Ka-37/656/2015 – 15 December 2015.
- Notification Letter No. Ka-37/ 581/2016 – 22 August 2016.

These notifications are attached to this EMP as Appendix 2.

5.3 Standards

The European Bank for Reconstruction and Development (EBRD) Performance Requirement (PR) 2 requires:

- An effective grievance mechanism for workers to raise workplace concerns must be provided, using a transparent process without any retribution.

6. Responsibilities

Mining companies and their workers are required to:

- a. Comply with all enacted Myanmar laws and rules, and with all guidelines and standards.
- b. Comply with all orders, directives and notifications issued by the Minister for Mines, his delegate or the Myanmar Gems Enterprise Department of Jade Mining.
- c. Comply with this EMP.
- d. Act with care and integrity at all times.
- e. Be mindful of real, potential and perceived conflicts of interest and act in a transparent manner.
- f. Treat each other and all members of the community with respect, dignity and consideration at all times.
- g. Not engage in behaviours that offend, intimidate or discriminate on gender, race or religion.
- h. Not engage in any activities involving bribery, corruption, payment of secret commissions or exercise of improper influence under any circumstances.

- i. Respect and where required protect cultural heritage and religious sites from disturbance.
- j. Respect the rights of landowners.
- k. Not make, use or distribute drugs, alcohol or other addictive substances.
- l. Not carry, use or trade weapons including firearms and explosive devices.
- m. Not carry, use or trade items banned by Myanmar laws or rules, or orders, directives or notifications.
- n. Not wear military green or green camouflage uniforms.
- o. Not litter or discard syringes or other hazardous materials and items.
- p. Dispose of all waste in proper waste disposal containers or facilities.
- q. Not harass, capture, keep as pets, sell or trade protected wildlife.

7. Performance criteria

Responsible conduct and behaviour will be determined by:

- No complaints related to the conduct and behaviour of mining companies and their workers.

8. Inspection and monitoring requirements

Compliance with the code of conduct will be determined using the compliance checklist attached to this code. The frequency of inspections of mining company and worker conduct and behaviour is set out in Table 1.

Table 1 Frequency of inspection and monitoring

Activity	Frequency
Conduct and behaviours	Monthly

Code of Conduct

Compliance Checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
No community complaints relating to mining company or worker conduct or behaviour	
No evidence of workers involved in drug, alcohol or addictive substance use or trade	
No evidence of workers in possession of weapons or banned items	
No evidence of hunting, capture or sale of protected wildlife	
Evidence of proper disposal of litter and waste materials and items	

Hpakant/Lonkin Gems Tract Environmental Management Plan	
Community Grievance Mechanism	
Version: Rev 1	Date: 31 October 2018

1. Introduction

Communities in areas affected by jade mining should be given the opportunity to raise issues and grievances related to mining with the mining company concerned. A defined process (a grievance mechanism) is frequently used to effectively and proactively manage a community's feedback, grievances or concerns.

A grievance mechanism is an important part of engaging with local communities as it creates opportunities for companies and communities to identify problems and discover solutions together. The mechanism also provides useful information to help evaluate the social and environmental performance of mining activities, including where improvements are required.

All types of issues can be raised by the community and may include those related to financial loss, physical harm, damage to an asset, disrupted access to a resource such as drinking water, harassment by company representatives or other health, safety and environmental impacts that occur as a result of mining activities. Criminal activity, bribery, corruption or fraud may be recorded as a grievance but resolution of these types of grievances should be referred to the law enforcement agencies.

The community grievance mechanism (this plan) describes the process for communities to raise complaints and grievances related to jade mining, and how mining companies will manage those grievances and complaints.

Participation in the community grievance management process does not replace any existing Myanmar legal processes, or negate an individual's right to pursue other remedies as provided for under Myanmar laws. Employee and worker grievances are addressed in the Occupational Health and Safety Management Plan.

This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objectives of this community grievance mechanism are to:

- Provide a process for communities to express their concerns related to jade mining activity, and for grievances to be addressed by the relevant mining company.
- Provide for timely, effective and coordinated responses to complaints or grievances, including, if necessary, measures to avoid a recurrence of the action that led to the complaint.

3. Definitions

Affected party – a person or persons or organisation impacted by mining activities.

Community – a group of people who share a common sense of identity and interact with one another on an ongoing basis.

Community Reference Group – a group formed of members of the community to facilitate communication between mining companies and local residents, including for the community to raise issues and concerns, to inform the community about jade mining activity and social development progress, and to address issues related to involuntary resettlement and indigenous peoples.

Complaint – a formal expression of discontent concerning a mining company action raised by an affected party.

Corrective action – an action taken to correct a situation that has already occurred to improve a process or procedure to eliminate the causes of non-conformance and to prevent recurrence of incidents.

Grievance – a complaint lodged by an affected party alleging damage, impact, or dissatisfaction specifically resulting from the actions, or a lack of action, by a mining company. A grievance is usually raised with the expectation of a corrective action, compensation or both.

Grievance mechanism – a locally-based, formalised way to receive, assess, and resolve community and/or individual complaints about the performance or behaviour of a mining company, including its workers.

Incident – a specific event or sequence of events that result in unwanted or unintended impact on the environment, safety, security, health, the livelihood of people and/or an impact on property, or on legal/regulatory compliance.

Mining company – a company, joint venture, person or persons holding a permit to produce gemstone from a gemstone block or concession.

Non-conformance – non-fulfilment of a requirement of this EMP and/or applicable laws and rules.

Preventative action – an action taken before a situation has occurred to improve a process or procedure to eliminate the causes of non-conformance and to prevent recurrence of incidents.

Worker – any person working for a mining company including all mining company staff, contractors, subcontractors and family members.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Incident Reporting Procedure.
- Community Support and Development Plan.
- Occupational Health and Safety Management Plan.

5. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to community grievance mechanism are listed in this section.

Myanmar guidance applicable to the management of community grievances are:

- EMP Template (EIA Procedure Annex 5) requires public consultation and information disclosure including establishing a complaints and grievance mechanism related to environmental and social issues arising during all phases of a project.
- Guideline on Public Participation in EIA Process requires that a project proponent should establish a complaints and grievances mechanism related to environmental and social issues arising during the construction, operation and decommissioning/closure/post-closure phases of a project. The mechanism:
 - Should be managed by the project proponent, with the involvement of local authorities.
 - May include the setting up of a project mediation committee and/or dispute resolution committee.

Further guidance on establishing and managing community grievances is provided in the following standards and guidelines which represent good international practice:

- International Finance Corporation:
 - Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts (2006).
 - Addressing Grievances from Project-Affected Communities - guidance for projects and companies on designing grievance mechanisms. Good Practice Note. September 2009.

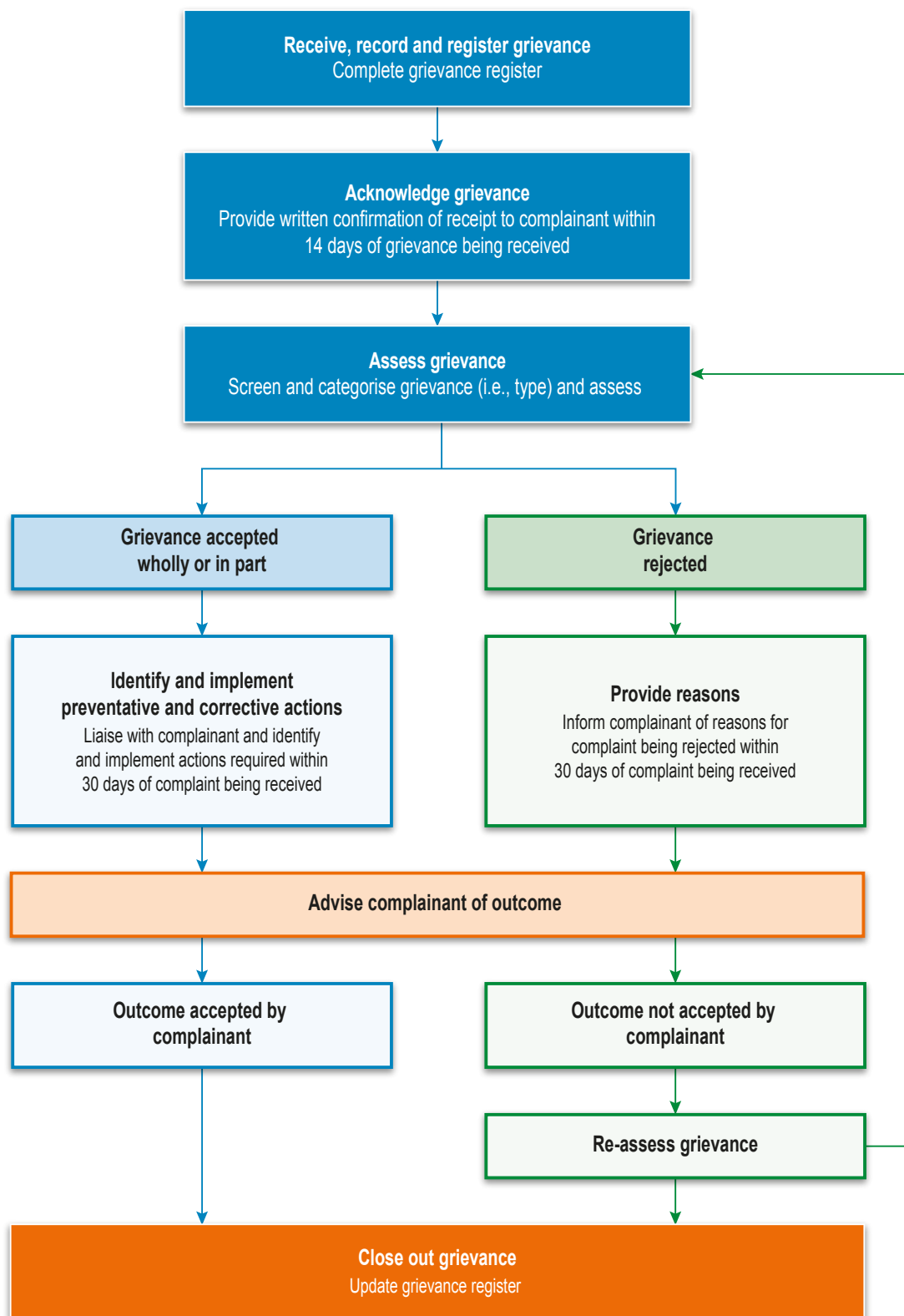
6. Community grievance mechanism

Grievances may be filed face-to-face, by telephone, in writing by letter, or electronic means. Written grievances may be lodged in person with a mining company representative. Individuals may lodge grievances anonymously and all grievances must be managed to protect confidential or sensitive information.

The community grievance mechanism detailed below incorporates relevant international good practice for grievance management and should be implemented in conjunction with the related plans listed in Section 4 of this plan. The mechanism is summarised in Figure 1.

Community grievances should be managed as follows:

- a. Allocate primary responsibility for implementation of the community grievance mechanism to the mine manager.
- b. Identify a mining company representative who will investigate and resolve grievances received from the community.
- c. Train and induct all workers in the procedures for managing grievances from the community (this EMP).
- d. Provide information to the community on the grievance mechanism and the process for raising a complaint.



- e. Record all grievances in a mining company grievance register including the following information:
 - i. Name of complainant.
 - ii. Affected persons, noting that the complainant may be representing another person or community.
 - iii. Date and time of the incident or alleged incident that gave rise to the grievance.
 - iv. Details of the complaint or grievance.
- f. Provide written acknowledgement of receipt of the grievance within 14 days of a grievance being received including the anticipated time it will take to assess the grievance.
- g. Screen the grievance, and determine if it is valid, and whether it will be accepted, in part or in its entirety.
- h. If not accepted, advise the complainant of the outcome with reasons, within 30 days of receipt.
- i. If accepted, liaise with the complainant, local authorities and mining company personnel as required to:
 - i. Investigate the causes of the complaint.
 - ii. Identify any required preventative and corrective actions. Resolution options should be commensurate with the nature of the grievance.
 - iii. Advise the complainant of the action(s) to be taken to resolve the complaint (within 30 days of receipt of the complaint).
- j. Implement identified preventative and corrective actions which may include:
 - i. Unilateral resolution (mining company or its workers propose a solution).
 - ii. Bilateral resolution (mining company and complainant reach a resolution through discussion and negotiation).
 - iii. Consultation using a third party, such as the Community Reference Group.
 - iv. Engagement with the relevant government authority.
- k. Re-assess the complaint if the complainant does not accept the outcomes of the grievance assessment and investigation process.
- l. If a complaint cannot be easily resolved by the mining company and/or local authority, the Community Reference Group (see Community Support and Development Plan) shall be engaged in the resolution process.
- m. Update the grievance register with information on:
 - i. Actions taken to resolve the complaint or grievance.
 - ii. Date on which the complaint or grievance was resolved.

7. Performance criteria

The performance criteria for community grievance mechanism are:

- All complaints acknowledged within the initial response time.
- All complaints recorded in the grievance register.
- All complaints assessed and closed out.

8. Inspection and monitoring requirements

Compliance with the community grievance mechanism will be determined using the checklist attached to this plan. The frequency of inspection and monitoring is set out in Table 2.

Table 2 Frequency of inspection and monitoring

Activity	Frequency
Grievance register	Monthly
Grievance close-out rates	Monthly

Community Grievance Mechanism

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Evidence of compliance with the grievance mechanism set out in this plan.	
Evidence of correct use and maintenance of grievances register.	
All complaints and grievances acknowledged within the initial response time.	
Complainants advised of the outcome and findings of the grievance assessment process.	
Close out actions recorded in the grievance register.	
Unresolved grievances referred to the Community Reference Group.	

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Hpakant/Lonkin Gems Tract Environmental Management Plan	
Community Health, Safety and Security Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Introduction

Jade mining activities can have significant health, safety and security impacts on nearby local communities. The Myanmar Government expects mining companies to take responsibility for and protect the health, safety and security of communities in the areas affected by their mining activities.

Mining companies will manage direct impacts on communities' health, safety and security and facilitate and support management of indirect impacts on their health, safety and security.

The health, safety and security of communities will be protected by:

- Adopting mining methods that safeguard communities from excessive noise, dust and vibration, interaction with mining equipment and vehicles, and unstable mine pits and waste rock dumps.
- Managing chemicals and hazardous materials and non-hazardous waste to prevent community exposure to these materials including contaminated water supplies.
- Preventing accidents and injuries by separating communities from mining activities and implementing safe work practices at and around mines.
- Managing the health of mine workers to prevent the spread of diseases to communities.
- Managing drug and alcohol use at mine sites and worker accommodation.
- Facilitating access by the community to health services and programs, and supporting increased capacity of such services.

The Community Health, Safety and Security Management Plan (this plan) describes how mining companies will protect the health, safety and security of communities in the areas that they mine. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objective

The objective of this plan is to carry out mining activities in a manner that protects the health, safety and security of communities in the Hpakant/Lonkin Gems Tract.

3. Definitions

Communicable disease – an infectious disease transmissible from person to person either by direct or indirect contact.

Community – a group of people who share a common sense of identity and interact with one another on an ongoing basis.

Community Reference Group – a group formed of members of the community to facilitate communication between mining companies and local residents, including for the community to raise issues and concerns, to inform the community about jade mining activity and social development progress, and to address issues related to involuntary resettlement and indigenous peoples.

Complaint – a formal expression of discontent concerning a mining company action raised by an affected party.

Corporate social responsibility – corporate social responsibility (CSR) is a mining company's initiatives to assess and take responsibility for the environmental and social impacts of its activities.

CSR fund – as specified by The Second Amending Law of the Myanmar Gemstone Law (2016), a fund not less than two percent of the investment for health, education, transportation and other developments of the related work area.

Emergency – a present or imminent event that requires prompt coordination of actions, or special regulation of persons or property, to protect the health, safety, or welfare of people or to limit damage to property and the environment.

Grievance – a complaint lodged by an affected party alleging damage, impact, or dissatisfaction specifically resulting from the actions, or a lack of action, by a mining company. A grievance is usually raised with the expectation of a corrective action, compensation or both.

Mining company – a company, joint venture, cooperative, persons or person holding a permit to produce gemstone from a gemstone block or concession.

Worker – any person working for a mining company including all mining company owners, employees, contractors, subcontractors and family members.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Code of Conduct.
- Air Quality and Dust Suppression Management Plan.
- Chemicals and Hazardous Materials Management Plan.
- Community Grievance Mechanism.
- Community Support and Development Plan.
- Emergency Preparedness and Response Management Plan.
- Erosion and Sediment Control Plan.
- Mine Closure Management Plan.
- Mine Pit and Waste Rock Dump Management Plan.
- Noise and Vibration Management Plan.
- Non-hazardous Waste Management Plan.
- Occupational Health and Safety Plan.
- Rehabilitation Management Plan.
- Water Management Plan.
- Worker Accommodation Management Plan.

5. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to the protection of community health, safety and security from mining activities are listed in this section.

5.1 Laws, rules and guidelines

Myanmar laws and guidance applicable to the protection of community health, safety and security from mining activities are:

Public Health Law (1972), specifically:

- Section 3(1) requires the government to advise, inspect and supervise activities for a healthy environment including garbage disposal, drinking water, pollution and building construction and maintenance.
- Section 3(4) requires the government to prevent and eliminate contagious diseases including through public vaccination programs.
- Section 4 empowers the government to form, direct and advise groups and government ministries and departments on public health matters set out in this law.
- Section 5 grants organisations appointed by the government to carry out inspections of workplaces, shops and buildings regarding environmental health matters including food, products, housing and private clinics.

The Prevention and Control of Communicable Diseases Law (2015), specifically:

- Section 3 requires the Department of Health to immunise children against communicable diseases and educate people about these diseases to prevent outbreaks.
- Section 4 requires the Department of Health to control the spread of an outbreak of a principal epidemic disease or notifiable disease through immunisation and other measures.
- Section 9 requires households to report communicable disease outbreaks to the nearest health department office or hospital.
- Section 11 outlines the measures a health officer may take to prevent and control the spread of communicable diseases including inspections and medical examinations.

The Control of Smoking and Consumption of Tobacco Product Law (2016), specifically:

- Section 9 requires non-smoking areas to be designated, clearly marked and supervised.

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.
- Section 46 requires a gemstone permit holder to not have social impact on the public in carrying out gemstone mining, and to raise a fund not less than two percent of the investment for health, education, transportation and other developments of the related work area.

Motor Vehicle Law (2015) requires motor vehicles to be registered and drivers to be licensed for particular types of vehicles. It aims to provide a safe and efficient road network and to reduce pollution from motor vehicles.

The Social Security Law (2012), specifically:

- Section 11(a) requires companies to register for the social security system and benefits contained in law if they employ a minimum or greater number of people determined by the Ministry of Labour.
- Section 15(a) outlines funds included in the social security fund including health and social care, family assistance, and invalidity, superannuation, survivors and unemployment benefits, and social housing plan.
- Section 18(b) requires employers to deduct contributions from workers' wages and to pay that money and the employers contribution to the social security fund.
- Section 48 requires employers to have insurance for the employment injury benefit fund, and workers to submit a medical certificate when claiming against the fund.
- Section 49 states employees covered by the employment injury benefit fund under this law, cannot make claims under the Workmen's Compensation Act 1923.
- Section 75 sets out employers' obligations to maintain records of employee appointment, contact details, work, injuries and termination, and to make that information available to the social security offices on request.

The Workmen's Compensation Act (1923) sets out an employer's obligations to arrange for injured workers to be treated and compensated for injuries sustained while working.

5.2 International standards

Further guidance on protecting community health, safety and security is provided in the following standards and guidelines, which represent good international practice:

- International Finance Corporation (IFC):
 - Performance Standards on Environmental and Social Sustainability - PS 1: Assessment and Management of Environmental and Social Risks and Impacts (2012).
 - Performance Standards on Environmental and Social Sustainability - PS 2 – Labour and Working Conditions (2012).
 - Environmental, Health and Safety General Guidelines (2007).
 - Environmental, Health and Safety Guidelines for Mining (2007).
- World Health Organisation Air Quality Guidelines (2005).
- Voluntary Principles on Security and Human Rights (Foley Hoag, 2018).

6. Management measures

The management measures below are based on good international practice for community health, safety and security in a mining context and incorporate relevant provisions of the international guidelines above.

Before mining

Managing community health, safety and security requires mining companies to develop trust in affected communities and be transparent in the collection, analysis and use of community health information. Community participation in health surveys and programs must be obtained by free, prior and informed consent.

The following management measures must be implemented:

- a. Fund and support the Department of Health and/or third-party health services providers in community awareness about the need for and purpose of health surveys, and obtain participating communities' free, prior and informed consent for the surveys.
- b. Obtain any required consents or permits from the Department of Health for the conduct of a health survey.
- c. Fund and support a health survey of a representative sample of community households to understand the existing health conditions of communities likely to be directly or indirectly affected by the proposed mining activities. The health survey should be endorsed by the Department of Health and may be conducted by the department and/or a third-party health service provider. As a minimum, the health survey will include:
 - i. General information about participating households and their members, including:
 - a. Number of people in the household, their sex, age (confirmed or estimated) and period of residency in the house, and any temporary visitors and their relationship to the household.
 - b. Housing conditions including number of occupants per room (to monitor overcrowding), ventilation (exposure to indoor air pollutants) and floor surface(s).
 - c. Nutritional information including diet and food sources.
 - d. Drinking water sources i.e., spring, well, watercourse or bottled water.
 - e. Type of sanitation i.e., pit toilet, use of a community facility or no formal sanitation.
 - f. Immunisation status including for tuberculosis, diphtheria, tetanus, pertussis, influenza, hepatitis b, polio, measles and rubella.
 - ii. Clinical information about household members.
 - a. Questionnaire to understand the general state of health of all participating community households in the previous 12 months and sickness in previous week. Diagnosis and treatment being received for specific disease states including hypertension, tuberculosis, malaria, filariasis (all ages) and symptoms of cough and shortness of breath, fever or diarrhoea in infants and children under 10 years of age.
 - b. Measurements of the standing weight, height and waist circumference/build (obese, normal, thin, wasted) for adults in each participating community household.
 - c. Blood pressure of adults and adolescents >10 years.
 - d. Evidence of anaemic conditions.
 - e. Examination of liver, kidney and spleen for enlargement.
 - f. Examination of lymph nodes for enlargement.
 - g. Eye infections (conjunctivitis, cataract, pterygium, other eye diseases).

- h. Skin infections (scabies, sores and tropical ulcers, ring worm, fungal skin infections by infective agent).
 - i. Dental health (dental caries, missing teeth, gum infections, oral cancer).
 - j. Consumption of stimulants (tobacco, alcohol, drugs – frequency and amount).
- d. Keep health survey results confidential and secure, and only provide to Department of Health authorised third-parties for the purposes of developing strategies to manage community health.
- e. Conduct a health risk assessment to understand how the proposed mining activities might affect community health.
- f. Consult with the Department of Health and third-party health service providers on community health services and programs planned or being implemented in the mine location and vicinity.
- g. Work with the Department of Health and local third-party health providers to develop strategies to manage the predicted community health impacts of the mining activities.
- h. Conduct fitness-for-work health checks for all workers in accordance with the Occupational Health and Safety Plan.
- i. Educate workers in health and disease prevention and encourage workers to share this knowledge and adopt similar practices in their own communities.
- j. Work with community reference groups to identify and implement strategies to protect and improve the health of communities, including funding infrastructure, equipment, supplies and other resources.

During mining

The following management measures must be implemented:

- k. Implement the Code of Conduct to protect community health, safety and security through appropriate mining company and worker behaviour.
- l. Implement the Air Quality and Dust Suppression Management Plan to protect communities from poor air quality and dust.
- m. Implement the Chemicals and Hazardous Materials Management Plan to protect communities from exposure to chemicals and substances that could harm their health.
- n. Implement the Community Grievance Mechanism to identify and respond to community concerns regarding their health, safety and security.
- o. Implement the Community Support and Development Plan to promote strategies for protecting and improving the health, safety and security of communities.
- p. Implement the Emergency Preparedness and Response Management Plan to reduce the impacts of spills and other incidents on community health, safety and security.
- q. Implement the Erosion and Sediment Control Plan to protect communities from flooding and related health risks including water-borne diseases.
- r. Implement the Mine Pit and Waste Rock Dump Management Plan to separate mining activities from communities and to protect communities from unstable mine pits and waste rock dumps.
- s. Implement the Noise and Vibration Management Plan to protect communities from excessive noise and vibration causing property damage.

- t. Implement the Non-hazardous Waste Management Plan to protect communities from disease through contaminated water supplies, vector-borne diseases such as malaria and dengue fever, and water-borne diseases such as diarrhoea, cholera and typhoid.
- u. Implement the Occupational Health and Safety Plan to reduce the potential for workers to spread communicable and other diseases in communities and for mining activities to impact community safety.
- v. Implement the Water Management Plan to protect community water sources.
- w. Implement the Worker Accommodation Management Plan to help prevent the spread of communicable diseases in nearby communities.
- x. Review the health risk assessment when significant changes occur to the mining method or size of the mine to determine if the assessment requires updating.
- y. Review health strategies every two (2) years or following a major outbreak of a communicable disease related to mining company workers.
- z. Advise the Department of Health and third-party health providers of any changes to the expected impacts on community health services and programs, and implement strategies to manage the identified impacts.
- aa. Work with local administration, police and other applicable security agencies to identify potential mining-induced security issues and threats.
- bb. Train security personnel employed by mining companies in the Voluntary Principles on Security and Human Rights.

After mining

The following management measures must be implemented:

- cc. Advise the Department of Health and local third-party health providers of proposed closure of the mine and discuss arrangements for the transfer of facilitated or supported health services, including funding arrangements.
- dd. Implement the Mine Closure Management Plan to address community health and safety concerns related to in the closure concept and final landform design.
- ee. Implement the Rehabilitation Management Plan to ensure mine pits and waste rock dumps are left in a manner that protects community health and safety.

7. Performance criteria

The performance criteria for community health, safety and security are:

- Mining activity-related community health, safety and security grievances.
- Mining activity-related community health, safety and security incidents.

8. Inspection and monitoring requirements

Mining companies will be responsible for inspection and monitoring of community health, safety and security, in partnership with the Department of Health and/or third-party health service providers. In addition to the inspection and monitoring required under the management plans referenced in this plan, mining companies will carry out the inspections and monitoring set out in Table 2.

Table 2 Frequency of inspection and monitoring

Activity	Frequency
Community health, safety and security-related grievances.	Monthly.
Community health, safety and security-related incidents.	Monthly.
Community health strategies.	Annually.
Community health survey (in partnership with the Department of Health and/or third-party health service providers).	Every two (2) years.
Health risk assessment.	Every two (2) years.
Consultation with Department of Health and third-party health service providers	Every six (6) months.

Community Health, Safety and Security Management Plan

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Community health survey completed	
Community health risk assessment completed (or updated, if required)	
Evidence of consultation with Department of Health and third-party health service providers on health survey and health risk assessment findings	
Evidence of facilitation and support for community health strategies and programs	
Evidence of corrective action in response to a health, safety or security grievance or incident.	

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Hpakant/Lonkin Gems Tract Environmental Management Plan	
Cultural Heritage Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Introduction

Jade mining activities of all scales have the potential to damage or disturb artefacts, buildings and sites of archaeological, cultural, historical and religious significance, including graveyards and burials (collectively referred to as cultural heritage), primarily as a result of vegetation clearance, ground disturbance, vehicle movements and damage or vandalism by workers.

The cultural heritage management plan (this plan) describes measures to be undertaken to minimise impacts on cultural heritage as a result of jade mining. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objectives of this cultural heritage management plan are to:

- Avoid or minimise adverse impacts on cultural heritage.
- Manage any cultural heritage items or sites found during mining activities.

3. Definitions

Affected party – a person or persons or organisation impacted by mining activities.

Chance find – an unexpected discovery of cultural heritage.

Community – a group of people who share a common sense of identity and interact with one another on an ongoing basis.

Community Reference Group – a group formed of members of the community to facilitate communication between mining companies and local residents, including for the community to raise issues and concerns, to inform the community about jade mining activity and social development progress, and to address issues related to involuntary resettlement and indigenous peoples.

Complaint – a formal expression of discontent concerning a mining company action raised by an affected party.

Corrective action – an action taken to correct a situation that has already occurred to improve a process or procedure to eliminate the causes of non-conformance and to prevent recurrence of incidents.

Cultural heritage – a site, building or artefact having historical, religious, cultural, or archaeological significance, including graveyards and burial sites. A site, building or feature defined under applicable laws.

Grievance – a complaint lodged by an affected party alleging damage, impact, or dissatisfaction specifically resulting from the actions, or a lack of action, by a mining company. A grievance is usually raised with the expectation of a corrective action, compensation or both.

Incident – a specific event or sequence of events that result in unwanted or unintended impact on the environment, safety, security, health, the livelihood of people and/or an impact on property, or on legal/regulatory compliance.

Mining company – a company, joint venture, person or persons holding a permit to produce gemstone from a gemstone block or concession.

Non-conformance – non-fulfilment of a requirement of this EMP and/or applicable laws and rules.

Preventative action – an action taken before a situation has occurred to improve a process or procedure to eliminate the causes of non-conformance and to prevent recurrence of incidents.

Worker – any person working for a mining company including all mining company staff, contractors, subcontractors and family members.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Land Access Management Plan.
- Community Support and Development Plan.
- Community Grievance Mechanism.
- Incident Reporting Procedure.

5. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to cultural heritage management are listed in this section.

5.1 Laws, rules and guidelines

Myanmar laws and guidance applicable to the management of cultural heritage are:

The Protection and Preservation of Antique Objects Law (2015), specifically:

- Section 12 requires anyone who finds an antique object to notify the relevant ward or village tract administrator.

The Protection and Preservation of Ancient Monuments Law (2015), specifically:

- Section 15(f) requires a person to obtain prior permission from the Department of Archaeology and National Museum to dig, quarry or mine within the specified area of an ancient monument which includes buildings, religious buildings and structures, natural and manmade caves, and other manmade structures and features.

The Protection and Preservation of Cultural Heritage Regions Law (1998), specifically:

- Section 13 requires a person to obtain prior permission from the Department of Archaeology for work within an ancient monument site or zone, on a building within a zone, in a cultural heritage region, and to construct a bridge, canal or embankment, or carry out an archaeological excavation.

- Section 22 requires buildings in cultural heritage regions to be constructed in accordance with conditions set by the Ministry of Culture.

The Guideline on Public Participation in EIA Process requires proponents to engage with affected communities, relevant government departments and civil society and non-government organisations on the impacts of jade mining. This includes consulting these groups on potential impacts to cultural heritage including damage or disturbance to ancient monuments and antique objects, and cultural heritage sites. The guideline requires inclusive and comprehensive consultation and that stakeholders are fully informed of potential impacts and proposed mitigation.

5.2 International standards

Further guidance on managing cultural heritage is provided by the International Finance Corporation which represents good international practice:

- International Finance Corporation – Performance Standard 8: Cultural Heritage (2012).

6. Management measures

The following management measures must be implemented:

- a. Train all workers on any known cultural heritage sites, the procedures to be followed for protection of these sites and how chance finds of cultural heritage items or sites are to be managed.
- b. Seek community advice on the location of cultural heritage sites in areas required for mining or associated activities before mining commences.
- c. Consult with the Community Reference Group(s) (see Community Support and Development Plan) and affected communities who use, or have used within living memory, the cultural heritage for long-standing cultural purposes to understand the importance of the site or area. If its importance is uncertain, seek advice from an archaeologist with experience in the cultural heritage of the area and if necessary notify the relevant state and national authorities.
- d. Maintain a register of cultural heritage sites at or adjacent to the mine site, including the location (GPS coordinates) and extent of the site, the type of site, its importance, any special considerations for its protection and management, and details of any custodian.
- e. Exclude mining activities from known cultural heritage sites in the vicinity of work areas with temporary fencing or markers.
- f. Allow continued access, or provide an alternative access route, to cultural heritage sites on the mine site in consultation with the community and Community Reference Group(s) and subject to overriding health, safety and security considerations.
- g. Do not interfere with or remove cultural heritage unless all of the conditions below are met:
 - i. No technically or financially feasible alternatives to removal are available.
 - ii. Overall benefits of the mining activity conclusively outweigh the anticipated cultural heritage loss from removal (as agreed with the Community Reference Group).
 - iii. Removal of cultural heritage is conducted using the best available technique.
- h. Where avoidance of a cultural heritage site is not feasible and removal is required, apply the following management hierarchy:
 - i. Relocate the cultural heritage site or item and implement restoration measures to maintain the cultural heritage value and functionality including the ecosystem processes needed to support it.
 - ii. Where relocation is not possible or practicable, document the cultural heritage and salvage valuable artefacts for preservation in a museum or other suitable facility.
 - iii. Where relocation, restoration or salvage is not feasible, consult with the affected parties (through the Community Reference Group) to compensate for the loss of that cultural heritage.
- i. In the event of the discovery of potential cultural heritage, implement the following steps:
 - iv. Cease all mining activity in the area immediately.
 - v. Establish a 50-m radius exclusion zone around the discovery using temporary fencing and/or markers. Exclude all activities from the area, and do not remove any material from the area.
 - vi. Once the area is secured, report the discovery to the mine environmental and safety officer.

- vii. Complete a Chance Find Report to provide a written record of the circumstances of the find, including:
 - a. Details of the find (name of discoverer, date, time, GPS/map coordinates (if available) and type (if known)).
 - b. Why workers were in the area.
 - c. How the cultural heritage was recognised.
 - d. If any damage was incurred prior to or during the find (and details of the extent of any damage that occurred).
 - e. Measures taken to protect the cultural heritage, if required.
- viii. Provide the Chance Find Report to the mine manager and the Community Reference Group to determine how it will be managed. If its importance is uncertain, seek advice from an archaeologist with experience in the cultural heritage.
- ix. Exclude entry to the area until appropriate advice on its management has been received from the Community Reference Group and/or an archaeologist.
- j. Limit vehicle, mining plant and equipment movements to established tracks and work areas. Off-road and offsite activities should be minimised to reduce potential impacts on cultural heritage.

7. Performance criteria

The performance criteria for cultural heritage management are:

- No damage to cultural heritage.
- No complaints received.
- Chance find reports completed.

8. Inspection and monitoring requirements

Compliance with the cultural heritage management plan will be determined using the checklist attached to this plan. The frequency of inspection and monitoring is set out in Table 1.

Table 1 Frequency of inspection and monitoring

Activity	Frequency
Ad hoc interviews with workers to check for awareness of the requirements for cultural heritage management.	Ongoing; at least once every mining season.
Routine inspections of known cultural heritage sites to ensure they are retained and remain undisturbed.	Monthly
Ongoing liaison with local communities and the Community Reference Group(s) regarding cultural heritage issues.	Ongoing

Cultural Heritage Management Plan

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Workers are aware of cultural heritage management requirements.	
Register of cultural heritage sites.	
No damage to known cultural heritage.	
Evidence of ongoing liaison with the community and Community Reference Groups regarding cultural heritage.	
Chance find reports completed.	

Hpakant/Lonkin Gems Tract Environmental Management Plan	
Erosion and Sediment Control Plan	
Version: Rev 1	Date: 31 October 2018

1. Purpose

Vegetation clearance and earthworks required to mine heavily disturb the ground surface. Rainfall can erode this disturbed ground, causing sediment-laden runoff to enter watercourses. The extent of erosion is dependent on the slope and the type of soils that are disturbed. For example, steeper slopes are more prone to erosion. Erosion, and subsequent sedimentation of surface water, can degrade habitat (smothering of vegetation and aquatic plants), reduce water quality and soil capacity, and affect watercourse hydrology and behaviour through bed aggradation and altered channels.

The erosion and sediment control plan (this plan) describes how erosion and sedimentation associated with large-scale jade mining will be managed. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objective

The objective of this plan is to avoid or reduce erosion of mining-disturbed areas and subsequent sedimentation of downstream watercourses to protect them and their beneficial uses.

3. Definitions

Cut-off drain – means a channel dug into the ground upstream of an open pit to collect and divert water away from the mine face.

Diversion bund – a mound of earth constructed to divert water away from slopes or mine faces. Often constructed in conjunction with a cut-off drain.

Drainage line – a depression or low point that will collect water and cause it to flow downhill.

Guideline values – maximum concentrations or specified ranges of concentrations of a pollutant that should not be exceeded.

Sediment basin – a large pond or dam or series of ponds and dams constructed to collect runoff and allow sediment to settle. They can be excavated into the ground or constructed as an aboveground structure. See Figure 1 for construction and Figure 2 for typical siting.

Sediment trap – a structure constructed across a drainage line to slow water and cause suspended soil to settle. Typically excavated into the ground and constructed of rocks and gravel. See Figure 3.

Silt fence – a fence placed across a drainage line to slow water and cause suspended sediment to settle. Typically made of straw bales or woven mats or fabric.

Runoff – water flowing across land following rainfall.

Watercourse – a creek, stream, river or other water channel, either natural or man-made, temporary or permanent.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Mine Pit and Waste Rock Dump Management Plan.
- Rehabilitation Management Plan.

5. Hazards and impacts

Erosion of soil is a natural occurrence that is accelerated by land disturbance, mining excavation and waste rock management. Factors that can increase the potential for erosion include: the removal of vegetation or other ground cover; exposure of bare earth to forces such as flowing water or strong winds; steep slopes; soils that are structurally unstable and break into very fine particles when wet. The sources of hazard, impact pathway, impacts and receptors are described in Table 1.

Table 1 Erosion and sedimentation hazards and impacts

Hazard (source of impact)	Pathway	Impact and receptor
Ground disturbance, earth moving	Runoff causing erosion and sedimentation of land and watercourses	Reduced water quality due to increased sediments (TSS) impacting downstream beneficial uses (e.g., aquatic ecosystems and communities); raised river beds due to deposited sediments increasing the likelihood of overbank flooding; deterioration of soil quality and fertility due to increased erosion
Watercourse obstructions	Flooding over river banks	Flooding of villages and community infrastructure potentially causing the loss of life and property; loss or degradation of biodiversity
Water jetting or sluicing of jade bearing formations	Runoff to watercourses causing erosion and sedimentation; runoff to mine voids creating stagnant water lakes or ponds	Poor water quality; degraded aquatic ecosystems
Mine pits	Discharge of collected water (e.g., from heavy rainfall event) to the receiving environment	Poor water quality; degraded aquatic ecosystems

6. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to erosion and sediment control are listed in this section.

6.1 Laws, rules and guidelines

The laws, rules and guidelines relating to erosion and sediment control are:

Freshwater Fisheries Law (1991), specifically:

- Section 36 requires permission from the Department of Fisheries to construct, maintain or use a dam, bank or weir on freshwater fishery waters.
- Section 40 prohibits persons from harassing fish or aquatic organisms or polluting their habitat.

- Section 41 prohibits persons from affecting water quality and quantity in a leasable or reserved fishery and the rivers and creeks supplying water to that fishery.

The Conservation of Water Resources and Rivers Law (2006), specifically:

- Section 8 prohibits persons doing works on watercourses or changing watercourse channels that ruin or cause waste of the water resources.
- Section 11(c) prohibits persons from disposing of soil and other materials from mining into watercourses or waterbodies or gullies which flow to watercourses or waterbodies.
- Section 22 requires persons to obtain permission to stockpile materials on river banks and waterfronts.

The Conservation of Water Resources and Rivers Rule (2013) prohibits dumping of rubbish and dangerous materials in rivers.

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

Environmental Conservation Rules (2014), specifically:

- Rule 68, requires owners of small enterprises to obtain the Environmental Conservation Department's advice regarding impacts of its business before applying for a licence to operate the business.

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 4(d) empowers the Ministry of Mines to acquire land or legally transfer land with the consent of the owner that is within a gemstone tract.
- Section 15(b) requires the Ministry of Mines to issue a gemstone production permit if the applicant pays the determined price within the specified time.
- Section 15(c) requires the Ministry of Mines to determine the tenure and price of any extension of a small-scale gemstone production permit.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

National Environmental Quality (Emission) Guidelines set out noise, air emission and water discharge criteria for protecting human and ecosystem health.

The Myanmar Engineering Council Law (2013), specifically:

- Sections 20 to 25 allow suitably qualified persons to apply for registration as a graduate technician or technician, and the Myanmar Engineering Council to issue a certificate of registration.
- Sections 26 to 30 allow suitably qualified persons to apply for registration as a registered engineer, and the Myanmar Engineering Council to issue a certificate of registration.
- Section 31 grants registered graduate technicians, technicians and engineers the right to practice their relevant discipline or area of expertise and requires them to abide by the laws, rules and procedures issued under the law.

The National Environmental Quality (Emission) Guidelines set out the guideline values for discharge of runoff and wastewater from mining sites involving the extraction of stone. These guidelines are applicable to jade mining and have been adopted in this EMP. Table 2 lists the water quality parameters and guideline values.

Table 2 Guideline values for discharge of runoff and wastewater

Parameter	Unit	Maximum concentration
Biological oxygen demand	mg/L	30
Chemical oxygen demand	mg/L	125
Oil and grease	mg/L	10
pH	S.U. ^a	6-9
Total coliform bacteria	100 mL	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

^a Standard unit

6.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) and Article 54(c) of The Second Amending Law of the Myanmar Gemstone Law (2016) for the Hpakant/Lonkin Gems Tract.

The notifications relevant to erosion and sediment control are:

- Notification Letter No. 121/99, October 4, 1999.
- Letter No. Ka-37/295/2017, December 29, 2014.
- Letter No. Ka-37/078/2014, September 4, 2015.
- Letter No. Ka-37/146/2016, January 26, 2016.
- Letter No. Ka-37/383/2016, May 23, 2016.

These notifications are attached to this EMP as Appendix 2.

6.3 International guidelines

The International Finance Corporation (IFC) has published a guideline that provides general guidance on erosion and sediment control. The relevant guideline is:

- Environmental, Health and Safety Guidelines for Mining. December 2007. IFC/World Bank.

The International Erosion Control Association (Australasia) has developed best practice guidelines for the control of erosion and sedimentation. The following publication provides valuable guidance on the factors contributing to and the requirements for controlling erosion and sedimentation:

- Best Practice Erosion and Sediment Control. November 2008 (and subsequent revisions). International Erosion Control Association (Australasia).
- Best Practice Erosion and Sediment Control. November 2008. Appendix B - Sediment Basin Design and Operation - Draft document. December 2016. International Erosion Control Association (Australasia).

7. Management measures

The application of best practice erosion and sediment control is based upon surface water management and drainage control, erosion control (including revegetation measures) and management of sediment.

Discharges of runoff and wastewater must not exceed guideline values listed in the National Environmental Quality (Emissions) Guidelines (2012), as presented in Table 2. Erosion and sedimentation is a significant impact and the focus of this management plan. During the transitional period for this EMP, turbidity (Total suspended solids) is the water quality parameter that will be measured.

The management measures detailed below incorporate the notifications listed above and are to be implemented with the notifications.

Before mining

The following management measures must be done before mining commences:

- a. Complete a hydrological assessment by a qualified hydrologist of the concession to determine the catchment area(s), drainage pathways and watercourses within the concession and downstream.
- b. Design the mine to avoid:
 - i. Watercourses and land adjacent to watercourses.
 - ii. All high risk areas for soil erosion including steep slopes and areas where landslips have occurred or are possible.
- c. Design the surface water management system (Figure 1) for the mine to:
 - i. Site and design infrastructure to limit runoff to watercourses.
 - ii. Locate topsoil stockpiles and waste rock dumps away from drainage lines and creeks, and preferably in flat areas.
 - iii. Divert runoff around the mine (and soil disturbance) using diversion bunds and cut-off drains.

- iv. Collect runoff on-site (i.e., within the active working area) in sediment basins and allow suspended sediments to settle before discharge to adjacent watercourse.
 - v. Grade roads adjacent to watercourses to drain away from watercourses, particularly headwater streams.
 - vi. Design road approaches to watercourses at right angles to limit disturbance to watercourse banks.
- d. Complete a surface water management plan by a qualified civil engineer who is registered under The Myanmar Engineering Council Law (2013) or recognised international law or institution. The plan will consider:
- i. Climate of the area including seasonal variation and climate change predictions:
 - Average annual rainfall including average minimum and average maximum rainfall.
 - Maximum (storm event) rainfall and duration.
 - Predicted increase in storm frequency and intensity under climate change scenarios.
 - ii. Soil types and particle sizes.
 - iii. Catchment area, land use and runoff coefficient.
 - iv. Retention time required to achieve discharge water quality guideline values.
- e. The surface water management plan will include:
- i. Hydrological assessment required by (a) including map showing catchments, watercourses and drainage lines.
 - ii. Information on how (b) and (c) have been achieved.
 - iii. Information set out in (d) above.
 - iv. Sediment basin and sediment trap designs including discharge spillways.
 - v. Location of cut-off drains, diversion bunds, sediment traps and sediment basins.
 - vi. Maintenance requirements for sediment basins including clean-out interval.
- f. Update surface water management plan annually to incorporate experience, changes and information gained during previous year of mine operation.

During mining

Management measures to limit erosion that must be implemented are:

- g. Minimise the area of disturbance.
- h. Conduct work (including excavation) activities during the dry season, May through to September.
- i. Avoid earthworks during major rain events. In the event of heavy rain, cease work and, wherever safe to do so, remain on site to monitor and maintain erosion and sediment controls.
- j. Prohibit the washing, servicing or refuelling of equipment, vehicles or machinery near or within watercourses
- k. Stockpile overburden and/or topsoil materials away from watercourses (i.e., maintain a minimum 100 m separation from watercourse banks).
- l. Install diversion bunds on the upper side stockpiles and waste rock dumps.

- m. Construct cut-off drains around open pits to stop water draining into the pit.
- n. Discharge water and wastewater in a manner that prevents scouring and erosion.
- o. Stabilise and revegetate exposed areas as soon as possible after area mined out.
- p. Install landform and soil stabilisation measures on side hill cuts to prevent slumping and/or erosion.
- q. Install roadside drains and culvert crossings to manage surface flows along haul roads and access roads.
- r. Restrict vehicle movements to designated roadways, tracks and car parks to minimise the area of surface compaction.

Management measures to control the release of sediments that must be implemented are:

- s. Avoid depositing soil and rock directly into watercourses.
- t. Maintain a 100-m-wide vegetation buffer from watercourses (see Figure 2).
- u. Construct sediment basins to capture sediment-laden water from runoff within the mining area (see Figure 3).
- v. Regularly remove accumulated sediment from sediment basins and dispose in designated areas within waste rock dumps.
- w. Clean out and maintain silt fences, sediment traps (see Figure 4) and diversion bunds before heavy rainfall, the wet season and regularly during the wet season.
- x. Construct and maintain sediment controls (such as diversion bunds, silt fences, cut-off drains and sediment traps) to settle suspended soil and reduce the velocity of, and dissipate, flows from hardstand areas, roads, work sites and stockpiles.
- y. Control sediment runoff from waste rock dumps and stockpiles.
- z. Rehabilitate disturbed areas as soon as possible after mining to minimise the potential for erosion and sediment-laden runoff entering to watercourses. Implement the Rehabilitation Management Plan.
- aa. Ensure backfilled excavations are appropriately compacted and contoured to avoid surface water ponding.
- bb. Remove temporary bridges and causeways from Uru Creek and its major tributaries by May each year.

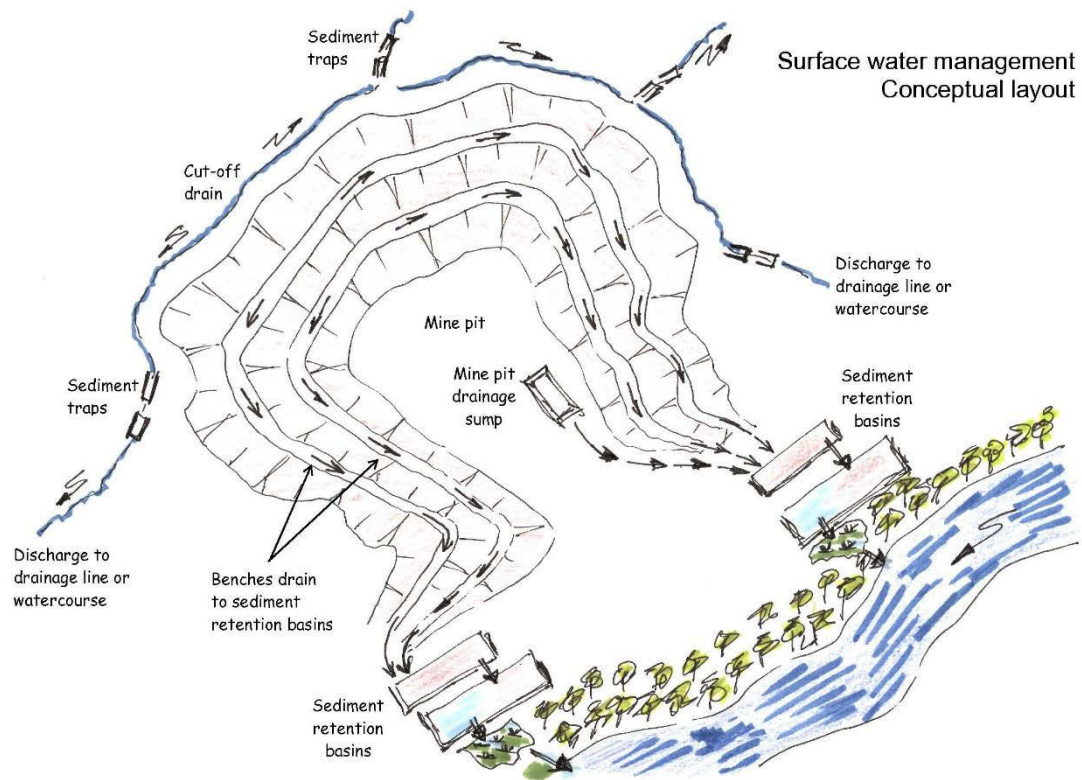
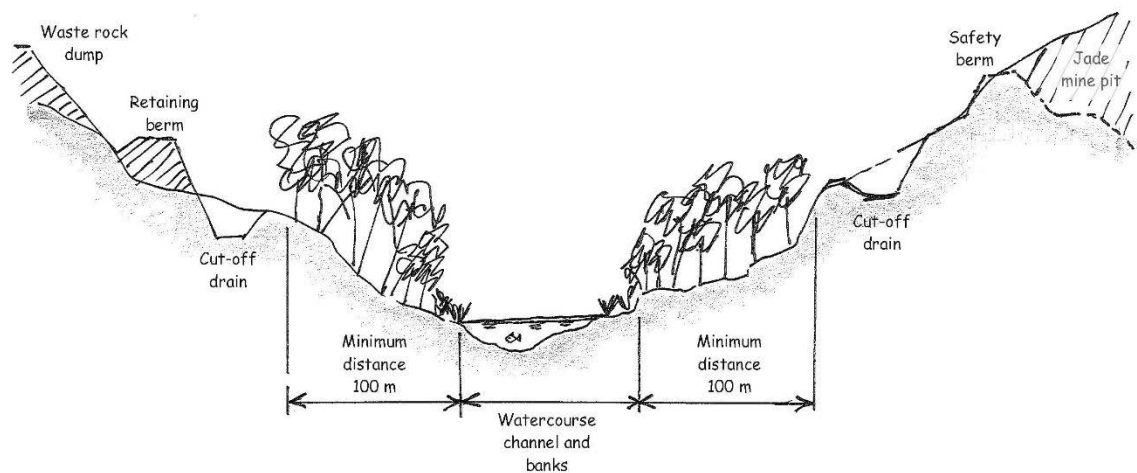


Figure 1 Conceptual layout of surface water management system



Jade mine siting
Protection of watercourses and riparian vegetation

Figure 2 Protection of watercourses and riparian vegetation

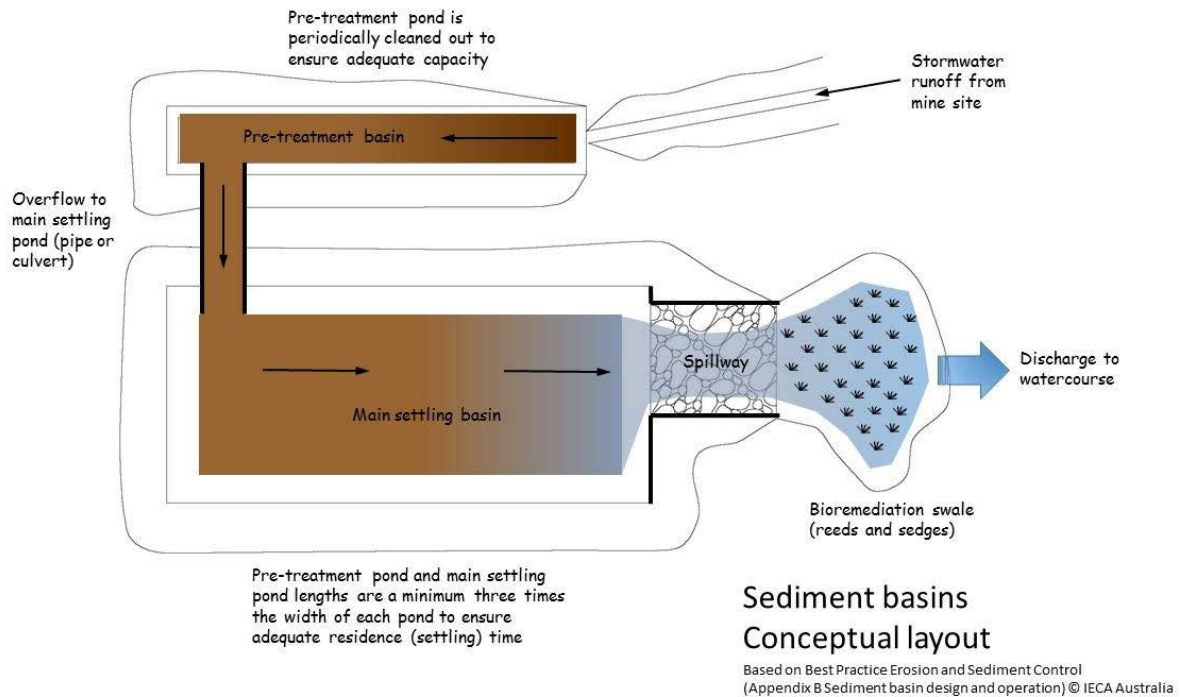


Figure 3 Conceptual layout of sediment basin

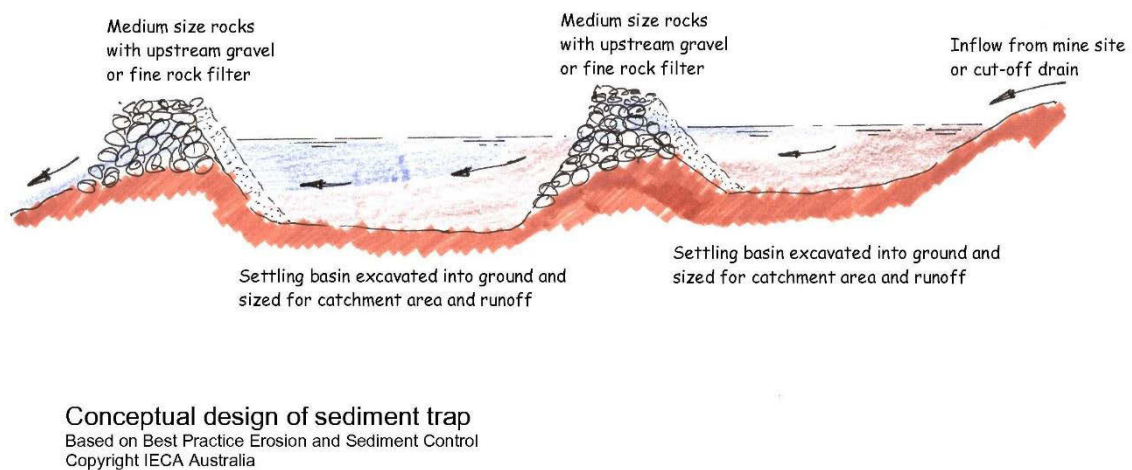


Figure 4 Conceptual design of sediment trap

After mining

Implement the Rehabilitation Management Plan.

8. Performance criteria

The performance criteria for erosion and sediment control are:

- Surface water management plan.
- No evidence of sedimentation of watercourses from mining-related activities.
- Turbidity (TSS) of discharge is within the prescribed limit.
- No complaints about poor water quality from downstream users.

9. Inspection and monitoring requirements

Erosion and sediment control structures will be regularly inspected and discharge water quality regularly monitored to ensure they are being installed, properly constructed and properly maintained. Compliance will be determined using the checklist attached to this plan.

The quality of water discharged from the concession will be tested monthly to ensure compliance with the relevant water quality parameter – Total suspended solids (TSS) in the National Environmental Quality (Emission) Guidelines Annex 1, Industry-Specific Guidelines, Section 2.7.1 Mining.

The frequency of inspections is set out in Table 3.

Table 3 Frequency of inspection and monitoring

Activity	Frequency
Hydrological assessment	Prior to mining commencing
Mine plan	Prior to mining commencing
Surface water management plan	Prior to mining commencing and annually until completion of mining
Erosion and sediment control structures	Monthly during dry season Weekly during wet season After storms or heavy rainfall
Discharge water quality	Monthly

Erosion and Sediment Control Plan

Compliance checklist

Maw and Concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Evidence of hydrological assessment including plans showing catchments and location of watercourses	
Surface water management plan showing location of surface water management system including cut-off drains, diversion bunds, sediment basins and discharge point	
Evidence that watercourses have been avoided, where possible	
Watercourse buffers exist and have not been disturbed	
Cut-off drains constructed and functional	
Diversion bunds constructed and functional	
Sediment traps constructed and functional	
Sediment basins constructed and functional	
Silt fences in place and functional	
Progressive rehabilitation of mined out areas is occurring	
Turbidity (TSS) measured at discharge point (criteria 50 mg/L)	

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Hpakant/Lonkin Gems Tract Environmental Management Plan	
Land Access Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Introduction

Jade mining companies will require access to land within their concession and may require access to land outside their concession for disposal of overburden, waste rock and non-hazardous waste. Mining companies may need to restrict access to land adjacent to mines and waste rock dumps for safety reasons. Land access including acquisition and resettlement can have adverse impacts on communities and individuals that use and/or live on the land. Involuntary resettlement (i.e., where people or communities are forced to leave their land and resettle elsewhere) can lead to long-term hardship and impoverishment, and should be avoided if possible. Mining activity can also result in involuntary restrictions on the use of land which can cause people and communities to lose access to natural resources, such as freshwater.

When it is not possible to avoid involuntary resettlement or restrictions, displaced or affected persons should be meaningfully involved in planning their resettlement, and fairly compensated for their losses including any loss of livelihood, and alternative arrangements made for access to natural resources.

This land access management plan (this plan) describes the procedures to be followed when accessing and/or acquiring public or private land for jade mining. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objectives of this land access management plan are to:

- Avoid or minimise (where avoidance is not possible) displacement of people as a result of mining activities.
- Provide fair, adequate and equitable compensation for land required for mining, including any houses and public buildings on such land.
- Provide free and informed participation of affected parties in decision-making related to any resettlement.
- Restore the livelihoods and standard of living of displaced persons.
- Provide alternative arrangements where access to natural resources has been denied.

3. Definitions

Affected party – a person or persons or organisation impacted by mining activities.

Community – a group of people who share a common sense of identity and interact with one another on an ongoing basis.

Community Reference Group – a group formed of members of the community to facilitate communication between mining companies and local residents, including for the community to raise issues and concerns, to inform the community about jade mining activity and social development progress, and to address issues related to involuntary resettlement and indigenous peoples.

Complaint – a formal expression of discontent concerning a mining company action raised by an affected party.

Corrective action – an action taken to correct a situation that has already occurred to improve a process or procedure to eliminate the causes of non-conformance and to prevent recurrence of incidents.

Grievance – a complaint lodged by an affected party alleging damage, impact, or dissatisfaction specifically resulting from the actions, or a lack of action, by a mining company. A grievance is usually raised with the expectation of a corrective action, compensation or both.

Incident – a specific event or sequence of events that result in unwanted or unintended impact on the environment, safety, security, health, the livelihoods of people and/or an impact on property, or on legal/regulatory compliance.

Involuntary resettlement – the involuntary taking of land resulting in relocation, loss of shelter, loss of assets, or loss of means of livelihood. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood as a result of project-related land acquisition and/or restrictions on land use).

Mining company – a company, joint venture, cooperative, persons or person holding a permit to produce gemstone from a gemstone block or concession.

Worker – any person working for a mining company including all mining company owners, employees, contractors, subcontractors and family members.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Community Grievance Mechanism.
- Community Support and Development Plan.
- Mine Closure Management Plan.

5. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to land access are listed in this section.

5.1 Laws, rules and guidelines

Myanmar laws, rules and guidelines that set out mining companies' and their workers' responsibilities are:

The Foreign Investment Law (2012), specifically:

- Section 4(c) restricts or prohibits businesses established with foreign capital which cause damage to the natural environment and ecosystems.

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 4(d) empowers the Ministry of Mines to acquire land or legally transfer land with the consent of the owner that is within a gemstone tract.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

5.2 International guidelines

Further guidance on managing land access is provided in the following standards and guidelines which represent good international practice:

- IFC Performance Standards on Environmental and Social Sustainability: PS 5 - Land Acquisition and Involuntary Resettlement.
- World Bank Operational Manual: OP 4.12 – Involuntary Resettlement.

6. Land access management measures

The management measures for gaining access to land for mining are set out below. The procedure for resettlement of landowners is shown in Figure 1.

Before mining

The following management measures must be implemented before mining commences:

- a. Consider feasible alternative mine design and mining methods to avoid, and where avoidance is not possible, reduce the land required and minimise the need to displace people, communities and/or businesses, and/or restrict access to natural resources such as freshwater and land for agricultural use.
- b. Identify the rightful owners of land or assets required for mining or associated activities.
- c. Undertake prior, open and informed consultation with all affected persons about their options for resettlement and/or alternatives to the use of affected resources.
- d. Engage the Community Reference Group (see Community Support and Development Management Plan) in the consultation process, where appropriate.
- e. Provide information to potentially affected people about the Community Grievance Mechanism.
- f. Where resettlement is unavoidable, identify, map and record the details of people who will be displaced, and determine eligibility for compensation.
- g. Discourage ineligible persons, such as opportunistic settlers, from claiming benefits through, for example, eligibility criteria and a cut-off date for eligibility.
- h. Document and disseminate information on the eligibility criteria and cut-off date for eligibility.
- i. Determine compensation for resettlement and other economic losses directly attributable to mining in accordance with the following guidelines:

- i. A choice of resettlement options, including replacement land and/or housing or cash compensation, and relocation assistance.
- ii. Offer, where feasible, land-based compensation (e.g., agricultural land) where livelihoods of displaced persons are subsistence or land-based, or where land is collectively owned.
- iii. Full replacement cost for loss of land and/or assets where cash compensation requested.
- iv. Arrangements for continued access to affected resources, or access to alternative resources with equivalent livelihood-earning potential and accessibility.
- v. Alternative income generating opportunities.
- vi. Transitional support for the time required to establish alternative income earning opportunities.
- j. Promptly pay compensation for resettlement and other losses directly attributable to the mining proposal.
- k. Record all transactions to acquire land, pay/provide compensation, and relocation activities.
- l. Only take possession of acquired land and related assets after all compensation has been provided to the affected parties.
- m. Provide opportunities to displaced persons to derive economic benefits from mining.

During mining

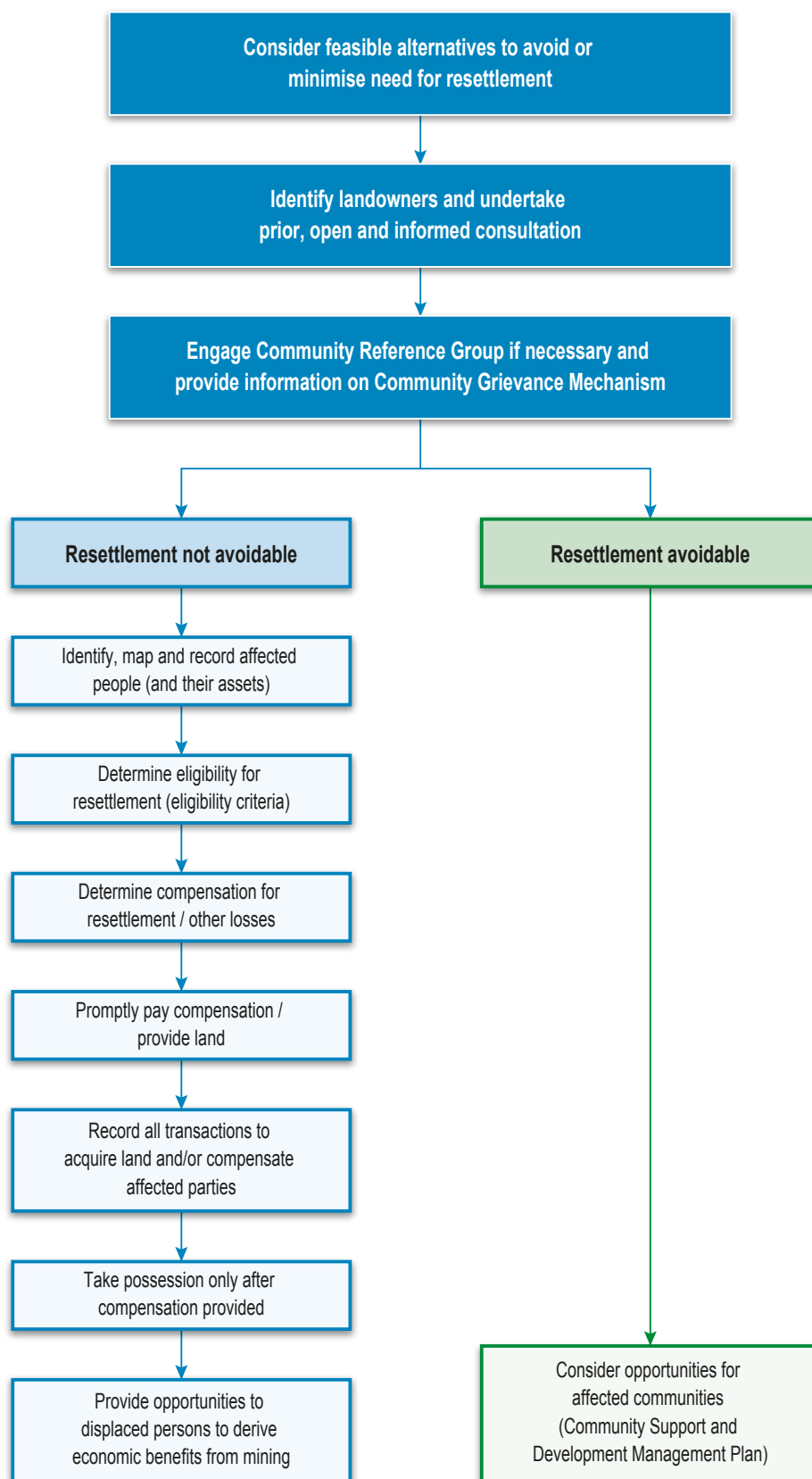
The management measures that must be implemented during mining are:

- n. Implement agreed resettlement actions and associated compensation, and maintain records of all actions undertaken.
- o. Notify landowners in advance, in writing of temporary access required to public or private land.
- p. Access land along formed roads or access tracks, or along an access route agreed with the landowner, where feasible.
- q. Act courteously and responsibly when accessing land.
- r. Do not block or restrict access to public roads unless through prior agreement and consultation with relevant road authorities, including providing alternative access.
- s. Manage any complaints from landowners in accordance with the Community Grievance Mechanism.
- t. Undertake an independent completion audit of all resettlement and compensation activities to verify that all agreed actions have been implemented, compensation has been paid, and that resettled landowners are achieving sustainable livelihoods.
- u. Undertake corrective actions for any persons whose post-displacement livelihood status has declined as a result of displacement and/or resettlement.

After mining

The following management measures must be implemented after mining is complete:

- v. Restore access to natural resources and land if safe to do so.
- w. Implement the Mine Closure Management Plan.



7. Performance criteria

The performance criteria for managing land access are:

- Compensation paid for loss of land and/or access, and/or assets.
- Displaced persons resettled and/or compensated.
- Corrective actions undertaken for any displaced persons whose livelihoods have declined.
- Community grievances addressed in accordance with the Community Grievance Mechanism.

8. Inspection and monitoring requirements

Compliance with the land access management measures will be determined using the checklist attached to this plan. The frequency of inspections is set out in Table 2.

Table 2 Frequency of inspection and monitoring

Activity	Frequency
Compensation records	Monthly
Resettlement records	Monthly
Grievance register	Monthly
Standard of living of physically displaced households	Bi-annual
Relocation household tenure	Bi-annual

Land Access Management Plan

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Evidence of consultation with all affected persons and communities.	
Community and household baseline surveys in affected areas.	
Appropriate compensation provided for involuntary resettlement and/or loss of assets (compensation records).	
Evidence that people and households have been properly resettled (resettlement records).	
Appropriate compensation paid for long-term land and/or natural resource access restrictions (compensation records).	
Complaints register (complaints recorded and closed out).	
Ongoing liaison with the community regarding land access restrictions.	
Access restored to natural resources and land following mine closure.	

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Hpakant/Lonkin Gems Tract Environmental Management Plan	
Mine Pit and Waste Rock Dump Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Purpose

Jade mining involves the excavation of large amounts of material creating large open pits to access jade and disposal of overburden in large waste rock dumps. A key risk relating to the creation of these pits and waste rock dumps is their physical stability.

The physical stability of the slopes of open pits and waste rock dumps is influenced by the geotechnical properties of soils, their slopes and the environmental conditions (such as rainfall and seismicity). Failure of pit walls and the faces of waste rock dumps can create landslides. These have the potential to cause loss of property (buildings, houses and mining equipment) and loss of life (people and animals) in the path of the landslide. Landslides can also smother land and downstream beneficial uses (e.g., aquatic ecosystems and agricultural areas) and can be further eroded causing sediment-laden runoff to enter watercourses.

This plan describes the general principles for mine pit and waste rock dump design to enable mines and waste rock dumps to be constructed safely and to create stable landforms. Stable landforms are important for mine closure and final rehabilitation. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objectives for mine pit and waste rock dump stability are to:

- Ensure the long-term stability of jade mining areas to protect human health and safety, property and the environment.
- Avoid or reduce erosion of mining-disturbed areas to protect downstream watercourses and their beneficial uses from sedimentation.

3. Definitions

Batter – the inclined or sloping part of the open pit wall.

Bench – open pit mining generally uses steps in the walls to prevent rock falls and to ensure stability. The flat part of the step is called a bench.

Bund – a pile or mound of material capable of diverting runoff or restraining a vehicle depending on its height, width and shape.

Cut-off drain – means a channel dug into the ground upstream of an open pit to collect and divert water away from the open pit.

Diversion bund – a mound of earth constructed to divert water away from open pit or waste rock dump batters. Often constructed in conjunction with a cut-off drain.

Drainage line – a depression or low point that will collect water and cause it to flow downhill.

Mine face – the active working part of an open pit.

Mine wall – the walls of an open pit.

Open-pit mining – the process of excavating rock or minerals from the earth by their removal from an open pit.

Overburden – rock or soil overlying a mineral deposit or gemstone bearing formation.

Runoff – water flowing across land following rainfall.

Terrace – to ensure the stability of open pit mining using terraces or benches.

Waste rock dump – designated area for the disposal of overburden and waste rock.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Erosion and Sediment Control Plan.
- Rehabilitation Management Plan.

5. Hazards and impacts

Jade mining involves the excavation of large amounts of material creating large open pits to access jade and disposal of overburden and waste rock in large waste rock dumps. A key risk relating to the creation of these pits and waste rock dumps is their physical stability and the potential for landslides.

Landslides are naturally occurring environmental hazards that are defined as mass movements of rock, debris, and soil down a slope of land. Landslides result from the failure of the soil and rock materials that make up the hill-slope or batter and they are driven by gravity. The likelihood of landslides is increased by the removal of forests which provide structural stability of soils, creation of landforms with very steep slopes including open pits and waste rock dumps, and through blasting. The sources of hazard, impact pathway, impact and receptors are described in Table 1.

Table 1 Pit and waste rock dump stability hazards and impacts

Hazard (source of impact)	Pathway	Impact and receptor
Steep mine walls	Slope failure	Pit wall failure resulting in landslide potentially causing the loss of life and property; smothering of downslope environment.
Unstable waste rock dumps	Slope failure	Waste dump batter failure resulting in landslide potentially causing the loss of life and property; smothering of downslope environment.
Bare (disturbed) mine faces and waste rock dumps	Runoff causing erosion and sedimentation of watercourses	Reduced water quality due to increased sediments (TSS) impacting downstream beneficial uses (e.g., aquatic ecosystems and communities); increased riverbed height due to deposited sediments increasing the likelihood of overbank flooding; deterioration of soil quality and fertility due to increased erosion.

6. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to mine closure are listed in this section.

6.1 Laws, rules and guidelines

The laws, rules and guidelines relating to mine closure are:

The Conservation of Water Resources and Rivers Law (2006), specifically:

- Section 8 prohibits persons doing works on watercourses or changing watercourse channels that ruin or cause waste of the water resources.
- Section 11(c) prohibits persons from disposing of soil and other materials from mining into watercourses or waterbodies or gullies which flow to watercourses or waterbodies.
- Section 22 requires persons to obtain permission to stockpile materials on river banks and waterfronts.

The Conservation of Water Resources and Rivers Rule (2013) prohibits dumping of rubbish and dangerous materials in rivers.

Freshwater Fisheries Law (1991), specifically:

- Section 36 requires permission from the Department of Fisheries to construct, maintain or use a dam, bank or weir on freshwater fishery waters.
- Section 40 prohibits persons from harassing fish or aquatic organisms or polluting their habitat.
- Section 41 prohibits persons from affecting water quality and quantity in a leasable or reserved fishery and the rivers and creeks supplying water to that fishery.

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

Environmental Conservation Rules (2014), specifically:

- Rule 68, requires owners of small enterprises to obtain the Environmental Conservation Department's advice regarding impacts of its business before applying for a licence to operate the business.

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 4(d) empowers the Ministry of Mines to acquire land or legally transfer land with the consent of the owner that is within a gemstone tract.

- Section 15(b) requires the Ministry of Mines to issue a gemstone production permit if the applicant pays the determined price within the specified time.
- Section 15(c) requires the Ministry of Mines to determine the tenure and price of any extension of a small-scale gemstone production permit.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

The Myanmar Engineering Council Law (2013), specifically:

- Sections 20 to 25 allow suitably qualified persons to apply for registration as a graduate technician or technician, and the Myanmar Engineering Council to issue a certificate of registration.
- Sections 26 to 30 allow suitably qualified persons to apply for registration as a registered engineer, and the Myanmar Engineering Council to issue a certificate of registration.
- Section 31 grants registered graduate technicians, technicians and engineers the right to practice their relevant discipline or area of expertise and requires them to abide by the laws, rules and procedures issued under the law.

6.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) and Article 54(c) of The Second Amending Law of the Myanmar Gemstone Law (2016) for the Hpakant/Lonkin Gems Tract.

The notifications relevant to mine pit and waste rock dump management are:

- Letter No. Ka-37/078/2014, September 4, 2015.
- Letter No. Ka-37/146/2016, January 26, 2016.
- Letter No. Ka-37/209/2017, February 16, 2016.
- Letter No. Ka-37/295/2017, December 29, 2014.
- Letter No. Ka-37/383/2016, May 23, 2016.
- Letter No. Ka-37/578/2016, August 22, 2016.
- Notification Letter No 85/2004, May 12, 2004.

These notifications are attached to this EMP in Appendix 2.

6.3 International guidelines

The International Finance Corporation (IFC) has published a guideline that provides general guidance on mine and waste rock dump stability. The relevant guideline is:

- Environmental, Health and Safety Guidelines for Mining. December 2007. IFC/World Bank.

The Australian Government has developed leading practice guidelines for the mining industry. The following publications provide valuable guidance on the factors contributing to and the requirements for successful closure and rehabilitation of mine sites.

- Mine closure. Leading Practice Sustainable Development Program for the Mining Industry. September 2016. Australian Government.
- Mine rehabilitation. Leading Practice Sustainable Development Program for the Mining Industry. September 2016. Australian Government.

7. Management measures

Open pit mining is a complex engineering system with a range of factors that need to be understood and effectively managed for the mine to operate safely and economically. The design of open pit excavations should endeavour to prevent hazardous and unexpected failures of the mine walls during mining and after mining has stopped.

Depending on the stripping ratio, large quantities of overburden or waste rock need to be removed to expose the Uru Boulder Conglomerate for jadeite to be mined. The overburden and waste rock is disposed of in designated waste rock dumps. Construction and management of these dumps during mining is important to ensure their long-term stability to protect human health, safety and the environment.

Figures 1 and 2 show conceptual arrangements for stable mines and waste rock dumps.

The management measures detailed below incorporate the notifications listed above and are to be implemented with the notifications to minimise potential hazards relating to safety and the environment.

Before mining

The following management measures must be done before mining commences:

- a. Complete a geotechnical assessment by a qualified geotechnical engineer who is registered under The Myanmar Engineering Council Law (2013) or recognised international law or institution to:
 - i. Identify high risk areas for soil erosion and landslips. For example, steep slopes or valleys and areas adjacent to watercourses.
 - ii. Define the batter slopes and heights of open pits based on a geotechnical assessment of the geology of the mining area (shear strength and shear stress) and an appropriate factor of safety.
 - iii. Define the size, shape and height of waste rock dumps and temporary stockpiles based on a geotechnical assessment that includes the properties of material and the suitability of the proposed disposal area.
- b. Complete a mine plan by a qualified mining engineer who is registered under The Myanmar Engineering Council Law (2013) or recognised international law or institution that:
 - i. Incorporates the recommendations of the geotechnical assessment.
 - ii. Incorporates haul roads with gradients no more than 8% to 10% to minimise the risk of accidents.
 - iii. Includes an estimate of the production rates of waste rock.
 - iv. Avoids locating infrastructure in (or below) high risk landslide areas.
 - v. Identifies safe access points.

- vi. Avoids watercourses and land adjacent to watercourses.
 - vii. Includes a minimum buffer distance of 100 m between the mine or waste rock dump and villages and cultural sites.
 - viii. Includes a surface water management system design including cut-off drains, diversion bunds, sediment traps and sediment basins, as set out in the surface water management plan required in the Erosion and Sediment Control Plan.
 - ix. Identifies mine runoff and stormwater discharge points.
 - x. Identifies appropriate fuel, explosives and hazardous materials storage areas separated from workers accommodation.
 - xi. Sets out the sequence for progressive rehabilitation of mined-out areas.
 - xii. Includes a plan or plans showing the layout of the mine (benches and batters), haul roads, waste rock dumps (benches and batters), mine infrastructure areas (including fuel, explosives, chemicals and hazardous materials storage), and proposed rehabilitation.
- c. Update mine plan annually to incorporate experience, changes and information gained during previous year of mine operation.

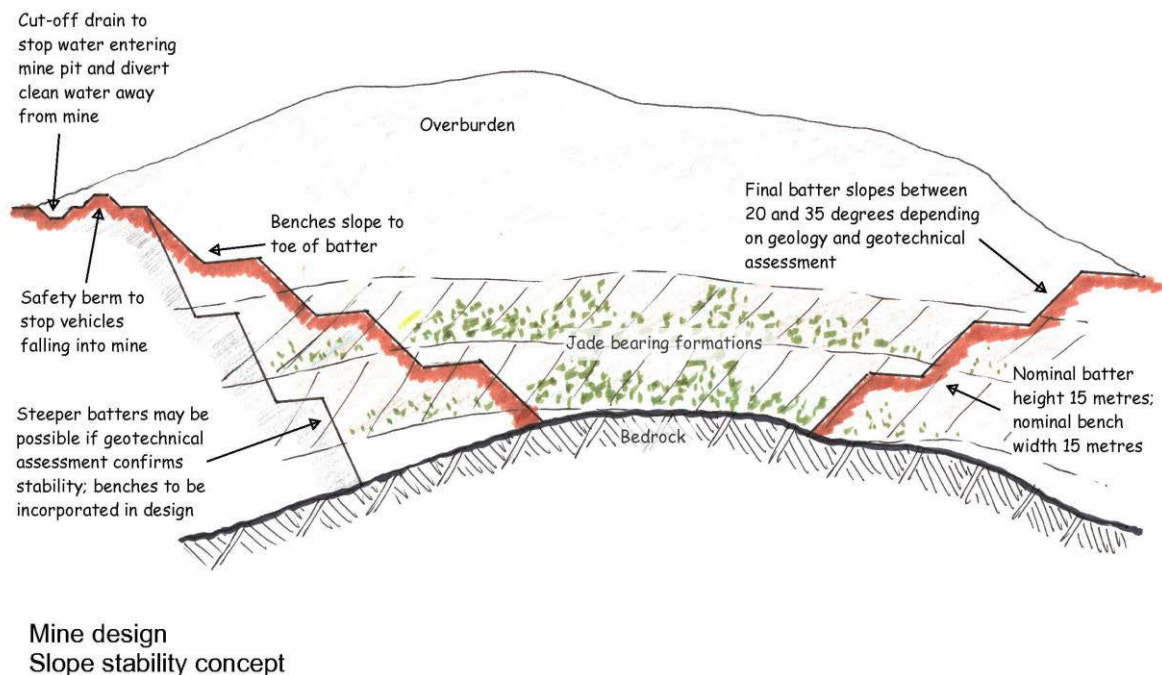


Figure 1 Mine slope stability concept

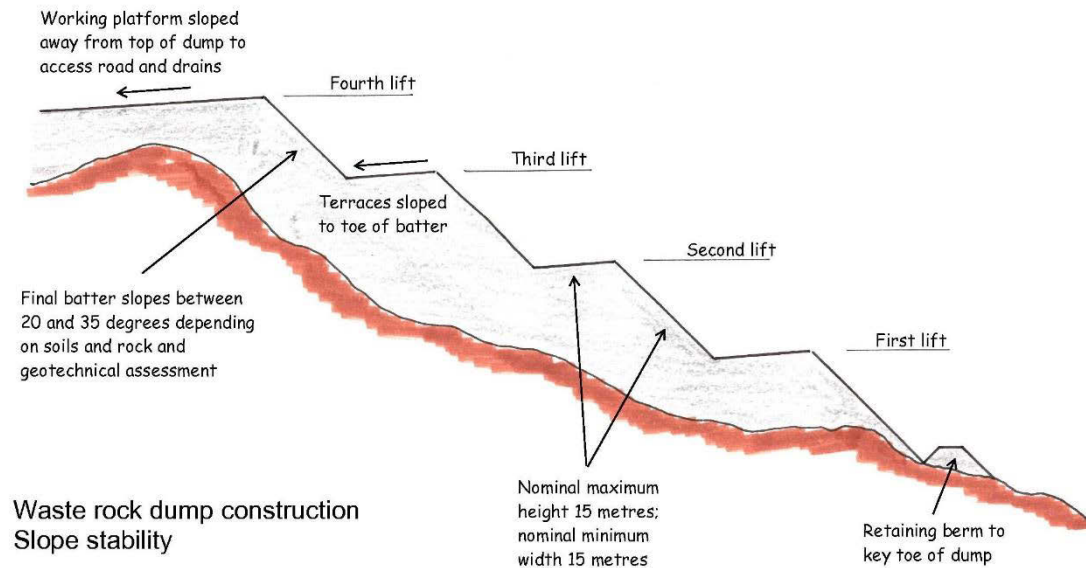


Figure 2 Waste rock dump stability concept

During mining

Management measures to limit hazards from open pit mining that must be implemented are:

- d. Construct cut-off drains around open pits to prevent water from entering the mine and eroding batters causing slope instability.
- e. Build a safety bund around the edge of the open pit to stop vehicles falling into the mine.
- f. Construct open pits so that the final overall batter slopes are stable (nominally between 20 and 35 degrees) and based on the geotechnical assessment and the mine plan.
- g. Construct benches that are at least 15 m wide between batters that are no more than 15 m in height unless the geotechnical assessment confirms higher batters are safe and stable.
- h. Grade benches to slope to the toe of the batter.
- i. Ensure that mine pit floors drain away from the high wall or highest batters.
- j. Management measures to limit hazards from waste rock disposal that must be implemented are:
- k. Use designated areas for disposal of overburden. Preferentially use mined-out areas and open pits.
- l. Construct waste rock dumps from the bottom up using terraces.
- m. Construct waste rock dumps with maximum lifts of 15 m and minimum benches or terraces of 15 m width.
- n. Construct benches away from the face to avoid erosion or slumping.

- o. Grade benches or terraces to the toe of batters.
- p. Install drainage such as cut-off drains at the toe of the batter or slope to capture sediment-laden runoff.
- q. Direct runoff collected in cut-off drains and open pit drainage systems to sediment traps and sediment basins before discharge to drainage lines or watercourses. Implement the Erosion and Sediment Control Plan.
- r. Progressively revegetate lifts and benches using fast growing grasses/legumes to stabilise the soils and waste rock. Implement with Rehabilitation Management Plan.

After mining

Implement the Mine Closure Management Plan.

8. Performance criteria

The performance criteria for mine pit and waste rock dump management are:

- Mine plan developed.
- Geotechnical assessment completed.
- Open pit mine and waste rock dump constructed in accordance with the mine plan.
- No landslides (geotechnical failures) of open pits or waste rock dumps.

9. Inspection and monitoring requirements

Open pit walls and waste rock dumps will be regularly inspected to ensure they are properly constructed, maintained and rehabilitated. Compliance will be determined using the checklist attached to this plan.

The frequency of inspections is set out in Table 3.

Table 3 Frequency of inspection and monitoring

Activity	Frequency
Mine design (mine plan)	Prior to mining commencing
Geotechnical assessment	Prior to mining commencing
Open pit walls (geotechnical failures, slumping, cracking, areas of erosion)	Monthly during dry season Weekly during wet season After storms or heavy rainfall
Waste rock dump (geotechnical failures, slumping, cracking, areas of erosion)	Monthly during dry season Weekly during wet season After storms or heavy rainfall

Mine Pit and Waste Rock Dump Management Plan

Compliance Checklist

Maw and Concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Mine plan showing final batter arrangement and surface water management plan showing location of cut-off drains, diversion bunds, sediment traps, sediment basins and discharge points.	
Geotechnical assessment with recommendations on allowable heights of batters and widths of benches and overall slopes of waste rock dumps and open pit batters.	
Watercourses avoided in mine and waste rock dump design, where possible.	
Mine and waste rock dumps are being constructed in accordance with the mine plan and geotechnical assessment.	
Open pit walls are stable with no wall failures (e.g., slumping, cracking, areas of erosion)	
Waste rock dump and stockpiles are stable with no slips (e.g., slope failures, slumping, cracking, areas of erosion)	
Watercourse and village buffers exist and have not been disturbed.	
Cut-off drains constructed and functional.	
Diversion bunds constructed and functional.	
Sediment traps and sediment ponds constructed and functional.	
Progressive rehabilitation of mined-out areas and lower terraces of waste rock dumps is occurring.	

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Hpakant/Lonkin Gems Tract Environmental Management Plan	
Noise and Vibration Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Introduction

Jade mining generates both noise and vibration, principally through blasting which is necessary for the recovery of jadeite. Blasting can cause excessive noise and vibrations, which can impact workers and neighbouring communities. The two main impacts from blasting are overpressure (vibrations that travel through the air) and ground vibrations.

Airborne vibration commonly includes both audible noise and vibration known as air blast, which can cause objects to rattle and generate noise. Excessive levels of ground vibration from blasting can cause substantial damage to structures. People can detect vibration at relatively low levels.

Blasting noise and associated vibrations can startle individuals (and wildlife) and cause annoyance and discomfort. The degree to which people are disturbed will be influenced by the air blast and vibration levels as well the time of day (day, night), how frequency it occurs, and the sensitivity of individuals.

Other sources of noise emissions associated with mining will include vehicle engines, activities such as loading and unloading of rock, power generation, ripping ground and drilling.

This noise and vibration management plan details procedures to be followed to reduce the impacts of noise and vibrations on local communities and other sensitive receptors as a result of mining activities.

The noise and vibration management plan (this plan) describes how noise and vibration associated with large-scale jade mining will be managed. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objectives of noise and vibration management are to:

- Avoid unacceptable health, safety and amenity risks related to blasting.
- Prevent nuisance by minimising, to the extent practicable, the level and type of potentially harmful noise and vibration generated by mining activities.
- Minimise the impacts of mining-related noise and vibration on local communities, workers and other sensitive receptors.

3. Definitions

Affected party – a person or persons or organisation impacted by mining activities.

Air blast – a sudden rush of air following an explosion or from a collapse in a confined space (such as a tunnel).

Community Reference Group – a group formed of members of the community to facilitate communication between mining companies and local residents, including for the community to raise issues and concerns, to inform the community about jade mining activity and social development progress, and to address issues related to involuntary resettlement and indigenous peoples.

Complaint – a formal expression of discontent concerning a company action raised by an affected party.

Decibel – a unit of measurement for the intensity of sound.

Grievance – a complaint lodged by an affected party alleging damage, impact, or dissatisfaction specifically resulting from the actions, or a lack of action, by a mining company. A grievance is usually raised with the expectation of a corrective action, compensation or both.

Incident – a specific event or sequence of events that result in unwanted or unintended impact on the environment, safety, security, health, the livelihood of people and/or an impact on property, or on legal/regulatory compliance.

PPE – personal protective equipment. Refers to specialised clothing or equipment worn by employees for protection against health and safety hazards at a work site. As a minimum, PPE would include long trousers, long-sleeved shirt, boots, gloves, and where needed, a face mask.

Sensitive receptor – areas occupied or buildings inhabited by people who are more susceptible to the adverse effects of exposure to noise or other emissions such as air pollutants, and usually include houses, schools, hospitals, drug rehabilitation centres and monasteries.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Occupational Health and Safety Management Plan.
- Community Grievance Mechanism.
- Incident Reporting Procedure.

5. Hazards and impacts

Mining activities such as drilling and blasting, earthworks, and vehicle traffic can generate noise and vibration levels that expose sensitive receptors to levels above those recommended in national and international guidelines.

Potential impacts from mining activities that generate noise and vibration are listed in Table 1.

Table 1 Noise and vibration hazards and impacts

Hazard (source of impact)	Pathway	Impact and receptor
Blasting (vibration)	Ground vibration and air blast.	Damage to property, discomfort/annoyance to people and sleep disturbance.
Noise (blasting and other mining activity)	Proximity of mining activities to people, villages and settlements.	Discomfort/annoyance to people, sleep disturbance, disturbance to wildlife, decreased amenity in villages and settlements.

6. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to noise and vibration are listed in this section.

6.1 Laws, rules and guidelines

The laws, rules and guidelines relating to noise and vibration are:

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

National Environmental Quality (Emission) Guidelines set out noise, air emission and water discharge criteria for protecting human and ecosystem health.

The National Environmental Quality (Emissions) Guidelines (2012) encourage mine operators to apply noise prevention and mitigation measures where predicted or measured noise impacts from a mine exceed the applicable noise level guideline at the most sensitive point of reception. Noise impacts should not exceed the levels set out in the National Environmental Quality (Emissions) Guidelines (2012), as presented in Table 2, or result in a maximum increase in background levels of 3 decibels (dBA) at the nearest sensitive receptor location off-site.

Table 2 Noise guideline levels

Receptor	One Hour LAeq (dBA) ^a	
	Daytime 07:00 – 22:00 (10:00 – 22:00 for Public holidays)	Night time 22:00 – 07:00 (22:00 – 10:00 for Public holidays)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

^a Equivalent continuous sound level in decibels

6.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) and Article 54(c) of The Second Amending Law of the Myanmar Gemstone Law (2016) for the Hpakant/Lonkin Gems Tract.

The notification relevant to noise and vibration is:

- Letter No. Ka-37/383/2016, May 23, 2016.

This notification is attached to this EMP in Appendix 2.

6.3 International guidelines

Further guidance on noise and vibration is provided in the following standards and guidelines which represent good international practice:

- IFC Environmental, Health and Safety General Guidelines (Section 1.7, Noise) (2007).
- IFC Environmental, Health and Safety Guidelines for Mining (2007).

7. Management measures

Good practice noise and vibration management is based on controlling sources of noise and vibration and minimising the potential for the adverse effects of noise and vibration.

Noise levels must not exceed guideline values listed in the National Environmental Quality (Emissions) Guidelines (2012), as presented in Table 2. Compliance with the guideline values is achieved through noise modelling and real-time noise monitoring. During the transitional period for this EMP, the good practice measures listed below will be implemented. They will reduce the risk of adverse effects of noise and vibration if properly implemented.

General management measures

The measures for managing noise and vibration are:

- a. Train all personnel in the measures in this plan to reduce noise and vibration levels.
- b. Provide appropriate personal protective equipment (PPE) for workers using noise generating equipment or conducting blasts, including adequate hearing protection (ear muffs).
- c. Schedule and conduct noisy activities only during the daytime, and, where practicable, during periods that are less likely to result in noise nuisance.
- d. Use the Community Grievance Mechanism to manage all community complaints related to blasting, noise and vibration.
- e. Conduct annual monitoring of noise levels at the mine, and where practical, following a request from the Community Reference Group, to verify noise levels do not exceed those listed in Table 2.

Noise from vehicles, plant and equipment

The measures for managing noise from vehicles, plant and equipment are:

- f. Use the natural topography as a noise buffer when locating high noise generating facilities and equipment, where practicable.
- g. Re-locate noise sources to less sensitive areas to take advantage of distance and natural noise buffers, where practicable.
- h. Site permanent facilities away from villages, settlements and other sensitive receptors, if possible.
- i. Inspect and maintain all noise generating equipment, including routine mechanical servicing of earthmoving equipment, to prevent deterioration over time that could lead to excessive noise generation.
- j. Limit machinery and vehicle movements to defined work areas and designated roads.

Noise and vibration from blasting

The measures for managing noise and vibration from blasting are:

- k. Use mechanical ripping, where possible, to avoid or minimise the use of explosives.
- l. Only conduct blasting using personnel who are trained and certified as competent in this activity.
- m. Limit blasting activities to daytime hours and during prescribed periods of the day.
- n. Use correct charging and blasting ratios to avoid overuse of explosives.

8. Performance criteria

The performance criteria for noise and vibration management are:

- Compliance with relevant noise guideline levels.
- No incidents related to blasting.
- Community grievances related to noise and vibration are resolved.
- No blasts conducted outside of prescribed hours.

9. Inspection and monitoring requirements

Blasting, noise and vibration inspections and monitoring will be conducted regularly to check compliance with this plan. Ongoing liaison with local communities about noise and vibration issues related to mining activities will be conducted. Complaints will be recorded and addressed in accordance with the Community Grievance Mechanism. Compliance will be determined using the checklist attached to this plan.

The frequency of inspection and monitoring is set out in Table 3.

Table 3 Frequency of inspection and monitoring

Monitoring measure	Frequency
Noise level monitoring	Annually, and following Community Reference Group requests.
Servicing and maintenance of vehicles, plant and equipment.	In accordance with manufacturer's specifications.
Blasting events	Daily to ensure blasts occurring during prescribed hours.

Noise and Vibration Management Plan

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Evidence of noise monitoring.	
Vehicle, plant and equipment exhausts in good working order.	
Evidence that machinery and vehicle movements are limited to defined work areas and designated roads.	
Blasting not occurring outside prescribed hours.	
Complaints register (complaints recorded and closed out).	

Hpakant/Lonkin Gems Tract Environmental Management Plan	
Non-hazardous Waste Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Introduction

Jade mining activities generate a variety of different types of solid and liquid wastes including non-hazardous and hazardous waste. All waste can lead to health, safety, environmental and aesthetic impacts if not properly managed, and may include land contamination, poor water quality, increased pest and insect numbers, degraded habitat, and increased exposure to health risks.

This plan addresses the management of non-hazardous waste only. The management of chemicals and hazardous materials is addressed separately in the Chemicals and Hazardous Materials Management Plan.

Non-hazardous waste streams that will be produced during mining include:

- Domestic waste, including camp wastes and food scraps.
- Paper and cardboard packaging.
- Plastic packaging, containers and drink bottles.
- General construction waste, including timber, glass and scrap metal.
- Used tyres and old equipment.

This plan also covers the management of domestic wastewater, including human waste (pit toilets and septic systems) and domestic greywater.

This non-hazardous waste management plan details procedures to be followed for the safe handling, transport, storage and disposal of non-hazardous wastes associated with jade mining. The plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objective for non-hazardous waste management is to:

- Avoid or minimise potential adverse impacts and risks to the environment, safety and human health through inappropriate management of non-hazardous waste.

3. Definitions

Greywater – wastewater generated at accommodation camps and offices from sinks, showers/baths, laundry and other domestic appliances.

Hazardous material – any solid, liquid or contained gaseous substance with properties that make it potentially dangerous or harmful to human health, safety and/or the environment. Hazardous properties might include the following:

- Flammable i.e., burns easily.
- Corrosive e.g., very high (alkaline) or low (acid) pH.
- Reactive e.g., explosive or toxic.
- Biological e.g., medical waste.

Hazardous waste – any unwanted or unusable hazardous material.

Landfill – a system of rubbish disposal in which waste is buried in an excavated hole in the ground. A landfill may be unlined, or where practical, lined with an impermeable material such as clay or geotextile fabric.

Non-hazardous waste – any unwanted or unusable solid, liquid or gaseous substance that does not pose an immediate hazard to human health, safety and/or the environment.

Pit toilet – a type of outdoor toilet excavated in the ground, used where it is impractical to provide a standard, flushing-type toilet.

PPE – personal protective equipment. Refers to specialised clothing or equipment worn by employees for protection against health and safety hazards at a work site. As a minimum, PPE would include long trousers, long-sleeved shirt, boots, gloves, and where needed, a face mask.

Recyclable non-hazardous waste – non-hazardous waste that is recovered and treated or processed into products, materials or substances, whether for the original or other purposes. Commonly recycled waste includes glass, paper, cardboard and some plastics.

Reusable non-hazardous material – non-hazardous material that instead of becoming waste is used again for the same purpose or is reused for another purpose. Reuse is a type of waste prevention and commonly includes materials such as wood.

Septic system – a self-contained, onsite collection and treatment system that collects sewage (human waste) and greywater in a septic tank. The tank is usually a buried watertight chamber made of concrete, fibreglass, PVC or plastic where solids (sludge) settles to the bottom, with liquids on the top. The liquid effluent then flows by gravity or is pumped to a series of infiltration drains buried in the soil.

Watercourse – a creek, stream, river or other water channel, either natural or man-made, temporary or permanent.

4. Associated plans and procedures

This Non-hazardous Waste Management Plan should be read in conjunction with the following plans which also form part of the EMP:

- Chemicals and Hazardous Materials Management Plan.
- Emergency and Spill Response Management Plan.

5. Hazards

Potential impacts to the environment and people from the inappropriate management of non-hazardous waste materials from mining activities are listed in Table 1.

Table 1 Potential hazards, pathways and impacts related to inappropriate non-hazardous waste management

Hazard (source of impact)	Pathway	Impact and receptor
Improperly stored, and/or disposed of non-hazardous wastes	Direct disposal of non-hazardous wastes to the ground Stormwater runoff mobilising non-hazardous wastes to watercourses Direct disposal of non-hazardous wastes to watercourses	Reduced soil and water quality due to presence of non-hazardous wastes; impacting downstream beneficial uses (e.g., aquatic ecosystems and communities)
	Animal pests – disease vectors	Increased incidence of disease in worker and/or local populations
Improperly managed human waste and/or domestic wastewater	Direct disposal to ground and/or watercourses Animal pests (e.g., rats) – disease vectors Mosquitos – disease vectors	Increased incidence of disease in worker and/or local populations.

6. Applicable laws, rules, guidelines and standards

The Myanmar regulatory requirements applicable to the management of non-hazardous waste are:

Freshwater Fisheries Law (1991), specifically:

- Section 40 prohibits persons from harassing fish or aquatic organisms or polluting their habitat.
- Section 41 prohibits persons from affecting water quality and quantity in a leasable or reserved fishery and the rivers and creeks supplying water to that fishery.

The Conservation of Water Resources and Rivers Law (2006), specifically:

- Section 22 requires persons to obtain permission to stockpile materials on river banks and waterfronts.

The Conservation of Water Resources and Rivers Rule (2013) prohibits dumping of rubbish and dangerous materials in rivers.

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

National Environmental Quality (Emission) Guidelines set out noise, air emission and water discharge criteria for protecting human and ecosystem health.

In the absence of specific regulation or guidance on waste management in Myanmar, the following standards and guidelines represent good international practice:

- International Finance Corporation (IFC):
 - Performance Standard 3: Resource Efficiency and Pollution Prevention.
 - Environmental, Health, and Safety (EHS) Guidelines: Environmental – Waste Management Facilities.
- EPA Victoria Publication 788.3 – Siting, design, operation and rehabilitation of landfills (2015).

7. Waste management procedures

Non-hazardous waste should be managed through a documented system based on the waste management hierarchy of reduce, reuse, recycle, treat and dispose (see Figure 1 below).

The system should include provisions to:

- Select and use materials that will avoid and minimise the generation of wastes.
- Maximise the reuse and/or recycling of wastes through collection, handling, transport, storage and tracking of waste types generated.
- Use treatment and disposal methods appropriate to the waste type.

Priorities for waste management should be based on the severity of potential risks and impacts to the environment and human health.

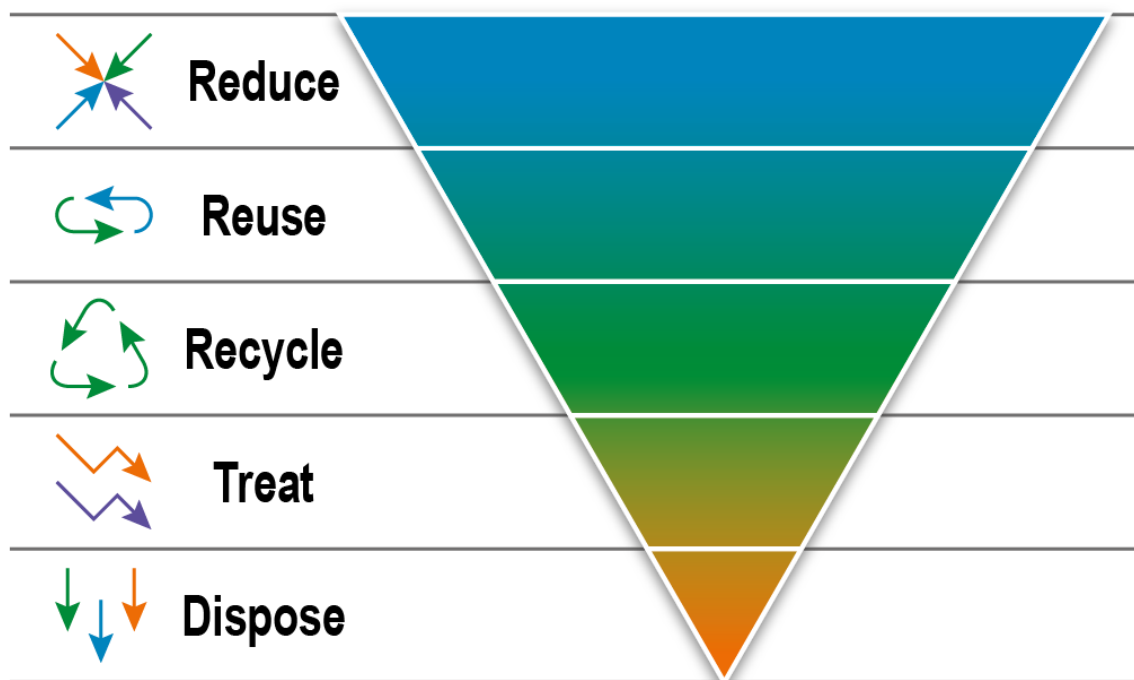


Figure 1 Waste management hierarchy

The procedures detailed below incorporate relevant Myanmar legislation and international good practice in waste management and should be implemented in conjunction with the other related plans detailed in Section 4 of this plan.

The procedures for managing non-hazardous wastes are:

- a. Use mining processes or materials that avoid or minimise the generation of non-hazardous waste.
- b. Allocate primary responsibility for non-hazardous waste management to the mine manager and mine environment and safety officer.
- c. Train and induct all personnel in the procedures for the safe handling, transport, storage and disposal of non-hazardous waste.
- d. Provide personnel with appropriate personal protective equipment (PPE) required to implement the non-hazardous waste management procedures.
- e. Identify the types of non-hazardous waste expected to be generated at the mine and set-up on-site collection and storage areas for these types.
- f. Provide clear signage for the separation of non-hazardous waste, and properly labelled storage containers, at all mining worksites and in worker accommodation areas.
- g. Store non-hazardous waste in appropriate containers e.g., covered bins that segregate waste and prevent waste being blown by wind or washed by stormwater or taken from the containers by pest animals.
- h. Reuse non-hazardous waste where feasible, for example wood, metal and packaging materials.
- i. Recycle non-hazardous waste, such as glass, paper, cardboard and plastics, where facilities are available to take such waste.
- j. Locate all non-hazardous waste storage areas at least 50 m away from watercourses, houses, schools and hospitals.
- k. Locate any pit toilets or septic systems at least 100 m from watercourses. All pits and septic systems are to be constructed in a manner that allows effective infiltration through the soil. Pit and septic systems should be at least 500 mm deep.
- l. Keep all work areas clean and tidy of litter or other non-hazardous waste.
- m. Clean up all releases and spills of non-hazardous waste immediately.
- n. Avoid disposing of non-hazardous waste with any hazardous waste, waste rock or overburden.
- o. Transport wastes to an appropriate disposal facility (e.g., common landfill) as often as practicable to prevent non-hazardous waste (especially organic waste) stockpiling at worksites or worker accommodation areas.
- p. Landfills must be for non-hazardous waste only and follow specific guidelines on siting and construction:
 - i. Landfills must be located at least 250 m from residential areas, and at least 500 m away from any watercourse or water supply wells.
 - ii. All areas of the landfill must be located outside of the 10-year groundwater recharge area.
 - iii. The seasonally high groundwater table level must be at least 1.5 m below the base of the landfill.
 - iv. Landfills must not be located in an area at risk of landslides, flooding, or within 500 m of a fault line or significantly fractured geologic structure.

- v. Landfills must be located in gently sloped topography and engineered to be structurally stable, i.e., maximum side slopes of 3:1 in non-seismically active areas and lower slopes (e.g., 5:1) in seismic active areas. This is particularly important when a landfill is constructed in a former mining pit.
- vi. Landfill slopes must be designed with regular drainage of water to minimise water infiltration and slope subsidence.
- vii. Each landfill should be large enough to accommodate the expected non-hazardous waste volumes, but not exceed 5 m in depth.
- viii. Deposit non-hazardous waste in landfills in layers 1-1.5 m thick, covered with soil or sand (a minimum of 30 cm depth). All food wastes must be covered immediately.
- ix. Cap the landfill when full with a layer of soil at least 500 mm thick.
- q. Keep records of the type and volume of non-hazardous waste transported offsite. See attached non-hazardous waste inventory example.
- r. Inspect onsite non-hazardous waste storage areas regularly and immediately rectify any problems identified.
- s. On cessation of mining, implement closure and rehabilitation procedures as detailed in the Mine Closure Plan and Rehabilitation Plan.

8. Performance criteria

The performance criteria for non-hazardous waste management are:

- Waste effectively segregated for recycling, reuse and/or treatment and disposal.
- Waste recycled where feasible (i.e., facilities are available to receive such waste).
- No non-hazardous waste released to the environment.

9. Inspection and monitoring requirements

Regular inspections shall be carried out at all mining and worker accommodation areas to verify that non-hazardous waste management measures are being implemented.

The frequency of inspections is set out in Table 2.

Table 2 Frequency of inspection and monitoring for non-hazardous waste management

Activity	Frequency
Visual inspection of all mining and worker accommodation areas to check that sites are tidy and non-hazardous waste is being managed in accordance with this plan.	Weekly

Non-hazardous Waste Management Plan

Compliance Checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Evidence of mine specific waste management plan including details of how different waste types will be stored, reused/recycled or treated and disposed of	
Evidence of worker induction and PPE provision	
Waste storage bins in good working order (including bin covers) with appropriate signage	
Evidence of appropriate segregation of waste	
Evidence of recycling of waste	
No evidence of waste being blown, washed or taken into the environment	
Waste and septic systems located appropriate distance from watercourses	
Records of type and quantity of waste transported offsite	
Records of weekly visual inspections having been carried out	

Non-hazardous Waste Inventory

Management options: reuse, recycle, treat and dispose, dispose

Waste type	Volume/quantity	Management	Disposed to
Paper and cardboard	1 tonne	Dispose	Hpakant landfill
Plastic bottles	400	Recycle	Myanmar recyclers
Glass	1 tonne	Recycle	Myanmar recyclers
Food waste	0.5 tonne	Dispose	Hpakant landfill
Timber	60 lineal metres	Reuse	New construction area

Hpakant/Lonkin Gems Tract Environmental Management Plan	
Occupational Health and Safety Plan	
Version: Rev 1	Date: 31 October 2018

1. Introduction

Mining has inherent hazards which could present significant health and safety risks to mine workers. The types of hazards that could cause an occupational health and safety (OH&S) incident include the use of vehicles and machinery, explosions/blasts, landslides or slope failures, and the emission of air pollutants and noise.

Effective OH&S management seeks to address these risks and:

- Eliminate hazards by removing the activity from the work process if practicable. Examples include using less hazardous chemicals, using different equipment or doing mining differently.
- Control the hazard at its source through use of engineering controls. Examples include safety barriers around rotating equipment such as drills, mufflers on vehicle and machine exhausts, and specially designed cupboards or sheds for storing hazardous materials (e.g., chemicals).
- Minimise the hazard through design of safe work systems and administrative control measures. Examples include job rotation, training in safe work procedures, lock-out and tag-out of workers at work sites, workplace monitoring, and limiting exposure to a hazard and/or work duration.
- Provide appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

Mining companies should provide a safe and healthy work environment for their workers, taking into account risks inherent to the mining activities, and the types of hazards present. Mining companies and their workers play a critical role in managing the OH&S risks of jade mining, through the implementation of OH&S procedures, including, at a minimum, those contained in this plan.

This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objective

The objective of this plan is to promote safe and healthy working conditions and protect the health of mine workers.

3. Definitions

Communicable disease – an infectious disease transmissible from person to person either by direct or indirect contact.

Explosive charge – explosive material inserted or poured into a blast hole and set off using a detonator.

Incident – a specific event or sequence of events that result in unwanted or unintended impact on the environment, safety, security, health, the livelihood of people and/or an impact on property, or on legal/regulatory compliance.

Infection control procedures – measures taken to minimise the risk of spreading infections.

Mining company – a company, joint venture, cooperative, persons or person holding a permit to produce gemstone from a gemstone block or concession.

Misfire – the situation where an explosive charge fails to explode or only partially explodes leaving unexploded charges in the blast hole.

PPE – personal protective equipment. Refers to specialised clothing or equipment worn by workers for protection against health and safety hazards at a work site. As a minimum, PPE would include high-visibility clothing or vest, long trousers, long-sleeved shirt, boots and gloves. Where needed PPE would include a safety helmet, safety glasses, ear muffs, a face mask and breathing apparatus.

Worker – any person working for a mining company including all mining company owners, employees, contractors, subcontractors and family members.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Code of Conduct.
- Incident Reporting Procedure.
- Noise and Vibration Management Plan.
- Mine Stability and Waste Rock Management Plan.
- Air Quality and Dust Suppression Management Plan.
- Hazardous Materials Management Plan.
- Non-Hazardous Waste Management Plan.
- Emergency Preparedness and Spill Response Plan.
- Worker Accommodation Management Plan.

5. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to OH&S of mine workers are listed in this section.

5.1 Laws, rules and guidelines

Myanmar legislation and guidelines applicable to the OH&S of mine workers include:

Myanmar Investment Law (2016), specifically:

- Section 51 requires investors to employ qualified people as senior managers, and technical and operational experts, and to ensure they have the entitlements and rights of labour laws and rules.
- Section 73 requires the investor to obtain and maintain the type of insurances stipulate in the rules.

The Foreign Investment Law (2012), specifically:

- Section 4(c) restricts or prohibits businesses established with foreign capital which cause damage to the natural environment and ecosystems.

The Labour Organisation Law (2011), specifically:

- Section 17 permits labour organisations to draw up their constitution and rules, and gives them the right to negotiate with employers.
- Section 18 grants a labour organisation the right to request an employer reappoint employees if their dismissal relates to their membership of a labour organisation.
- Section 19 gives labour organisations the right to represent workers in settling a dispute before the Conciliation Body.
- Section 20 gives labour organisations the right to participate in discussions with the government, employers and complaining workers on their rights.
- Section 21 gives labour organisations the right to participate in collective bargaining in accordance with the labour laws.
- Section 22 requires labour organisations to conduct their activities peacefully.

The Settlement of Labour Disputes Law (2012), specifically:

- Section 38 requires employers to negotiate a complaint within prescribed period.
- Section 39 does not allow employers to alter a worker's conditions during or after a dispute that is before an arbitration body or tribunal.
- Section 40 prohibits employers locking out workers or workers striking over a dispute without seeking to negotiate or seek conciliation or arbitration by an arbitration body or tribunal.
- Section 51 requires employers to compensate workers whose benefits are reduced as a result of a dispute.

The Leave and Holidays Act (1951) sets out worker's entitlements to public holidays and annual leave.

Minimum Wages Act (2013), specifically:

- Sections 12 and 13(a) to (g) which set out the duties of an employer to pay minimum wages.

Payment of Wages Law (2016), specifically:

- Sections 3 to 5 which set out the methods and timeframes for payment of wages.
- Sections 7 to 10 which set out the wage deductions employers are entitled to make.
- Section 14 which set out the requirement for employers to pay overtime wages in accordance with the law.

Workmen's Compensation Act (1923), sets out an employer's obligations to arrange for injured workers to be treated and compensated for injuries sustained while working.

Social Security Law (2012), specifically:

- Section 11(a) requires companies to register for the social security system and benefits contained in law if they employ a minimum or greater number of people determined by the Ministry of Labour.
- Section 15(a) outlines funds included in the social security fund including health and social care, family assistance, and invalidity, superannuation, survivors and unemployment benefits, and social housing plan.

- Section 18(b) require employers to deduct contributions from workers' wages and to pay that money and the employers contribution to the social security fund.
- Section 48 requires employers to have insurance for the employment injury benefit fund, and workers to submit a medical certificate when claiming against the fund.
- Section 49 states employees covered by the employment injury benefit fund under this law, cannot make claims under the Workmen's Compensation Act 1923.
- Section 75 sets out employers' obligations to maintain records of employee appointment, contact details, work, injuries and termination, and to make that information available to the social security offices on request.

Employment and Skill Development Law (2013), specifically

- Section 5 requires an employment agreement and sets out the content of the agreement.
- Section 14 requires an employer to train employees in the type of work they are being employed to do.
- Section 30(a) and (b) requires employers to make monthly payments to a training fund not less than 0.5% of total wages for the company.

Public Health Law (1972), specifically:

- Section 3(1) requires the government to advise, inspect and supervise activities for a healthy environment including garbage disposal, drinking water, pollution and building construction and maintenance.
- Section 3(4) requires the government to prevent and eliminate contagious diseases including through public vaccination programs.
- Section 4 empowers the government to form, direct and advise groups and government ministries and departments on public health matters set out in this law.
- Section 5 grants organisations appointed by the government to carry out inspections of workplaces, shops and buildings regarding environmental health matters including food, products, housing and private clinics.

The Prevention and Control of Communicable Diseases Law (2015), specifically:

- Section 3 requires the Department of Health to immunise children against communicable diseases and educate people about these diseases to prevent outbreaks.
- Section 4 requires the Department of Health to control the spread of an outbreak of a principal epidemic disease or notifiable disease through immunisation and other measures.
- Section 9 requires households to report communicable disease outbreaks to the nearest health department office or hospital.
- Section 11 outlines the measures a health officer may take to prevent and control the spread of communicable diseases including inspections and medical examinations.

The Control of Smoking and Consumption of Tobacco Product Law (2016), specifically:

- Section 9 requires non-smoking areas to be designated, clearly marked and supervised.

The Indian Explosives Act (1884), specifically:

- Section 5 requires a licence to manufacture, possess, use, sell, transport and import explosives.

- Section 7(a) grants the government or local administration the right to enter any place to inspect and examine the manufacture, possess, use, sell, transport and import of explosives if they believe the licence conditions are not being met.

Explosive Substance Act (1908), specifically:

- Section 3 prohibits unlawful or malicious use of explosives to harm people and prescribes the punishment for such acts.
- Section 4 prohibits unlawful or malicious intent to use explosives to harm people and prescribes the punishment for such acts.
- Section 5 prohibits persons having in their possession explosive substances for suspicious activities and prescribes the punishment for such acts.

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

Motor Vehicle Law (2015) requires motor vehicles to be registered and drivers to be licensed for particular types of vehicles. It aims to provide a safe and efficient road network and to reduce pollution from motor vehicles.

5.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) and Article 54(c) of The Second Amending Law of the Myanmar Gemstone Law (2016) for the Hpakant/Lonkin Gems Tract.

The notifications relevant to the OH&S management are:

- Notification Letter No. 121/99, October 4, 1999.
- Letter No. Ka-37/568/2015, August 19, 2016.
- Letter No. Ka-37/383/2016, May 23, 2016.
- Letter No. Ka-37/581/2016, August 22, 2016.
- Letter No. Ka-37/209/2017, February 16, 2016.

These notifications are attached to this EMP in Appendix 2.

5.3 International standards

Further guidance on establishing and implementing OH&S procedures and controls is provided in the following standards and guidelines, which represent good international practice:

- International Finance Corporation (IFC):
 - Performance Standards on Environmental and Social Sustainability - PS 1: Assessment and Management of Environmental and Social Risks and Impacts (2012).

- Performance Standards on Environmental and Social Sustainability - PS 2 – Labour and Working Conditions (2012).
- Environmental, Health and Safety General Guidelines.
- Environmental, Health and Safety Guidelines for Mining.
- World Health Organisation Air Quality Guidelines (2005).

Worksafe Victoria (Australia) has published guidelines on the design of blasts and safe use of explosives. The following guidelines provide important information on blast management plans and safe distances or exclusion zones around blasts.

- Blast management plans. April 2011. Worksafe Victoria.
- Safe distances when using explosives. March 2012. Worksafe Victoria.

6. Occupational health and safety procedures

The procedures required to protect the health and safety of mine workers are set out in this section.

6.1 Hazards and risks

The main hazards and risks to the OH&S of mine workers include:

- Potential injury or death from a mine-related incident including:
 - Vehicle accident (collision or rollover).
 - Contact or collision with mining equipment (haul trucks and excavators).
 - Mining equipment failure (compressor or drill rig malfunction).
 - Uncontrolled or unexpected explosion.
 - Contact with hazardous materials including acids, caustic solutions, solvents, etc.
 - Fire caused by fuel spill or explosion.
 - Electrocution from contact with live electrical wires.
 - Landslides from mine wall collapse or waste rock dump slope failure.
- Health risks associated with:
 - Unsafe or contaminated drinking water from poor sanitation and/or polluted water causing gastrointestinal infections.
 - Exposure to hazardous substances and toxic chemicals causing burns, skin irritations, eye infections, and respiratory infections and diseases.
 - Exposure to excessive dust causing respiratory infections and diseases.
 - Exposure to excessive noise causing hearing loss.
 - Crowded accommodation and unhygienic living conditions potentially causing the spread of communicable diseases.
 - Administration and consumption of drugs, alcohol or other addictive substances.

The OH&S procedures detailed below incorporate the requirements of the laws and notifications listed above, and relevant elements of international good practice. The procedures aim to prevent accidents occurring in the first instance and reduce the potential consequence of accidents that do occur to as low as reasonably practicable.

Hazards to mine workers that are related to air and noise emissions, hazardous waste, water and wastewater, and landslides (mine pit and waste rock dump) are covered under the respective plans forming part of this EMP and are not repeated here. The procedures to be following in the event of an accident are set out in the Emergency Preparedness and Response Plan forming part of this EMP.

6.2 General procedures

The general procedures and controls for managing the OH&S of mine workers are:

Training and awareness

- a. Train all mine workers in the hazards and risks specific to their role, their tasks and their work site. Training should be developed and delivered by suitably qualified personnel, in a language and medium understood by all workers, and should cover:
 - i. Site-specific OH&S hazards and risks.
 - ii. Safe operation of mining vehicles, plant and equipment.
 - iii. Proper use of materials, tools, plant and equipment.
 - iv. Appropriate PPE and its use.
 - v. Safe work practices i.e. how the hazards are managed and controlled, including for manual handling, working at height and confined space entry.
 - vi. Basic first aid.
 - vii. Precautions to prevent exposure to disease including basic hygiene requirements.
 - viii. Emergency procedures as set out in the Emergency Preparedness and Response Plan.
- b. Provide refresher training for all workers at least once a year before the start of the mining (dry) season.
- c. Provide site inductions for all visitors including the hazard and risks associated with the work sites they will visit. Accompany visitors at all times.
- d. Establish and maintain a register of worker training and visitor inductions.
- e. Allow workers to raise OH&S concerns, including as anonymous complaints, and:
 - i. Record and acknowledge all concerns raised in a worker grievance register.
 - ii. Assess and promptly address all concerns, using an understandable and transparent process that provides timely feedback to those concerned, without any retribution.
 - iii. Record the resolution (close out) of all grievances in the register.
 - iv. Inform workers of the grievance mechanism at the time of recruitment and make it easily accessible at all work sites.
 - v. Do not impede access by workers to other judicial or administrative remedies that might be available under the law.
- f. Comply with all relevant OH&S enacted existing laws, rules, regulations, orders and directives at all times.
- g. Do not start any job until a method of working safely has been established, and suitable training provided to workers.
- h. Intervene or stop work if unsafe behaviour, work practices or equipment is observed.

Personal protective equipment

- i. Provide suitable uniforms and personal protective equipment (PPE) for all workers including:
 - i. High-visibility clothing (long trousers and long-sleeved shirts).
 - ii. Safety boots
 - iii. Gloves
 - iv. Safety helmet.
 - v. Face mask, as needed.
 - vi. Safety glasses, as needed.
 - vii. Ear muffs, as needed.
 - viii. Breathing apparatus, as needed.
- j. Do not allow mine workers to wear military green or green camouflage uniforms.

Work registers and schedules

- k. Establish and keep up-to-date a register of all workers.
- l. Establish and keep up-to-date a sign-on/sign-off register for all workers.
- m. Establish work schedules and roster workers ensuring appropriate working and rest times.

Fitness for work

- n. All workers must be over 18 years old and have appropriate identification to confirm their age.
- o. All workers must have a health check and a valid health certificate before starting work with a mining company. The health check shall conform with good international practice, and will, as a minimum, include:
 - i. Blood pressure.
 - ii. Hearing and eye sight test.
 - iii. Respiratory test.
 - iv. Alcohol and/or drug use or addiction tests.
 - v. Review of pre-existing medical conditions including injuries, operations, diseases, anaemias and chronic conditions affecting the liver, kidneys, heart, lungs, bladder, skin, and brain.
 - vi. Screening for communicable diseases.
 - vii. Review of physical capabilities including mobility, dexterity and any impairment such as arthritis, joint injuries or problems, and walking or lifting difficulties.
- p. Workers presenting for work must have appropriate PPE.
- q. Workers presenting for work must not:
 - i. Be under the influence of alcohol, drugs or other addictive substances.
 - ii. Be in possession of alcohol, drugs or other addictive substances.
 - iii. Be in possession of weapons including knives and guns, unless required by their role.

- iv. Be in possession of any explosive materials, unless required by their role.
- r. Establish and maintain a register of worker proof of age and health certificates.

6.3 Specific procedures

Specific procedures that must be followed to protect the health and safety of workers and people are:

Operating vehicles, plant and equipment

- a. Ensure the safe operation of vehicles, plant and equipment:
 - i. All drivers and plant and equipment operators must be properly trained in the use of vehicles, plant and equipment.
 - ii. Regularly service and maintain all vehicles, plant and equipment in safe working order.
 - iii. Equip all mining vehicles and machinery with functioning warning (flashing) lights and haul truck with white noise reversing alarms.
 - iv. Place road signs (at least 2.5 m wide by 1 m high) at appropriate places along roads to warn drivers of dangerous conditions, including:
 - a. Intersections.
 - b. Sharp curves.
 - c. Steep gradients.
 - d. Slippery road surfaces.
- b. Do not allow any worker to work or stand within the swing path of an excavator.
- c. Do not allow any worker to stand behind reversing vehicles and haul trucks.
- d. All drivers must obey speed limits and drive according to the road conditions.
- e. All drivers must drive slowly past schools, health care centres, hospitals, churches, and monasteries.

Safety in and around mine pits and waste rock dumps

To prevent landslides:

- f. Implement the Mine Pit and Waste Rock Dump Management Plan.
- g. Do not allow houses, tents or buildings for people to be built or erected within 100 m of the top of an open pit or edge of a waste rock dump or downhill of a waste rock dump.
- h. Inspect and maintain cut-off drains to ensure runoff does not flow down mine or waste rock dump batters.
- i. Regularly inspect open pit walls and waste rock dumps for instability (cracking, slumping, erosion gullies).
- j. Where unstable areas are identified and landslide is a high risk:
 - i. Immediately stop work in and downhill of the unstable area.
 - ii. Exclude all workers from and downhill of the unstable area.
 - iii. Warn Yemasay of risk and request they leave the area.

- iv. Warn adjacent communities of the unstable area and any risk to them.
- v. Place warning signs around unstable areas at risk of landslide.
- vi. Seek geotechnical engineering advice on how to safely stabilise the area.

Managing blasting safely

The following procedures must be implemented in planning and conducting blasting:

- k. Store explosive materials (e.g., ammonium nitrate) in dedicated, secure buildings or areas, not at or near worker accommodation.
- l. Store detonators separately and in a locked cabinet.
- m. Install lightning conductors on buildings storing explosive materials.
- n. Maintain records of explosive materials and detonators held and used.
- o. Design and conduct all blasting using a suitably trained and experienced person in the handling, transport and use of explosive materials (explosives expert).
- p. Design all blasts for the type and strength of the overburden or jade bearing formation to avoid overuse of explosives.
- q. Prepare a blast plan that includes:
 - i. Layout of the blast including the drilling pattern and blast hole depth.
 - ii. Drilling procedure.
 - iii. Explosives type and quantity, firing equipment (electronic or safety fuse) and method.
 - iv. Procedures for loading and charging the blast holes.
 - v. Detonation sequence.
 - vi. Powder factor (ratio of explosive charge to mass of overburden to be moved).
 - vii. Misfire procedure.
- r. Use shallow bore holes and small charges when blasting near villages, settlements and other infrastructure sensitive to vibration and air blast.
- s. Enforce adequate safety zones around blasts (see Safe distances when using explosives, Worksafe Victoria, March 2012) and ensure complete clearance of all people and equipment from the blasting area prior to preparing and setting off the explosive charges by:
 - i. Alerting all workers and people in the area of the planned blast.
 - ii. Directing them to safe locations away from the blast area.
 - iii. Sounding an alarm to warn of a blast and to sound all clear following a blast:
 - a. Sound 12 short signals 1 second apart using an audible air horn.
 - b. Wait 2 minutes before setting off the explosive charges.
 - c. If all charges explode, give the all clear with one continuous 5 second signal using an audible air horn.
 - iv. If there is a misfire:
 - a. Do not approach the blast area.

- b. Wait 10 minutes before an explosive expert inspects the reason for the misfire if electric detonators used.
- c. Wait 30 minutes before an explosive expert inspects the reason for the misfire if safety fuses used.
- d. Manage the misfire in accordance with the instructions given by the explosives expert.
- t. Maintain a blasting log that records the name of the person conducting blast, date and time of blast, number of blast holes, explosives material used, number of misfires and volume of any unexploded explosive material.

Managing accidents

The following procedures will be implemented in the event of an accident:

- u. Implement the Emergency Preparedness and Response Plan for all accidents.
- v. Implement the Incident Reporting Procedure for all accidents.
- w. Provide appropriate compensation for all accidents and deaths related to mining work, in accordance with The Law Amending the Workmen's Compensation Act (1923).

Worker health

Implement the following procedures to maintain the health of mine workers:

- x. Contribute funds to establish and maintain at least one health clinic with at least one doctor and two nurses in this zone.
- y. Provide first aid kits in all mining vehicles and buildings. First aid kits must include appropriate PPE to prevent transmission of infectious and communicable disease related to administering first aid (gloves, face masks, safety glasses).
- z. Provide appropriate and hygienic facilities (lavatories and hand washing basins).
- aa. Establish appropriate infection control procedures.
- bb. Provide adequate ventilation in buildings used by people.
- cc. Implement the Worker Accommodation Management Plan.
- dd. Manage waste in accordance with the Non-Hazardous Waste Management Plan.

7. Performance criteria

The performance criteria for OH&S are:

- Workers aware of and trained in OH&S.
- Workers provided with appropriate PPE and trained in its use.
- Workers familiar with the procedures required for their specific tasks.
- Worker concerns regarding OH&S recorded, investigated and closed out.
- No blasting-related incidents.
- No community complaints about driver behaviour.

8. Inspection and monitoring requirements

Compliance with this OH&S plan will be determined using the compliance checklist attached to this plan. The frequency of inspections is set out in Table 1.

Table 1 Frequency of inspection and monitoring

Activity	Frequency
OH&S training and induction records	Monthly
Worker grievance register	Monthly
Availability of PPE and appropriate use	Monthly
First-aid kits in vehicles, maintenance workshop and mine office and properly stocked	Monthly
Flashing lights on vehicles and reversing alarms on haul trucks and functioning properly	Monthly
Road signs and traffic management in place	Monthly
Community grievance register	Monthly
Explosive materials and detonators register	Monthly
Blasting plan records	Monthly
Blasting logs	Monthly
Worker familiarity with OH&S procedures	Adhoc; at least once every three months

Occupational Health and Safety Plan

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Up-to-date OH&S training and induction register	
Evidence of worker familiarity with OH&S procedures	
Evidence of contributions to health clinic	
Worker concerns about OH&S addressed and closed out	
Community concerns about mine safety addressed and closed out	
Evidence of provision of appropriate PPE and training in its use	
First aid kits fully stocked and available in all vehicles, maintenance workshop and mine office	
Up-to-date staff register and roster	
Vehicle, plant and equipment maintenance records	
Flashing lights on vehicles and reversing alarms on haul trucks and functioning properly	
No houses, tents or buildings for people within 100 m of the top of an open pit or top of an active waste rock dump	
Appropriate signage near landslide-prone areas	
Appropriate signage and traffic management on haul roads and roads used by mining vehicles, plant and equipment	

Evidence of compliance	Complies? (Y or N)
Lightning conductors appropriately installed on all ammonium nitrate storage facilities	
Explosive materials records	
Blasting plans prepared and kept	
Blasting logs prepared and kept	

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Hpakant/Lonkin Gems Tract Environmental Management Plan	
Rehabilitation Management Plan	
Version: Rev1	Date: 31 October 2018

1. Purpose

Jade mining involves the excavation of large amounts of soil and rock creating large open pits to access jade and disposal of overburden in large waste rock dumps. A key risk of this mining method is incomplete or no rehabilitation of disturbed areas. Failure to rehabilitate waste rock dumps can increase the risk of landslides. Exposed ground surfaces can erode during rainfall, causing sediment-laden runoff to enter watercourses. The extent of erosion is dependent on the slope and the type of soils that are disturbed. As a result there may be impacts on downstream beneficial uses (e.g., aquatic ecosystems and agricultural areas).

This plan describes the general principles for rehabilitation to enable mines to maximise the chance of rehabilitation success. Progressive rehabilitation is important for mine closure, as it reduces the extent of final rehabilitation. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objective

The objective of rehabilitation is to leave landforms that are safe, physically stable and non-polluting and that meet the agreed final land use.

3. Definitions

Cut-off drain – means a channel dug into the ground upstream of a mine face to collect and divert water away from the mine face.

Direct seeding – the sowing of a mix of seeds harvested from local species to promote a structurally diverse ecosystem that has components of the pre-clearing native vegetation.

Diversion bund – a mound of earth constructed to divert water away from slopes or mine faces. Often constructed in conjunction with a cut-off drain.

Drainage line – a depression or low point that will collect water and cause it to flow downhill.

Rehabilitation – the process of stabilising and revegetating disturbed areas (for example, mine batters) to create a stable landform, stable drainage and self-sustaining vegetation.

Revegetation – the act or process of preparing disturbed land to establish the right conditions to encourage a new vegetative cover by natural processes such as plant colonisation and succession, or manmade/active accelerated processes such as direct seeding or seed propagation and planting.

Runoff – water flowing across land following rainfall.

Sediment basin – a large pond or dam or series of ponds and dams constructed to collect runoff and allow sediment to settle. They can be excavated into the ground or constructed as an aboveground structure. See Figure 1 for construction and Figure 2 for typical siting in Erosion and Sediment Control Management Plan.

Sediment trap – a structure across a drainage line to slow water and cause suspended soil to settle. Typically made of rocks and gravel.

Watercourse – a creek, stream, river or other water channel, either natural or man-made, temporary or permanent.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Erosion and Sediment Control Plan.
- Mine Pit and Waste Rock Dump Management Plan.

5. Hazards and impacts

Jade mining activities impact the environment as a result of physical disturbance to extract jade and establish infrastructure. These activities can alter local hydrology (watercourses) and negatively impact on biodiversity by contributing to habitat fragmentation and degradation. If not rehabilitated, cleared and disturbed ground can contribute to ongoing erosion, sedimentation of watercourses and impacts on surrounding vegetation, property and amenity.

The sources of hazard, impact pathway, impact and receptors are described in Table 1.

Table 1 Hazards and impacts

Hazard (source of impact)	Pathway	Impact / receptor
Unstable landforms (open pits and waste rock dumps).	Heavy rain and storms causing landslides resulting in the mass movement of rock, debris, and soil downslope. Overland flow causing erosion and sedimentation of land and watercourses.	Loss of life or property in affected villages and settlements and loss of life to Yemasay working in mines and on waste rock dumps. Degradation or loss of biodiversity in surrounding areas and downstream of the mine site.
Watercourse obstructions and/or build-up of the riverbed from sediment runoff.	Flooding over riverbanks.	Loss of life or property in affected villages and settlements. Degradation or loss of biodiversity in surrounding areas and downstream of the mine site.
Unsuccessful rehabilitation of disturbed areas	Overland flow causing erosion and sedimentation of land and watercourses.	Loss of life or property in affected villages and settlements. Degradation or loss of biodiversity in surrounding areas and downstream of the mine site.

6. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to rehabilitation are listed in this section.

6.1 Laws, rules and guidelines

The laws, rules and guidelines relating to rehabilitation are:

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

Environmental Conservation Rules (2014), specifically:

- Rule 68, requires owners of small enterprises to obtain the Environmental Conservation Department's advice regarding impacts of its business before applying for a licence to operate the business.

National Environmental Quality (Emission) Guidelines set out noise, air emission and water discharge criteria for protecting human and ecosystem health.

The Conservation of Water Resources and Rivers Law (2006), specifically:

- Section 8 prohibits persons doing works on watercourses or changing watercourse channels that ruin or cause waste of the water resources.
- Section 11(c) prohibits persons from disposing of soil and other materials from mining into watercourses or waterbodies or gullies which flow to watercourses or waterbodies.
- Section 22 requires persons to obtain permission to stockpile materials on river banks and waterfronts.

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 4(d) empowers the Ministry of Mines to acquire land or legally transfer land with the consent of the owner that is within a gemstone tract.
- Section 15(b) requires the Ministry of Mines to issue a gemstone production permit if the applicant pays the determined price within the specified time.
- Section 15(c) requires the Ministry of Mines to determine the tenure and price of any extension of a small-scale gemstone production permit.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

6.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) and Article 54(c) of The Second Amending Law of the Myanmar Gemstone Law (2016) for the Hpakant/Lonkin Gems Tract.

The notifications relevant to mine closure are:

- Letter No. Ka-37/078/2014, September 4, 2015.
- Letter No. Ka-37/146/2016, January 26, 2016.
- Letter No. Ka-37/295/2017.

6.3 International guidelines

The International Finance Corporation (IFC) has published a guideline that provides general guidance on mine closure. The relevant guideline is:

- Environmental, Health and Safety Guidelines for Mining. December 2007. IFC/World Bank.

The Australian Government has developed leading practice guidelines for the mining industry. The following publication provides valuable guidance on the factors contributing to and the requirements for rehabilitation of mine sites.

- Mine rehabilitation. Leading Practice Sustainable Development Program for the Mining Industry. September 2016. Australian Government.

7. Management measures

The application of good practice rehabilitation generally consists of the following two stages:

- Landform design and reconstruction of a stable land surface.
- Revegetation (or development of an alternative land use) on the reconstructed landform.

The management measures detailed below incorporate the notifications listed above and are to be implemented with the notifications to minimise potential hazards relating to incomplete or no rehabilitation.

Measures in this plan must be implemented by the responsible mining company with input, and the assistance of third party specialists, as necessary to ensure the objective is met.

Revegetation of the mine site and waste rock dumps is the most effective way of controlling erosion and sedimentation. Progressive rehabilitation will reduce the extent of revegetation required at closure. Quick-growing groundcovers are initially used to reduce erosion from rainfall and runoff. Once groundcover plants are established, shade trees will be established to develop a dense canopy since many native forest species require shade for successful colonisation.

Species used for revegetation should reflect the overall rehabilitation and revegetation objectives i.e., growth, survival and regeneration. Factors to be considered include:

- Role of species in pre-clearing and/or surrounding vegetation communities.
- Likelihood of reintroduction through soil seed banks.
- Availability of seed.
- Likely speed of germination and plant establishment.
- Natural regeneration from adjacent vegetation.

Primary coloniser species, which are short-lived but prolific seed producers, are important in revegetation. Planting of seedlings of trees and shrubs that are tolerant and fast growing should accompany seeding.

7.1 Before mining

Preparation for rehabilitation is important and should be done before mining commences. Rehabilitation should be informed by a rehabilitation expert or a company specialising in rehabilitation of mine sites. Management measures to be implemented before mining begins are:

- a. Identify the grass and plant species to be used in revegetation with the assistance of local communities and/or suitably qualified botanists or rehabilitation specialists. Determine the availability of seed.
- b. Source seed of sterile fast growing grasses required to stabilise the ground; for example the sterile species of Vetiver grass.
- c. Collect seed from local tree and shrub species in adjacent native vegetation for direct seeding or propagation. Prioritise local native pioneer species and nitrogen fixing plants. Properly store the seed so that it remains viable and can germinate when planted.
- d. Establish or use an existing nursery to propagate native plant seeds to produce tree and shrub seedlings for planting in areas where direct seeding or natural regeneration is ineffective or incomplete.
- e. Maintain a sufficient stock of seed and tree and plant seedlings to supply anticipated progressive and final rehabilitation needs in each planting season.
- f. Identify areas where topsoil and cleared vegetation can be stockpiled for reuse in rehabilitation. Construct the stockpiles in ways that protect the topsoil from erosion. Plant sterile grasses (for example, Vetiver) on topsoil stockpiles to reduce erosion and provide organic matter.

7.2 During mining

Areas no longer required for mining and that have been constructed in their final landform should be progressively rehabilitated to reduce erosion and sedimentation of watercourses and to reduce the extent of rehabilitation required at the end of mining. The most suitable areas for progressive rehabilitation are:

- The lower batters and terraces of waste rock dumps.
- The upper batters and benches of open pit mines.
- Other cleared areas no longer required for mining activities.

Management measures to limit hazards from ineffective or incomplete rehabilitation during mining are:

- a. Undertake progressive rehabilitation of areas no longer required for mining using the methods described in Section 6.3 After mining.

7.3 After mining

Successful rehabilitation requires:

- The landform to be rehabilitated to be made safe, stabilised and in its final form.
- Preparation of the soil or subsoil to encourage germination of plants and revegetation.
- Revegetation of the prepared surface.

- Remediation of erosion, ineffective or incomplete revegetation, and management of weeds.

Management measures to limit hazards from ineffective or incomplete rehabilitation that must be implemented are:

Final landform

- a. Identify areas that are consistent with the final landform and suitable for rehabilitation, as proposed in the Mine Pit and Waste Rock Dump Management Plan and Mine Closure Management Plan.
- b. Re-profile areas suitable for rehabilitation to stable contours, re-establishing surface drainage lines and other land features where possible.
- c. Stabilise any disturbed watercourse banks to provide a suitable habitat for plant recolonisation.
- d. Maintain erosion and sedimentation control structures (cut-off drains, diversion berms, sediment traps and sediment basins) in place to continue to divert surface water around the pit and direct sediment-laden water to sediment traps and sediment basins.

Soil preparation

- e. Rip the surface of the disturbed ground along the contour to a depth of approximately 50 cm to alleviate compaction or the natural strength of the substrate and promote infiltration, which would otherwise hinder successful vegetation growth (Figure 1).
- f. Spread any available topsoil (from stockpiles) and organic matter (from stockpiled vegetation) over the ripped area to create a growth medium for revegetation.
- g. Apply brush matting, mulching or compost (from stockpiled vegetation) to all prepared surfaces to assist with moisture retention and erosion control.

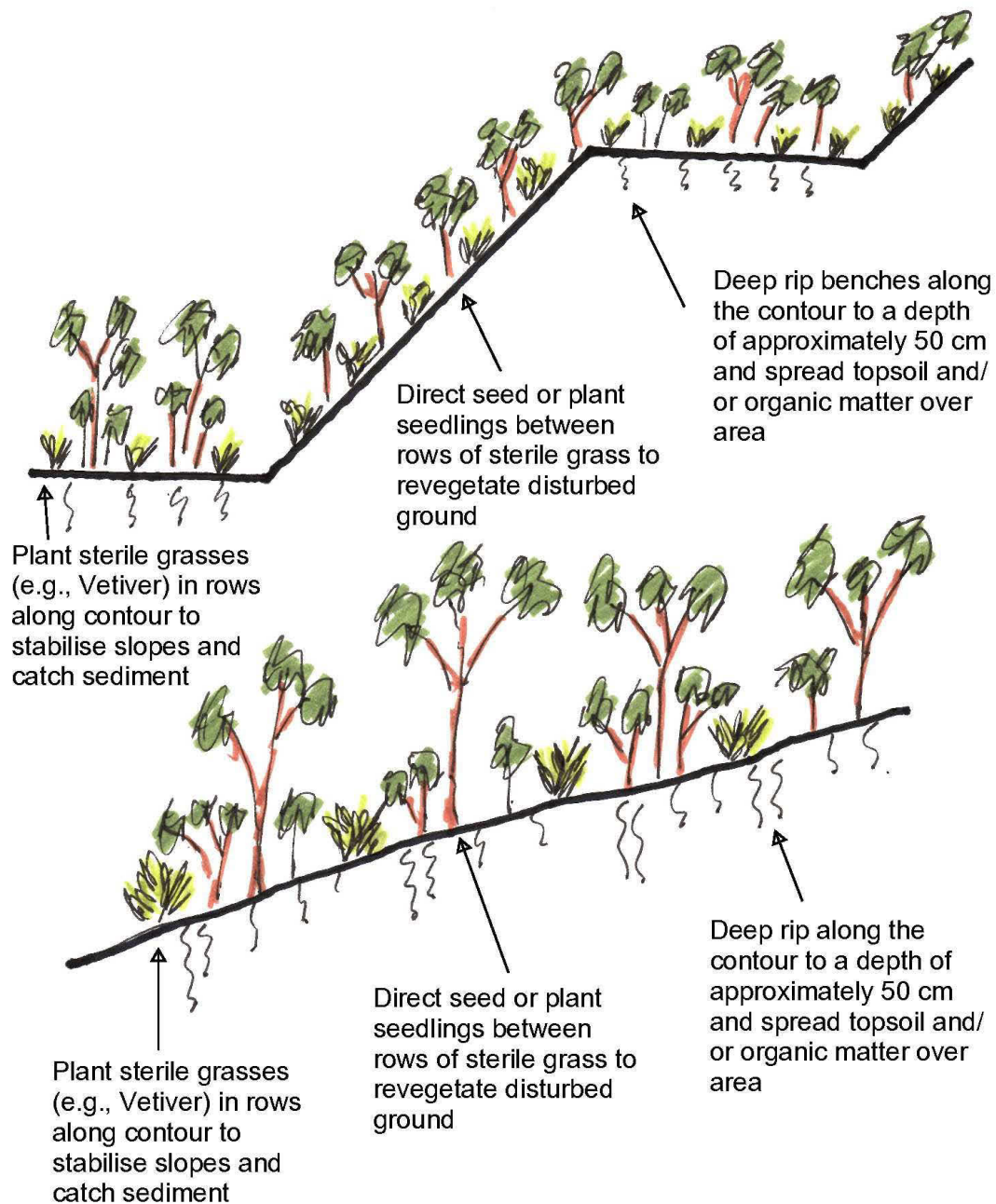


Figure 1 Rehabilitation (revegetation) concept

Seeding and planting

- h. Direct seed, sow and plant at the optimum time of the year for successful revegetation i.e., immediately before the wet season or near the end of the wet season but in sufficient time to enable the seeds and seedlings time to establish and be resilient over the dry season.
- i. Sow or plant sterile grass species (for example, sterile Vetiver grass) along the contour in evenly spaced rows to capture eroded soils (see Figure 1).
- j. Direct seed using local native species seed mix between the rows of sterile grasses once they are established (see Figure 1).
- k. Plant pioneer tree and shrub species seedlings in areas where revegetation is ineffective or incomplete or where required to encourage revegetation (see Figure 1).

Remedial works

- l. Regularly inspect rehabilitated areas for erosion, weed infestations and ineffective or incomplete revegetation.
- m. Control weeds through removal and disposal to landfill or by burning in a suitable area away from the rehabilitated area.
- n. Regularly inspect and maintain erosion and sediment control structures. Regularly clean out drains and sediment traps and basins until vegetation is established and there is no evidence of erosion and sedimentation (above natural loads).
- o. Repair eroding areas with silt fences and/or rock armouring and by planting sterile grasses.
- p. Replant areas of ineffective or incomplete revegetation.

8. Performance criteria

The performance criteria for rehabilitation are:

- Safe and stable final landforms in areas suitable and identified for progressive or final rehabilitation.
- Evidence of stocks of viable seed and seedlings for rehabilitation.
- Evidence of proper soil preparation i.e., deep ripping along the contour, spreading of topsoil or organic matter (if available), and application of matting where appropriate.
- Evidence of successful revegetation of suitable areas i.e., plants growing strongly and few or no areas of ineffective or incomplete revegetation.
- Evidence of remedial works for ineffective or incomplete revegetation i.e., no bare or eroding areas.
- No weed infestations and erosion in rehabilitated and remediated areas.

9. Inspection and monitoring requirements

Rehabilitated areas will be regularly inspected and monitored to ensure rehabilitation is successful. Compliance will be determined using the checklist attached to this plan.

The frequency of inspections is set out in Table 2.

Table 2 Frequency of inspection and monitoring

Activity	Frequency
Stocks of viable seed and seedlings	Annually following the planting season to ensure sufficient stocks for the next planting season.
Suitable areas for rehabilitation	Annually to enable time to prepare suitable areas for rehabilitation.
Rehabilitation and remedial works	Fortnightly inspection of rehabilitation and remedial works until successful establishment of vegetation. Six-monthly inspection of revegetated areas to assess the range of species established and whether there is a need for further remedial works.
Erosion and sediment control structures	Monthly during the dry season Weekly during the wet season After storms or heavy rainfall

Rehabilitation Management Plan

Compliance Checklist

Maw and Concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Safe and stable final landforms in areas suitable, and identified, for progressive or final rehabilitation.	
Evidence of stocks of viable seed and seedlings for rehabilitation.	
Evidence of proper soil preparation i.e., deep ripping along the contour, spreading of topsoil or organic matter (if available), and application of matting where appropriate.	
Evidence of revegetation of suitable areas i.e., plants growing strongly and few or no areas of ineffective or incomplete revegetation.	
Evidence of remedial works for ineffective or incomplete revegetation i.e., no bare or eroding areas.	
No weed infestations and erosion in rehabilitated and remediated areas.	

Hpakant/Lonkin Gems Tract Environmental Management Plan	
Water Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Purpose

Jade mining activities impact surface water and groundwater features through construction of barriers and diversions, erosion and sedimentation of watercourses, contamination and pollution of water, removal of riparian vegetation, and complete or partial dewatering of groundwater formations.

Land clearing, these disturbances and contamination and pollution reduce the availability and quality of water affecting terrestrial and aquatic ecosystems and people's health and livelihoods. Erosion and sedimentation of watercourses increases the extent and severity of flooding due to infilling of watercourse channels and modification of drainage paths and lines. Impacts from flooding are worsened by the monsoonal climate.

The water management plan (this plan) describes how jade mining will be conducted to protect surface water and groundwater resources and quality. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objective

The objective of this plan is to protect surface water and groundwater resources and water quality, and their beneficial uses.

3. Definitions

Catchment area – an area where all runoff from rainfall drains to a watercourse, lake or the sea. A catchment area may comprise several smaller catchments.

Chemical – a compound that has been artificially produced and occurs in solid or liquid form.

Community Reference Group – a group formed of members of the community to facilitate communication between mining companies and local residents, including for the community to raise issues and concerns, to inform the community about jade mining activities and social development progress, and to address issues related to involuntary resettlement and indigenous peoples.

Dewatering – the process of draining (either partially or wholly) an aquifer. This may occur via artificial processes (i.e., pumping) or natural processes (i.e., spring discharge).

Drainage line – a depression or low point that will collect water and cause it to flow downhill.

Guideline values – maximum concentrations or specified ranges of concentrations of a pollutant that should not be exceeded.

Hazardous material – any solid, liquid or contained gaseous substance with properties that make it potentially dangerous or harmful to human health, safety and/or the environment. Hazardous properties might include the following:

- Flammable i.e., burns easily.
- Corrosive e.g., very high (alkaline) or low (acid) pH.
- Reactive e.g., explosive or toxic.
- Biological e.g., medical waste.

Hazardous waste – any unwanted or unusable hazardous material.

Hydraulic jetting – a stream of water delivered by a high-pressure hose at a face to dislodge and wash away soils or subsoils to expose jades (historically known as placer mining).

Non-hazardous waste – any unwanted or unusable solid, liquid or gaseous substance that does not pose an immediate hazard to human health, safety and/or the environment.

Riparian – relating to the area adjacent to or situated on the banks of a watercourse or waterbody, for example river banks and or lake shores.

Runoff – water flowing across land following rainfall.

Watercourse – a creek, stream, river or other water channel, either natural or man-made, temporary or permanent.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Mine Pit and Waste Rock Dump Management Plan.
- Erosion and Sediment Control Plan.
- Non-hazardous Waste Management Plan.
- Chemicals and Hazardous Materials Management Plan.
- Rehabilitation Management Plan.
- Community Support and Development Plan.
- Mine Closure Management Plan.

5. Hazards and impacts

Ground disturbance, hazardous materials, and hazardous and non-hazardous waste are hazards that affect surface water and groundwater features and water quality. Table 1 lists the sources of hazard, impact pathway, impacts and receptors.

Table 1 Surface water and groundwater hazards and impacts

Hazard (source of impact)	Pathway	Impact and receptor
Ground disturbance, earth moving	Runoff causing erosion and sedimentation of land and watercourses.	Reduced water quality due to increased sediments (TSS) impacting downstream beneficial uses (e.g., aquatic ecosystems and communities); raised river beds due to deposited sediments increasing the likelihood of overbank flooding.

Hazard (source of impact)	Pathway	Impact and receptor
Deep excavation	Intersected groundwater formations causing full or partial dewatering of aquifers.	Reduced or lack of drinking water resources affecting people's health and livelihoods; poor water quality affecting people's health; degraded groundwater dependent ecosystems due to reduced or lack of water.
Watercourse diversions	Lack of flow. Scouring of diversion channel causing erosion and sedimentation of land and watercourses.	Loss or degradation of terrestrial (riparian) and aquatic ecosystems from lack of water. Loss of or reduced availability of water for agricultural and other beneficial uses. Reduced water quality due to increased sediments (TSS) impacting downstream beneficial uses (e.g., aquatic ecosystems and communities); raised river beds due to deposited sediments increasing the likelihood of overbank flooding.
Watercourse obstructions	Flooding over river banks.	Flooding of villages and community infrastructure potentially causing the loss of life and property; loss or degradation of biodiversity
Hydraulic jetting or sluicing of jade bearing formations	Runoff to watercourses causing erosion and sedimentation; runoff to mine voids creating stagnant water lakes or ponds.	Poor water quality affecting people's health and degrading aquatic ecosystems.
Mine pits	Discharge of collected water (e.g., from heavy rainfall event) to the receiving environment.	Poor water quality affecting people's health and degrading aquatic ecosystems.
Hazardous materials and hazardous waste	Runoff mobilising contaminated soils and water to surface water and groundwater features.	Poor water quality affecting people's health and degrading aquatic ecosystems.
Non-hazardous waste	Disposal of non-hazardous waste to watercourses. Runoff washing non-hazardous waste to surface water and groundwater features.	Poor water quality affecting people's health and degrading aquatic ecosystems.

6. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to managing surface water and groundwater resources are listed in this section.

6.1 Laws, rules and guidelines

The laws, rules and guidelines relating to erosion and sediment control are:

The Conservation of Water Resources and Rivers Law (2006), specifically:

- Section 8 prohibits persons doing works on watercourses or changing watercourse channels that ruin or cause waste of the water resources.
- Section 11(c) prohibits persons from disposing of soil and other materials from mining into watercourses or waterbodies or gullies which flow to watercourses or waterbodies.

- Section 22 requires persons to obtain permission to stockpile materials on river banks and waterfronts.

The Conservation of Water Resources and Rivers Rule (2013) prohibits dumping of rubbish and dangerous materials in rivers.

Freshwater Fisheries Law (1991), specifically:

- Section 36 requires permission from the Department of Fisheries to construct, maintain or use a dam, bank or weir on freshwater fishery waters.
- Section 40 prohibits persons from harassing fish or aquatic organisms or polluting their habitat.
- Section 41 prohibits persons from affecting water quality and quantity in a leasable or reserved fishery and the rivers and creeks supplying water to that fishery.

The Environmental Conservation Law (2012), specifically:

- Section 7(o) requires polluters to pay for environmental damages caused.
- Section 14 requires point source emissions/pollution to comply with environmental quality standards.
- Section 15 requires owners and occupiers to monitor and manage point source emissions/pollution using environmentally sound methods.
- Section 24 permits the Ministry to stipulate terms and conditions for environmental conservation and to conduct inspections to ensure compliance with the terms and conditions.
- Section 29 requires that no person violates the requirements set out in orders, directives and procedures issued under this law.

Environmental Conservation Rules (2014), specifically:

- Rule 68, requires owners of small enterprises to obtain the Environmental Conservation Department's advice regarding impacts of its business before applying for a licence to operate the business.

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 4(d) empowers the Ministry of Mines to acquire land or legally transfer land with the consent of the owner that is within a gemstone tract.
- Section 15(b) requires the Ministry of Mines to issue a gemstone production permit if the applicant pays the determined price within the specified time.
- Section 15(c) requires the Ministry of Mines to determine the tenure and price of any extension of a small-scale gemstone production permit.
- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

National Environmental Quality (Emission) Guidelines set out noise, air emission and water discharge criteria for protecting human and ecosystem health.

The National Environmental Quality (Emission) Guidelines set out the guideline values for discharge of runoff and wastewater from mining sites involving the extraction of stone. These guidelines are applicable to jade mining and have been adopted in this EMP. Table 2 lists the water quality parameters and guideline values.

Table 2 Guideline values for discharge of runoff and wastewater

Parameter	Unit	Maximum concentration
Biological oxygen demand	mg/L	30
Chemical oxygen demand	mg/L	125
Oil and grease	mg/L	10
pH	S.U. ^a	6-9
Total coliform bacteria	100 mL	400
Total nitrogen	mg/L	10
Total phosphorus	mg/L	2
Total suspended solids	mg/L	50

^a Standard unit

6.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(b) of The Myanmar Gemstone Law (1995) and Article 54(c) of The Second Amending Law of the Myanmar Gemstone Law (2016) for the Hpakant/Lonkin Gems Tract.

The notifications relevant to surface water and groundwater management are:

- Notification Letter No. 121/99, October 4, 1999.
- Letter No. Ka-37/295/2017, December 29, 2014.
- Letter No. Ka-37/146/2016, January 26, 2016.
- Letter No. Ka-37/383/2016, May 23, 2016.

These notifications are attached to this EMP in Appendix 2.

6.3 International guidelines

The International Finance Corporation (IFC) has published a guideline that provides general guidance on the management of surface water and groundwater resources including erosion and sediment control. The relevant guideline is:

- Environmental, Health and Safety Guidelines for Mining. December 2007. IFC/World Bank.

The International Erosion Control Association (Australasia) has developed best practice guidelines for the control of erosion and sedimentation. The following publication provides valuable guidance on the factors contributing to and the requirements for controlling erosion and sedimentation:

- Best Practice Erosion and Sediment Control. November 2008 (and subsequent revisions). International Erosion Control Association (Australasia).

- Best Practice Erosion and Sediment Control. November 2008. Appendix B - Sediment Basin Design and Operation - Draft document. December 2016. International Erosion Control Association (Australasia).

7. Management measures

Surface water and groundwater availability and water quality will be managed by a combination of the management measures and procedures listed in Section 4 Associated plans and procedures, and the additional measures in this plan.

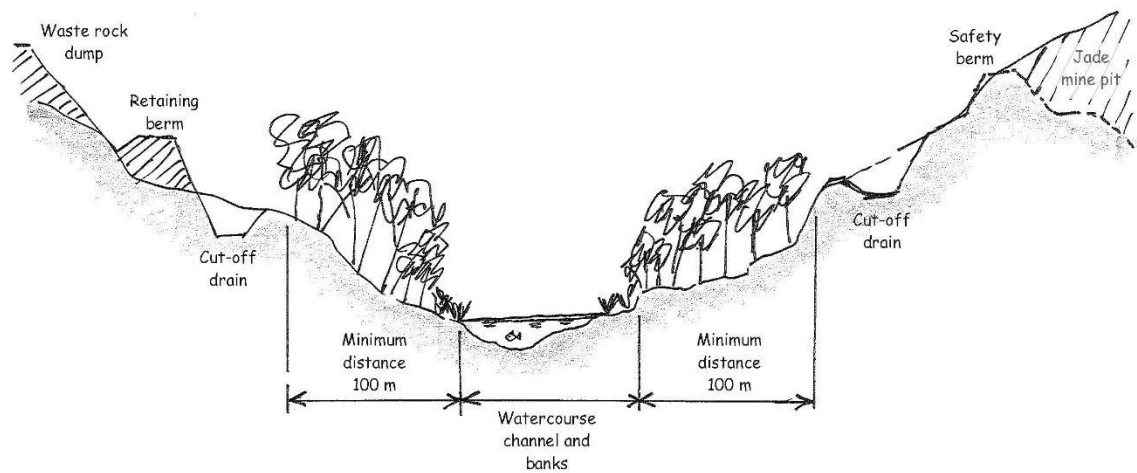
Discharges of runoff and wastewater must not exceed guideline values listed in the National Environmental Quality (Emissions) Guidelines (2012), as presented in Table 2. Erosion and sedimentation is the most significant impact on surface water features and water quality. During the transitional period for this EMP, turbidity (total suspended solids) is the water quality parameter that will be measured. The other water quality parameters will be measured as part of a regional monitoring network to establish a baseline for subsequent revision of this EMP.

The management measures detailed below incorporate the notifications listed above and are to be implemented with the notifications.

Before mining

The following management measures must be done before mining commences:

- a. Identify village and landowner water resources (wells, springs, streams) in consultation with local communities and landowners. Seek information of depth to water, flow or availability, seasonal variation to flow and availability, and consumption.
- b. Seek to identify the hydrogeological formation that is supporting wells and springs; engaging, if necessary, a qualified hydrogeologist to identify the source aquifer and recharge area.
- c. Seek to protect aquifer recharge areas through mine design and protection of native vegetation in recharge areas.
- d. Implement the Mine Pit and Waste Rock Dump Management Plan to determine catchment area(s), drainage lines and watercourses within the concession and downstream.
- e. Implement the Mine Pit and Waste Rock Dump Management Plan to design the surface water management system.
- f. Protect surface water features and their riparian vegetation through mine design, where practicable (Figure 1).



Jade mine siting
Protection of watercourses and riparian vegetation

Figure 1 Protection of watercourses and riparian vegetation

During mining

Management measures to protect surface water and groundwater resources that must be implemented are:

- g. Minimise the area of disturbance and avoid disturbing watercourses and their riparian vegetation (see Figure 1).
- h. Implement the Erosion and Sediment Control Plan to reduce erosion and sedimentation of watercourses.
- i. Remove temporary bridges and causeways from Uru Creek and its major tributaries by May each year.
- j. Implement the Non-hazardous Waste Management Plan to stop pollution of watercourses from inappropriately managed and discarded waste and sewage.
- k. Implement the Chemicals and Hazardous Materials Management Plan to stop contamination of soils, surface water and groundwater.
- l. Implement the Rehabilitation Management Plan to progressively revegetate disturbed ground to reduce erosion and sedimentation of watercourses.
- m. Provide an alternative water source where village or landowner water resources (wells, springs and streams) are adversely affected by mining-related activities. Discuss options for alternative water supply with the Community Reference Group and seek their advice on the most practical solution. Options may include:

- i. A bore (tube) sunk into a suitable aquifer that will not be affected by mining activities.
- ii. Piping water to the village / landowner from a suitable source that will not be affected by mining activities.
- iii. Provision and support for maintenance of a package water treatment plant.

After mining

The reinstatement of surface water features is important to ensure the long-term stability of landforms and surface water availability and quality. The following measures will be implemented:

- n. Implement the Mine Closure Management Plan.
- o. Implement the Community Support and Development Plan to discuss and arrange the handover of any water supply infrastructure.

8. Performance criteria

The performance criteria for surface water and groundwater management are:

- No complaints about poor water quality from downstream users.
- No unresolved complaints about reduced or lack of water resources.

9. Inspection and monitoring requirements

The inspection and monitoring requirements in the associated plans and procedures address the requirements of this plan. The key inspection and monitoring requirement is to resolve community concerns about poor water quality or reduced or lack of water resources from traditional sources i.e., wells, springs and streams.

Compliance will be determined using the checklist attached to this plan.

The frequency of inspections is set out in Table 3.

Table 3 Frequency of inspection and monitoring

Activity	Frequency
Watercourse buffers in place and protected	Monthly
Community grievance mechanism	Monthly

Water Management Plan

Compliance checklist

Maw and Concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Evidence that watercourses have been avoided, where possible	
Watercourse buffers exist and have not been disturbed	
Village and landowner water resources identified	
Community grievance register (water related complaints)	
Alternative water supplies provided where required	

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Hpakant/Lonkin Gems Tract Environmental Management Plan	
Worker Accommodation Management Plan	
Version: Rev 1	Date: 31 October 2018

1. Introduction

The jade mining industry has led to an increase in the number of mine workers in the Hpakant/Lonkin area. Workers coming from outside the area require accommodation which can put pressure on local housing and transport, and increase the demand for health services and resources, such as water and food. Without appropriate management, these pressures can lead to adverse impacts on local communities and the environment.

Suitable worker accommodation will help to alleviate these potential impacts and should include basic services such as water supply, adequate sewage, waste disposal and washing facilities, protection against the weather, and ventilation and lighting.

The worker accommodation management plan (this plan) describes how worker accommodation associated with large-scale jade mining will be managed. This plan forms part of the Environmental Management Plan (EMP) for the Hpakant/Lonkin Gems Tract and should be read in conjunction with other sections of the EMP.

2. Objectives

The objectives of this plan are to:

- Provide adequate accommodation and basic services for mine workers.
- Avoid or reduce environmental and social impacts from the influx of workers into the Hpakant/Lonkin Gems Tract.

3. Definitions

Communicable disease – an infectious disease transmissible from person to person either by direct or indirect contact.

Mining company – a company, joint venture, cooperative, persons or person holding a permit to produce gemstone from a gemstone block or concession.

Worker – any person working for a mining company including all mining company owners, employees, contractors, subcontractors and family members.

4. Associated plans and procedures

This plan requires management measures in the following plans to be implemented:

- Code of Conduct.
- Community Support and Development Plan.
- Occupational Health and Safety Plan.
- Non-Hazardous Waste Management Plan.
- Mine Closure Management Plan.

5. Applicable laws, rules, guidelines and standards

The laws, rules, guidelines and standards relating to worker accommodation are listed in this section.

5.1 Laws, rules and guidelines

The laws, rules and guidelines relevant to worker accommodation are:

The Prevention and Control of Communicable Diseases Law (2015), specifically:

- Section 3 requires the Department of Health to immunise children against communicable diseases and educate people about these diseases to prevent outbreaks.
- Section 4 requires the Department of Health to control the spread of an outbreak of a principal epidemic disease or notifiable disease through immunisation and other measures.
- Section 9 requires households to report communicable disease outbreaks to the nearest health department office or hospital.
- Section 11 outlines the measures a health officer may take to prevent and control the spread of communicable diseases including inspections and medical examinations.

The Control of Smoking and Consumption of Tobacco Product Law (2016), specifically:

- Section 9 requires non-smoking areas to be designated, clearly marked and supervised.

The Second Amending Law of the Myanmar Gemstone Law (2016), specifically:

- Section 16 requires a gemstone production permit holder to abide by rules, procedures, orders and directives issued under this law, the conditions of the permit, to pay royalties, to manage workers' conditions and wages in accordance with the law, and to make provisions for the prevention of environmental impacts.
- Section 36 sets out the duties of the Chief Inspector including right to inspect mine sites for compliance with rules, orders and directives, the health and safety of workers, and environmental impacts of gemstone production.

5.2 Notifications

Myanmar Gems Enterprise Department of Jade Mining has issued notifications under Article 54(c) of The Second Amending Law of the Myanmar Gemstone Law (2016) for the Hpakant/Lonkin Gems Tract.

The notification relevant to worker accommodation is:

- Notification Letter No. Ka-37/209/2017, February 16, 2017.

The notification is attached to this EMP in Appendix 2.

5.3 International standards

In the absence of specific regulation or guidance on worker accommodation in Myanmar, the following standards and guidelines represent good international practice:

- International Finance Corporation Environmental and Social Performance Standard 2. Labour and Working Conditions (2012).
- International Labour Office (ILO) Workers' Housing Recommendations (1961) No. 115.

Both of these documents set out minimum requirements for accommodation provided by employers such as a mining company. The accommodation must be appropriate for its location, clean, safe and meet the basic needs of workers. Workers' freedom of movement to and from the company-provided accommodation must not be unreasonably restricted.

Relevant elements of these documents have been incorporated into the management measures.

6. Management measures

The management measures below are based on good international practice for worker accommodation and incorporate the relevant guidelines listed above.

Planning for and during mining

The following management measures must be implemented before mining commences and during all mining activities:

- a. Provide suitable accommodation for mine workers at, or close to, the mine site.
- b. Provide free transport to and from surrounding communities and worker accommodation to work sites. Transport vehicles must be roadworthy, maintained and inspected, and all drivers must be trained and qualified.
- c. Avoid locating worker accommodation camps in areas prone to flooding, or on or near waste rock dumps or near the edge of open pits.
- d. Provide security for worker accommodation camps.
- e. Locate common dining rooms, canteens or mess rooms away from the sleeping areas.
- f. Provide basic services at each worker accommodation camp, including as a minimum:
 - i. Sufficient space for each worker, including a separate bed for each worker (arranged in tiers of no more than two, adequate headroom, comfortable bedding materials, mosquito nets, separate accommodation for males and females, adequate secure storage for personal belongings).
 - ii. Adequate sanitary, toilet, bathing and laundry facilities.
 - iii. Sufficient potable/safe drinking water.

- iv. Adequate waste, sewerage and waste water management (as per the Non-Hazardous Waste Management Plan).
- v. Adequate ventilation, natural light and artificial light.
- vi. Medical and first aid facilities.
- vii. Separate facilities for sick workers to prevent the spread of communicable diseases among the occupants.
- g. Maintain and regularly clean accommodation buildings and employ a sufficient number of workers to maintain and service worker accommodation.
- h. Undertake pest and vector (mosquito) control, as required.
- i. Install fire extinguishers and provide firefighting equipment at each accommodation block. Install smoke detectors and fire alarms in hallways to rooms used for sleeping.
- j. Designate and train camp fire wardens, carry out periodic testing of fire safety equipment and undertake regular firefighting and evacuation exercises.
- k. Provide rest and recreation rooms, and health facilities where not otherwise available in the community.

After mining

The following management measures must be implemented after mining is complete:

- l. At the conclusion of a worker's contract, provide workers with a reasonable period of time to vacate the premises, in accordance with national law and custom.
- m. Re-purpose worker accommodation and other facilities for use by other mining companies or by the community, where possible.
- n. If worker accommodation is not to be retained, clear all waste from the site, decommission and remove the facilities, and rehabilitate the site in accordance with the Mine Closure Management Plan.

7. Performance criteria

The adequate provision of appropriate worker accommodation will be determined by:

- No complaints from workers regarding accommodation.
- No complaints from the community regarding worker accommodation or transport.

8. Inspection and monitoring requirements

Worker accommodation should be inspected regularly to check that the premises are clean, habitable and maintained in a good state of repair. The results of each such inspection should be recorded and be available for review. Table 1 sets out the frequency of inspection and monitoring of worker accommodation.

Table 1 Frequency of inspection and monitoring

Activity	Frequency
Inspection of worker accommodation	Monthly
Inspection of worker transport vehicles including driver qualifications (where applicable)	Monthly
Fire extinguishers and firefighting equipment testing and fire drills	Monthly
Firefighting and evacuation exercises	Quarterly

Worker Accommodation Management Plan

Compliance checklist

Maw and concession number:

Name of mine and company:

Inspection/audit performed by:

Date of inspection/audit:

Evidence of compliance	Complies? (Y or N)
Worker facilities secure and in good working order with no immediate maintenance required	
Worker transportation meets worker and mine requirements (if applicable)	
Facilities not at risk from flooding and/or damage from mining activities including potential landslide areas	
Minimum requirements for basic accommodation services are being met	
Evidence of sufficient pest and vector control	
Evidence of firefighting and evacuation exercises	

Appendix 2 Notifications

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Appendix 2 contains a selection of notifications relevant to the preparation of this EMP. This is not an exhaustive list of all notifications that have been issued.

The notifications in Appendix 2 that have been incorporated into this EMP have been translated from Burmese to English by Valentis.

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The Republic of the Union of Myanmar

Ministry of Mines

Myanmar Gems Enterprise

Department of Jade Mining

Lone Khin

Letter No. Ka-37/ 078/2014

Date: September 4, 2015

To

Gem companies in joint venture with the government (all)

Private gem companies/associations (all)

Lone Khin/Hpakant Gems tract

Subject: Re preventing from environmental conservation damages due to jade mining in
Lonekhin / Hpakant gems tract

1. As gemstone blocks are permitted for mining operation again by Scrutinizing and Management Committee as per notification no. 4/2014 in Lone Khin/Hpakant gems tract starting from 1.9.2014, gem companies/private companies/ associations in joint venture with the government who has obtained a permit for jade mining/production shall carry out the mining operations and throw away the mine waste systematically in order to prevent from environmental conservation damages.
2. The Ministry of Mines has issued a notification no. (121/99) on 4.10.1999 for the permit holders to follow. In Chapter (5) of such notification, regulations for permit holders to follow in order to prevent from environmental conservation damages caused by gemstone production are promulgated.
3. In addition, the Ministry of Mines also enacted The Amending Law of the Myanmar Gemstone Law as per Law No. (8/2013), enacted on 16.6.2003 which states that company/association with a permit (or) when operating a private gemstone production, combined area of mine waste dump shall be designated within a gemstone tract and if willing to dump the mine waste outside the block, permit shall be applied to the Ministry of Mines.

4. Nevertheless, mine waste, rocks, stones fall into Uru creek and brooklet that flows into Uru creek and the creek floor has been raised due to heavy sedimentation and floods happen.
5. Those who hold the permit for jade mining/production shall abide by the notification no. 121/99, chapter 5 as per 4.10.1999 issued by the Ministry of Mines and also follow the below precisely-
 - (a) Mine waste and rocks produced from jade mining by machines from inland blocks within gemstone tracts must not be thrown into gemstone tract, flash water canals that flows into the rivers/creeks and valleys.
 - (b) In the gems tract area, besides or into the rivers, or anywhere heavy sedimentation can happen, mine waste must not be discarded, if waste unavoidably shall be discarded into the creeks, flash water canals and valleys, Detention ponds shall be built in the place before the water flows into the creeks. Soil waste and rocks shall be collected in the detention ponds and removed from the creek, only the water shall flow into the creek.
 - (c) Rocks that have been in the creeks shall be removed and put on the bank of the creek through the management of Area Supervisor and respected companies. On the side of the creek, the rocks shall be piled up to a certain height and soil shall be placed. To have better retained creek bank, trees shall be grown.
 - (d) Redirecting the creek current in the gems tract area, building temporary dams, making ditch and undermined area shall not be done at all.
 - (e) Small rocks and mine waste which blocks rivers/creeks, let the rain water wash away in rainy reason and end of raining season, to have better current in the creeks, creeks drudging and clearing the blockage work shall be done.
 - (f) Soil waste must not be dumped in the not permitted area without permit.
 - (g) Gemstone mining, and dumping mine waste and rocks/stones must not be done in water catchment areas.
 - (h) For the gemstone production work, permit holders shall abide the notification dated (4.10.1999) notification number (121/99), the gems mined out area, ditch, pits and damaged caused by the mining operation, surface disturbances or for the dangerous area shall be done safe or replantation of trees shall be done.
6. Permit holders for gemstone production in Lone Khin/Phar Kant gemstone tract area fail to follow the above instructions may be charged in accordance with section (38) and section (43) of the Myanmar Gemstone Law.
7. Therefore, gem companies/private companies/ associations with a permit in joint venture with the government shall follow the above instructions closely with respect in order to prevent from environmental conservation damages caused by jade mining/production.

Shwe Lin Maung
Director

Copy to

Minister, Ministry of Forestry and Mines, Kachin Government , Myitkyina Town
Managing Director, Myanmar Gems Enterprise, Naypyitaw

Township administrator, Hpakhant General Administration Department, Hpakant Town
Sub department, operation supervisors, Department of Jade Minings, Lonekhin
Camp manager, Department of Jade Mining (Moenyin, Khamti)
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The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation

Myanmar Gems Enterprise
Department of Jade Excavation

Lone Khin

Fax: 074-72422

Email: jade.lonekhin@gmail.com

Letter No. Ka-37/ 146/2016

Date: January 26, 2016

To

Owner/Person in charge

.....Company

Subject: To dump mine waste in combined mine waste areas systematically in Lone Khin, Hpakant Gems tract area

1. Inspection and Management Committee held a (10/2015) inspection and management committee's meeting and decided to permit dumping of the waste from the Lonekhin Hpakant jade mining operation on (12) dumping areas previously designated places to dump mine waste from jade mining during dry season in order to protect from environmental damages in Lone Khin, HpaKant gemstone tract.
2. Therefore, mine waste produced from raw jade mining during dry season 2016-2017 in Lone Khin, HpaKant gemstone tract shall be dumped in (12) combined waste dumping site previously and allowed to dump again on it systematically.

No	Mine waste area	Designated acres of the area	Acres used for dumping	Newly added acres for dumping
(a)	Nant Mhaw	30	20	10
(b)	Nant Ham	30	10	20
(c)	Masa	90	40	50
(d)	Nant Ma Phit	80	50	30
(e)	Maung Maung Bwan	150	90	60
(f)	Ka Lar Mhaw	80	60	20
(g)	Sate Mu Ywar Haung	120	50	70

(h)	Sai Aung	150	50	100
(i)	Kan Khan Bwan	300	150	150
(j)	Ahtet Met Lin Chaung	150	60	90
(k)	Wai Khar	150	80	70
(l)	Yay Aye Chaung	150	50	100

3. Therefore, those with gemstone mining/production permits shall abide by the directives issued by the Ministry of Mines relating to dumping mine waste and also follow the below instructions precisely–
 - (a) Not to dump the mine waste and sandstone produced from mining within inland blocks in gemstone tract into river/creeks and tributaries located in gemstone tract.
 - (b) The waste shall not be dumped into or right and left banks of the Uru river (300) feet distance unless special instruction to raise the banks or to make the river flow better.
 - (c) Big stones/rocks gathered from dumping mine waste shall only be thrown away in designated areas to avoid bad current and blockage and to prevent from danger for the by passer.
 - (d) Places near the human habitats, creeks, it can be dangerous due to piling of soil waste and waste stockpile may slide down, it may also block the creek current, road and bridge, houses blockage, the danger of flood, and there could be possible environmental impacts, therefore, the Maws (jade mining areas) shall collectively manage the adverse danger and prevent from environmental damages with special care.
 - (e) Mine waste dumped in combined area shall be structured with benches that have enough space (45 degree slope).
 - (f) Caution signs such as “Danger - combined mine waste stockpile”, “No trespasses” signposts shall be set up.
 - (g) In respected companies combined dumping sites, watchers tents shall be built, safety and hazard prevention scheme should be monitored very carefully. Dumping should be allowed only if there is no further danger.
 - (h) If waste has to be dumped into the creeks, flash water canals, detention ponds should be built before flowing into the creeks, sedimentation and wastes shall be collected in the detention ponds and removed from it. Only water shall flow into the creeks.
 - (i) In the low creeks banks, raising the banks and removing the big boulder through the management of Area supervisors, companies owners shall do that. The sides and on the banks of the creeks, the banks shall be raised systematically until it has enough height. Repairing the banks, if the creeks are not blocked by the big boulders, the big stones to be discarded shall be arranged on the bank nicely, the soil shall be covered for the tree plantation.
 - (j) If raw jade is discovered, towers and water filtering tanks shall be built to allow sedimentation of deep mud and flowing of clear/clean water. Let it settle down and clear water only shall flow out.
 - (k) If sand and stones are blocked in Uru creek and tributaries due to mining operations, machinery shall be used to mitigate the relevant area collectively.
 - (l) Land filling of the surface damaged by ditch, pits and work after gemstone mining (or) other safe methods shall be used and trees shall be grown.

(m) Gemstone mining in catchment areas will not be allowed. To conserve the catchment areas.

4. Therefore, owners and persons in charge who carry out jade/gems mining in Lone Khin, HpaKant gemstone tract shall make sure all workers follow the law, rule, orders and instructions in order to avoid unnecessary lawsuit.

Tin San Aung

Director

Copy

Managing Director, Myanmar Gems Enterprise

Township Adminsitrator, Township General Administration Department, Hpakant Town

Chairman, Gems Entrepreneurs Association (Hpakant)

Survey and Inspection Department (sub), Department of Jade Mining, Lone Khin

Office Reciept and Permit to sent

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Myanmar Gems Enterprise
Department of Jade Mining
Lone Khin
Fax: 074-72422
Email: jade.lonekhin@gmail.com

Letter No. Ka-37/ 209/2017

Date: February 16, 2016

To

Owner/Person in charge

..... Company/Association

Subject: Companies to follow the instruction relating to landslides caused by in Jade mining
Operations in Lone Khin, Hpakhant Gems tract Area

Reference: Letter No. Nya-1/1-107/2016 of Myanmar Gems Enterprise issued on 8.2.2016

1. Natural resources in Jade and Gems concessions under the administration of Myanmar Gems Enterprise are being mined by way of surface and underground mining, and as it is gems tract area, the tailing stockpiles are contiguous to jade and gems concessions area. Sometimes, there are landslides on the normal mountain and stockpile landslide at work site and heavy machinery accidents. Due to rain water and the moisture, it causes soil instability, cracks and it can also cause potential dangerous landslide. We also have seen the environmental impacts, environmental pollution and other dangerous worksite hazard.
2. In the said jade concessions, the landslide at workplaces, tailing stockpiles landslide, environmental impacts, pollution, accidents of the vehicles used at the worksite and other occupational hazard, therefore to prevent from all of these, the companies shall abide with the following instruction -
 - (a) In each and every gem tract area with the open cut mine method, when removing topsoil, to retain the stockpile, the company shall use Bench system, each Bench Height shall not exceed more than (25 ft), to have proper safe slope "Angle of Repose" shall not exceed

more than 45 degree, and to pay more attention not to have environmental impacts and to have proper occupational health and safety, every mines shall follow their prescribed Mine Design when carrying out the mining operation. Tailing shall be discarded at the designated place as instructed with systematic step by step.

- (b) The haul road made on the slope of the mine pit in the Open Cut concession shall be maintained and checked from time to time to see erosion and landslide. During raining season, haul road shall be checked daily, potential landslide area due to rain water, land deformed caused by undermined area and safety sign post shall be put there to keep all the workers away from it.
- (c) Building for people shall not be allowed to be built near the dangerous soil stockpile and cliff. The combined soil stockpile area and the cliff, the soil instability near the cliff, any building or no one shall be allowed to live there. In the potential landslide area, houses shall not be built and people shall not be allowed to live there.
- (d) In the raining season, on the heavy down pour day, cracks may occur, when that happens the houses shall be moved immediately and to report to the in charge person nearby when cracks and sign of potential landslide is starting. The in charge person shall take action immediately.
- (e) Due to rain, water going into open cut mine area, drainage and sump shall be clear for pumping the water out of the mine area. To have good and strong water pump, spare water pumps shall be kept as well for standby manner. Special arrangement shall be done for the drainage breakage if the drainage is broken while pumping. If there is any water tank above the mine site, the dam around the water tank shall be made secured strictly. The soil that can be softened and melt shall be removed as quickly as possible.
- (f) When it is raining without stopping, there can be leakages and it can create cracks and soil instability, when that happens, the operation shall be stopped until the right soil stability is back. To inspect all the companies who are instructed to stop temporarily whether they follow the instruction or not. There is always drainage breakage and landslide happens, when the operation starts again, the safety shall be scrutinized thoroughly.
- (g) Where it is raining without stopping, after the rain and the sun comes, the landslide usually happens, during this time, operation shall be paused, it is more important to have safety than production, when the site is safety to operate again, operation shall start again.
- (h) Not only in your concession area, but also the concessions that are contiguous to yours, if there is any sign of landslide heard or seen shall be notified. To help by informing nearby Mining department.
- (i) For the soil stockpile, not to have steep slope, the waste dump shall be made with benches/terraces, to have enough density, water shall be poured, pressed by roller paver equipment regularly.
- (j) To check whether there is cracks / or not, to assign all the big companies, to have enough light at the soil stockpile at night, when there are cracks and landslide to happen any time, to inform the Yaymasay stone picker by blowing whistle, showing signals and danger signs, signpost shall be put visibly at the site.
- (k) If it is thought to be any danger of potential landslide, the operation shall be stopped at once. People and equipment shall be relocated to the safe place as quickly as possible. To remove any danger soil that can cause landslide.

- (l) The dangerous places along the road to waste dump area (junction, curve, folk road), vinyl that has sign saying "Danger, move about with care" shall be posted for the public. The size of the poster shall be length (8) feet and width (2) feet with enough visibility. Enough traffic supervisors and vehicles direction control in charge shall be assigned and watch over it daily.
 - (m) Injuries, death and loss (covered by soil) due to natural disaster and hazard at site, rescue and medication if needed company shall use excavator as soon as possible. To prevent from happening it again, necessary things shall be done.
 - (n) To assign the in charge person for the rescue work at the same time and successfully day and night, the accident shall also be informed to the above department at the same time.
 - (o) Mining laws, Myanmar Gemstones Law and including Myanmar Investment law, the labor laws and their rights shall be learned and abide closely.
3. In the gems tract, for the mining work and safety measure, to avoid from the possible hazard at mine site, Officer from the department, in charge person from respected Maw, town elders will have education workshop about health and safety matter and at the same we would like to urge to follow the above instruction closely.

Dr Ye Htay (16 / 2 / 2017)

Director

Copy to

Managing director – Myanmar Gems Enterprise – Naypyitaw,

Permit to distribute (copy)

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation

Myanmar Gems Enterprise

Department of Jade Mining

Lone Khin

Letter No. Ka-37/ 295/2017

Date: December 29, 2014

To

Owner/Manager

..... Gems Company, Cooperative Association

Subject: with regard to the implementation of raw jade mining operations and environmental conservation work systematically and to report monthly

Reference: Letter No. Nya-1/1-1918/2014 of Myanmar Gems Enterprise (Head Office) issued on 8.2.2016

1. The Ministry of Mines has already issued a notification as per letter no.85/2014(Annexure-1) dated May 12,2014 for those who have permits for gemstone mining and production in order to prevent impacts on environmental. The following information is included in the notification –
 - (a) Soil / Rocks waste from the Gems tract area must not be dumped into streams, and in addition do not discard waste to the water catchment area in the valley and flash water passages.
 - (b) If unavoidably the waste has to be dumped into the flash water passage and valleys, Detention pond shall be put before letting it flow into the river. Detention pond shall be used to keep the sediment from waste soil and rock before flowing down into the streams.
 - (c) When raising the lower bank of the stream, the rocks that are blocking the current shall be cleared by the Area Supervisors and local authority management as priority. The removed rocks shall be piled on the bank and to make it stable, the topsoil shall be on top of the rocks and trees must be grown on it.
 - (d) Mining by changing the current of the stream/creek, by making makeshift dam on the stream, by making ditch and undermined area in the stream (or) other ways shall not be done on the stream.
 - (e) Rock and soil waste shall be dumped systematically on the designated combined dumping area.
 - (f) Rock and soil waste shall be dumped in the combined dumping site without the permit.
 - (g) In the concession of the gems production permitted area, gems mining in the water catchment area and discarding soil and rock waste in it shall not be allowed at all.

2. Above statements as per notification no. 85/2014 issued by the Ministry of Mines shall be followed precisely by those who have a permit for gemstone production and those who fail to follow shall be taken action against in accordance with section 43 of Myanmar Gemstone Law which may result in 3-year prison sentence or fines or both and may also result in one of the following -
 - (a) Suspension of the operation in accordance with permit
 - (b) Allowing to continue the work after paying fine.
 - (c) Annulling the permit
 - (d) Informing the relevant Ministry to blacklist the company or association, director of that company or association
3. Therefore, those who hold the gemstone production permits shall carry out the following with integrity, awareness and caution as a good citizen.
 - (a) Those who carry out gemstone mining in respective gems areas shall undertake methodically to conserve natural environments from damages.
 - (b) To draw up plan to conserve the environment not to have impacts on the environment.
 - (c) In the prepared plan, either by one concession, concessions, one maw by one maw, soil waste dump area, detention ponds, to discard systematically into sedimentary ponds, usage of it, scrutinizing it, waste dump area, detention ponds, dumped waste in sedimentary ponds, canals, it shall be managed directly or indirectly not to let sediments flow into streams.
 - (d) Canal and sediments due to sluicing and washing of gravel beds and that flows into streams and streamlets, and it shall be managed not let these flow into them.
 - (e) Rivers and river lets in the gems area, to have better current, the maintenance, removing the rocks in the rivers, silt, sediments shall also be removed.
 - (f) Waste dumping sites, gems mining in Maws, water catchment areas and other places, things shall be managed to carry out to prevent from erosion, topsoil damage, and less impact on the environment.
4. As Myanmar has become a 45th member of Extractive Industries Transparency Initiative (ETTI), The Global Transparency Standard will only be obtained if jade mining operations in Gems tract area shall be carried out methodically and conservation work is done systematically on a monthly basis.
5. Therefore, companies/cooperative associations shall carry out jade mining/production operations methodically and conservation of natural environment systematically as per notifications/ regulations announced precisely. The instructions, regulations shall be followed without fail. Natural environment conservation work for damages caused by jade exploration/mining shall be done monthly and status of such work shall be reported to upper departments along with maps, pictures before the 25th day of a month every month.

Copy to

Managing Director, Myanmar Gems Enterprise

Camp in Charge (Camp office (Khamti/Moenyin) to inform the business and supervise strictly

Office Receipt / Permit to send

Shwe Lin Maung

Director

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Myanmar Gems Enterprise
Department of Jade Mining
Lone Khin
Fax: 074-72422
Email: jade.lonekhin@gmail.com

Letter No. Ka-37/ 568/2015

Date: August 19, 2016

To

Owner/Manager/Person in charge

..... Company/association joint venture with the government
Lonekhin/Hpakant Gems Tract

Subject: Regarding regulations to keep and look after the jade on the joint venture concessions for companies who are in joint venture with the government operating jade mining with production sharing and jade sales.

1. In Lonekhin/Hpakant gems tract, if company/association who want to jade mining and production may apply for the desired concession area in accordance with procedures set and after obtaining the state permit with the approval of Myanmar Gemstone Enterprises Development Committee shall proceed with the signing of the contract. In accordance with the agreement, designated area is measured on the ground and given to respected companies.
2. For the JV companies, the companies the temporary area is not assigned, companies temporary area is assigned and companies who have been given assigned area, the following instruction shall be followed:
 - (a) After the block is accepted, as per clauses in contract signed between Myanmar Gems Enterprise and companies, the letter with intended operation date requesting for permit for jade operation and production shall be sent to and obtained from Department of Jade Mining (Lone Khin).
 - (b) When the concession is given, demarcation mark with concrete post (or) iron pole (or) 4 inches square thick wooden post with white and red stripe and placed permanently. It is important to keep those demarcation posts and prevent from unwilling people removing it. If needs to be moved, it cannot be done by discretion of the concession's owner. If it is found that the demarcation mark is moved illegally, the company and its in charges shall be litigated by Myanmar Gemstone law.

- (c) If due to the operation needs, unwilling person, the demarcation mark needs to be replaced, it shall be reported to Department of Jade Mining (Lonekhine). It will be field surveyed and measured by the group.
 - (d) After the concession is given to the company, for the administrative building, the permitted company can level the ground for building area, and construct the building. If the company is given only temporary permit, when constructing the administrative buildings, if the raw jade is found, they shall be given to Department of Jade Mining (Lonekhin) office. Permanent buildings are not allowed on the site.
 - (e) For all the JV company, all the raw jades shall be sent to Department of Jade Mining (Lonekhin) office compound and Valuation, Cutting, Polishing, Pairing for exhibition, Packing, and Storing shall be done in the Jade Mining Department compound. The company assist in preparing of land and building of storage houses and installation of cutting machine in the Department of Jade Mining office compound.
 - (f) For the JV company, to do jade mining and production, if the agreement is signed between Myanmar Gems Enterprise and the company, it will be necessary to recruit workers, arrange vehicles, heavy machinery, rations, fuel, industrial gun powder (ammonium nitrate) quickly in order to start the jade mining operation. To add more vehicles and equipment shall be done in accordance with the instruction. The preparation and progress report shall be sent to Department of Jade Mining (Lonekhin).
 - (g) For the jade mining and production, the (4) types of "Work Program" shall be sent to Managing Director of Myanmar Gems Enterprise and a copy shall be sent to Department of Jade Mining (Lonekhin).
 - (h) When there is any trespasses in your JV concession area, illegal miners, and no waste dump shall be allowed. For the company itself, without the permit, jade mining cannot be done and waste from private company shall not be dumped.
 - (i) Not related person, tents shall not be allowed in the concession area.
 - (j) The company shall take full responsibility for the JV concession area and as well as JV Jade mining and production operation shall be done in accordance with procedures, notifications, Myanmar Gemstone Law and Rules by paying special attention. They shall learn them and abide seriously.
 - (k) Especially, in the JV concession area, making drugs, storing drugs, distribution of drugs and keeping illegal arms and illegal matter shall not allowed at all.
3. Therefore, the JV companies with the state are allowed with the trust for the Jade Mining and Production, the company and its related people take full responsibility step by step to protect company and its related people's dignity. We would like to inform the above.

Copy to

Managing Director, Myanmar Gems Enterprise
 Assistant Director (Jade), Myanmar Gems Enterprise
 Supervisors (Sub-department), Jade Mining Department, Lonekhin
 Department of Survey and Field team, Jade Mining Department, Lonekhin
 Area Supervisor Members (area – 1,2,3,4,5,6,7,8,9,10
 Onsite Supervisor

.....company,maw, concession (), Office receipt
 and permit to send

Shwe Lin Maung

Director General

Tin San Aung

Director General

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Myanmar Gems Enterprise
Department of Jade Mining
Lone Khin
Fax: 074-72422
Email: jade.lonekhin@gmail.com

Letter No. Ka-37/ 578/2016

Date: August 22, 2016

To

Owner/Person in charge

..... Company/Association

Subject: Companies to designate Geologists and Mining Experts relevant to the workplace

Reference: Letter No. Ka-37/639/2015 of Department of Jade Excavation (Lone Khin) issued on
10.12.2015

1. Consortium, private company, associations shall hire experts for the management of mining methods which could not possibly damage the natural environment and social surroundings and for the right method of mining when excavating within Lone Khin, Hpakant gems tract.
2. However, consortium, private company, associations only submitted a list of supervisor, security personnel and vehicle/equipment in charge currently working.
3. As companies are required to designate experts such as Geologists and Mining Experts when carrying out jade mining operations. Companies/associations who have not designated such experts shall proceed with the hiring process and when finished, please report back to the department.

Tin San Aung

Director General

Copy to

Managing Director, Myanmar Gems Enterprise, Naypyitaw

Office Receipt, permit to send

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Myanmar Gems Enterprise
Department of Jade Mining
Lone Khin
Fax: 074-72422
Email: jade.lonekhin@gmail.com

Letter No. Ka-37/ 581/2016

Date: August 22, 2016

To

Managing Director/Person in charge

..... Company/Association

Subject: **Rules/Regulations for company/association to follow when designating staff/laborers**

Reference: Letter No. Ka-37/141/2016 of Department of Jade Excavation (Lone Khin) issued on
26.1.2016

1. Management of companies/associations who carry out jade mining shall abide by the following instructions when hiring staff/laborers –
 - (a) All staff must not wear military green uniform, and green camouflage uniform.
 - (b) To provide suitable uniform for mineral mining, mining helmet, safety shoes, gloves, face mask and earmuffs to be worn in workplaces as required by work environment.
 - (c) All staff and laborers must not use, sell, buy, and store drugs.
 - (d) To register all company's staff into social security board and company shall maintain the list of staff who completed the registration.
 - (e) To allow workers to only work in accordance with schedules set for over ground/underground.
 - (f) To allow working holidays as announced by the government.
 - (g) To designate minimum wage as 450 kyats per 1 hour and 3,600 kyats for 8 working hours per day as determined for the whole country regardless of regional difference and work type difference.
 - (h) To provide overtime fees in accordance with relevant laws if the nature of work demands overtime.

- (i) To continue paying the labor same amount of minimum wage if the amount exceeds the amount published in Minimum Wage Law, 2013 under section (14) (b).
 - (j) To increase the minimum wage to a minimum wage determined in accordance with relevant law if the current amount of minimum wage is lower than the amount determined.
 - (k) To pay the same amount of minimum wage determined regardless of gender difference and to pay the same amount of minimum wage per hour as determined for labors who work hourly.
 - (l) To train the staff/labor in order to reach a determined professionalism (or) production standards if necessary before the probation period and to pay 50% of determined minimum wage during 3 months of training period and 75% of determined minimum wage during 3 months of probation period.
 - (m) As per section 44(a) of Minimum Wage Rules, labors shall fulfil the designated production capabilities in accordance with the level of professionalism they have.
 - (n) As the minimum wage and overtime fees are a requirement stated by the law, other form of compensation such as bonuses shall be awarded depending on the success of work and profits gained.
 - (o) To avoid conflicts with leave and holidays designated for labors who are on a minimum wage.
 - (p) Minimum wage for small businesses with less than (15) labors, businesses irrelevant to family owned businesses shall be negotiated and agreed between owner and labor.
 - (q) Staff/labor shall sign a employment agreement relating employment confirmation within 30 days after they have been hired.
 - (r) Employment agreement and pay slip forms issued by relevant labor township office when paying salaries.
 - (s) To keep and maintain the personal records of staff/labor who are currently undertaking responsibilities in jade excavation areas.
 - (t) When hiring company's staff/labor, employment agreement shall be signed in accordance with law, rules and directives.
 - (u) To hire a person in charge assigned by the owner for the management of operations in every gemstone block, manager with required qualification and abilities and experts for excavation.
 - (v) To submit a right list of staff/labor to Department of Jade Mining (Lone Khin)
2. Therefore, I would like to notify all business owners who have raw jade Mining operations in Lone Khin, Phar Khant Yadanar area to carry out in accordance with directives stated as per above paragraph (1) when hiring laborers.

Tin San Aung

Director General

Copies to

Managing Director, Myanmar Gems Enterprise

Camp in charge, Department of Jade Mining (Khan Htee/ Moe Nyin) – To also inform Companies

Myanmar Gems and Jewellery Entrepreneurs Association (Hpakant)

Office Reciept / Permit to Send

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Myanmar Gems Enterprise
Department of Jade Mining
Lone Khin
Fax: 074-72422
Email: jade.lonekhin@gmail.com

Letter No. Ka-37/ 656/2015

Date: December 15, 2015

To

Owner/Manager/Person in charge

..... Company/association joint venture with the government
Lonekhin/Hpakant Gems Tract

Subject: Regarding regulations to keep and look after the jade on the joint venture concessions for companies who are in joint venture with the government operating jade mining with production sharing and jade sales.

1. In Lonekhin/Hpakant gems tract, if company/association who want to jade mining and production may apply for the desired concession area in accordance with procedures set and after obtaining the state permit with the approval of Myanmar Gemstone Enterprises Development Committee shall proceed with the signing of the contract. In accordance with the agreement, designated area is measured on the ground and given to respected companies.
2. For the JV companies, the companies the temporary area is not assigned, companies temporary area is assigned and companies who have been given assigned area, the following instruction shall be followed:
 - (a) After the block is accepted, as per clauses in contract signed between Myanmar Gems Enterprise and companies, the letter with intended operation date requesting for permit for jade operation and production shall be sent to and obtained from Department of Jade Mining (Lone Khin).
 - (b) When the concession is given, demarcation mark with concrete post (or) iron pole (or) 4 inches square thick wooden post with white and red stripe and placed permanently. It is important to keep those demarcation posts and prevent from unwilling people removing it. If needs to be moved, it cannot be done by discretion of the concession's owner. If it is

- found that the demarcation mark is moved illegally, the company and its in charges shall be litigated by Myanmar Gemstone law.
- (c) If due to the operation needs, unwilling person, the demarcation mark needs to be replaced, it shall be reported to Department of Jade Mining (Lonekhine). It will be field surveyed and measured by the group.
 - (d) After the concession is given to the company, for the administrative building, the permitted company can level the ground for building area, and construct the building. If the company is given only temporary permit, when constructing the administrative buildings, if the raw jade is found, they shall be given to Department of Jade Mining (Lonekhin) office. Permanent buildings are not allowed on the site.
 - (e) For all the JV company, all the raw jades shall be sent to Department of Jade Mining (Lonekhin) office compound and Valuation, Cutting, Polishing, Pairing for exhibition, Packing, and Storing shall be done in the Jade Mining Department compound. The company assist in preparing of land and building of storage houses and installation of cutting machine in the Department of Jade Mining office compound.
 - (f) For the JV company, to do jade mining and production, if the agreement is signed between Myanmage Gems Enterprise and the company, it will be necessary to recruit workers, arrange vehicles, heavy machinery, rations, fuel, industrial gun powder (ammonium nitrate) quickly in order to start the jade mining operation. To add more vehicles and equipment shall be done in accordance with the instruction. The preparation and progress report shall be sent to Department of Jade Mining (Lonekhin).
 - (g) For the jade mining and production, the (4) types of "Work Program" shall be sent to Managing Director of Myanmar Gems Enterprise and a copy shall be sent to Department of Jade Mining (Lonekhin).
 - (h) When there is any trespasses in your JV concession area, illegal miners, and no waste dump shall be allowed. For the company itself, without the permit, jade mining cannot be done and waste from private company shall not be dumped.
 - (i) Not related person, tents shall not be allowed in the concession area.
 - (j) The company shall take full responsibility for the JV concession area and as well as JV Jade mining and production operation shall be done in accordance with procedures, notifications, Myanmar Gemstone Law and Rules by paying special attention. They shall learn them and abide seriously.
 - (k) Especially, in the JV concession area, making drugs, storing drugs, distribution of drugs and keeping illegal arms and illegal matter shall not allowed at all.
3. Therefore, the JV companies with the state are allowed with the trust for the Jade Mining and Production, the company and its related people take full responsibility step by step to protect company and its related people's dignity. We would like to inform the above.

Copy to

Managing Director, Myanmar Gems Enterprise
Assistant Director (Jade), Myanmar Gems Enterprise
Supervisors (Sub-department), Jade Mining Department, Lonekhin
Department of Survey and Field team, Jade Mining Department, Lonekhin
Area Supervisor Members (area – 1,2,3,4,5,6,7,8,9,10
Onsite Supervisor

.....company,maw, concession (), Office receipt
and permit to send

Shwe Lin Maung

Director General

The Republic of the Union of Myanmar

Ministry of Natural Resources and N

Myanmar Gems Enterprise

Department of Jade Mining

Lone Khin

Fax: 074 – 72422

E-mail: jade.lonekhin@gmail.com

Letter No. Ka-37/ 383/2016

Date: May 23, 2016

To

Gem companies in joint venture with the government(all)

Private gem companies/associations(all)

Lone Khin/Phar Kant gemstone tract

Subject: Re supervision of Jade mining operation and occupational safety during raining season
in Lonekhin/ Hpakant gems tract.

1. The permit holder of all the JV companies with the state/Private Companies/associations for jade mining and the permitted concessions have some landslides near the residence area in the raining season, therefore, necessary prevention shall be done in the worksite area.
2. Especially, during and towards end of raining season, due to non-stop rain, high temperature, intermittent rain, landslide on the natural land, softening of the soil, and cracks occur and worksite soil instability and landslides, building being damaged by those landslides, vehicles/heavy equipment, staffs / workers got injuries and unwanted events, occupational hazard.
3. When the permit holders of jade mining companies do operation, prevention for the following occupational health and safety and shall abide the instructions.
 - (a) During raining season, when there is a lot of rain, they should attention to safety more than occupational hazard.
 - (b) When it rains non-stop, the operation shall hold and when the operations commences again, occupational health and safety should be checked, mining shall resumes.

- (c) When removing the topsoil, to have stable wall, bench shall be made, the height of the bench shall be not more than 25 feet and to have safety, Angle of Repose, the slope shall not exceed more than 45 degree.
- (d) Building houses near the dangerous cliff shall not be allowed, the houses built at the base of the cliff and on the slope of the cliff, people should not be allowed to live there and to avoid building houses on the instable land.
- (e) During heavy rain, cracks may occur; the houses on the cracks shall be relocated as soon as possible. It shall be reported to the in charge person, the in charge person shall inspect it right away and action shall be taken immediately.
- (f) If there is the sign of danger of landslide, the operation shall stop, workers and vehicles shall be removed from the danger zones, the dangerous soil shall be removed.
- (g) When removing those soil, if the topsoil, it shall be removed until the soil is stable enough, making base retaining wall, if it is hard base, it cannot positioned 90 degree, but it shall be piled up only up to 30 degree.
- (h) In the open pit, depending on the strength of the stability, the suitable height of the wall shall be piled up, if the depth goes down more, the safe retaining wall shall go down as well and make suitable safe situation.
- (i) The haul road and the stability of the road shall be inspected strictly; the haul road along the side to prevent from landslide, special attention and care should be given.
- (j) Rain water canals during raining season can cause some landslide, safety signposts for the workers shall be put up visibly.
- (k) When there is heavy rain, and sun comes out, the landslide happens; operation shall be stopped during that period.
- (l) When there is heavy rain, the rain water canals breaks halfway, precautions shall be taken as quick as possible.
- (m) If there is any water tank for household use above the concession, inspection must be done to prevent from leakages, if the dam is melted, it shall be removed quickly.
- (n) Old mined out pit, old mine pit turned to lake, dumping site and lakes nearby the residence or villages which are dangerously located shall pay special attention, and to prevent from overflow, or broken dam, the water amount shall be reduced through the release drainage.
- (o) This is related to everyone, not only in your concession but also nearby concession contiguous, the landslides prone area is heard or seen, it shall be notified to respected mining department and assist in recovering that with the company own discretion.
- (p) Creek or stream that flows across the concession, the current shall be made good and in the temporary bridge built in summer time and soil dam, they all shall be dismantled and removed.
- (q) During raining season, in the jade mining operating concession, generators, switches and electricity lines shall be carefully installed to prevent from the danger of electricity.
- (r) In the gun powder (ammonium nitrate) storage houses, to do checking of lightning conductor or if it is not installed, lightning conductor shall be installed.
- (s) When blasting in the concession, overuse of explosives shall be avoided.
- (t) Miners shall be given miner's helmet, boots and gloves. It is the responsibility of the company.

- (u) Precaution and preparation shall be done for natural disaster in order to prevent loss of lives.
 - (v) For safety notification issued occasionally shall be flowed exactly.
 - (w) Site manager and mine in charge shall remind all the workers at the site for occupational health and safety all the time and rules/disciplines shall be issued to follow safety procedures.
 - (x) If there is any accident, it shall be reported immediately, it shall be reported in the format designated.
4. If it is found that the operation is not done in accordance with the occupational health and safety measure, the concession permit will be suspended temporarily, it shall be allowed again after the all the safety measures are fixed again.
 5. Therefore, Lonekhin Hpakant gems tract, the permit holder of jade mining companies JV with the state, Private company/ association will do the operation in raining season, to prevent the danger of landslide, hazards at worksites, accidents of the workers, injuries, and death, the owner/operation manager/ manager shall follow the above instruction as guidelines with care and instruct to all the workers of all levels.

Tin San Aung

Director

Copy to

Managing Director, Myanmar Gems Enterprise, Naypyitaw

Assistant Director (Jade), Myanmar Gems Enterprise, Naypyitaw

Camp in Charge, Department of Jade Mining (Moenyin/Khamti) –(to instruct to all the companies)

Office receipt/permit to send

The Government of the Union of Myanmar
Ministry of Mines
Minister Office

Notification letter No 85 / 2004

Yangon City, 1366 , 9 days after full moon day of Kasone
(2004, May 12)

The Ministry of Mines according to the decision made during the Management Committee meeting (13-14/2004) held at the ministry of Mines on May 4, 2004 issued this notification in accordance with the mandate conferred under Myanmar Gems Law – law 54, sub (b).

The Directives to be followed by the permit holder of gems production license not to have impacts on environmental conservation during operation of the gems production

1. The Ministry of Mines has issued notification 121/99 dated 4 October 1999 to be followed by the permit holder of gems production license. In the **chapter (5)** of notification, the instructions to prevent from the impacts on environmental conservation due to gems production have been prescribed.
2. Moreover, in the amending law of Myanmar gems law (law no 8/2003) enacted on 16.6.2003, it is promulgated that the ministry of Mines has the right to designate the combined waste dump area for the permitted company, association or person who are doing gems production and if the permit holders may apply for a permit to designate an area in their concession or outside of it for sluicing, disaggregating the rocks and / or soil waste dump area from the ministry of Mines.
3. Nowadays, some of the gems production permit holders in Lonekhin, Hpakant and along Uru river did not comply with the restriction and there is constant impact on the environment. Especially, soil and rocks are thrown into Uru river and flash water rivers that flow into Uru river, valleys, because of that sandbank formation in Uru river, rising of river bed and current change happened and continuously it impacts Chindwin river.
4. Therefore, the gems tract designated area in Lonekhin, Hpakant gems tract and along Uru river, protection measure for environmental conservation impacts needs to be done.
5. Thus, the permit holders of gems productions shall followings exactly –
 - (a) Soil waste and rocks shall not be thrown into rivers in the gems tract area at all. Moreover, generally the waste shall not be thrown into the flash rivers that flow into the rivers and the valleys at all.
 - (b) If it inevitably has to throw into the rivers, flash water rivers and valleys, detention ponds shall be built before throwing it into the rivers. In this way, soil waste and rocks will be collected in the detention ponds and only water may flow into the rivers.

- (c) The lower bank of the river, when raising the bank of the river, big boulders blocking the rivers shall be removed through the management of Area supervisor groups and respected local authority. On the priority bank to be raised, boulders shall be arranged, on the arranged boulders, soil shall be filled. To have stable soil, trees shall be grown.
 - (d) In the rivers, excavating by redirecting current, by building temporary dam (temporary blockage), making pits and well (excavating in the river that appears to be pit or well) or other method of excavation shall not be done at all.
 - (e) Soil waste and rocks shall be discarded systematically in the designated combined dumping site.
 - (f) Soil waste and rocks shall not be discarded in not designated dumping area without permit at all.
 - (g) Water catchment area in the gems production permitted concession, gems mining, soil and rock waste must not be discarded at all.
6. The person who fail to comply with this notification clause (5), according to Myanmar gemstones law – law 43, up to 3 years jail, fine or both maybe applied. Besides, according to Myanmar gemstones law – law 38, either one of following administrative notifications shall be applied –
- (a) Suspension of the operation according to permit or license
 - (b) Permitting the operation after fine is paid
 - (c) Cancellation of permit or the license
 - (d) Notifying the respected department to blacklist the director or anyone from the company or association or the company and association itself.

General Ohn Myint
Minister
Ministry of Mines

Letter No< 14 – sub group (2) 2004 (environment)

Date: 2004, May 12

Distribution

- The chairman office of State Peace and Development Council
- The office of State Peace and Development Council
- Union Minister office
- The office of Government of the Union of Myanmar
- Environmental Conservation Committee
- High Court

- The office of Attorney General
- The office of the Auditor General
- Ministry of Mines, Environmental Conservation Committee
- All the ministries
- Director General, Department of Mines
- All the enterprises and the rest of the departments in the Ministry of Mines
- Managing Director, Press and publishing Enterprise, Myanmar Publishing house, request to include in the announcement.

The Government of the Union of Myanmar
Ministry of Mines
(Minister's office)
Yangon City, 1362 (ME), (10) days after fullmoon day of Tawthalin
(1999, October 4)

Notification letter No 121/99

The Ministry of Mine issued this notification, regarding the matters in the Myanmar Gems Law, Law 16, sub law (f), sub sections (1) to (7), in order for gems production permit holders to abide with the instructions, in accordance with the mandate conferred under the Myanmar Gems law – Law 54, sub law (b).

The directives to be followed by Permit holders of Gems Production

Chapter (1)

Designation of the standard for employing staff and workers, workload, age, wage, salary and other remuneration in the Gems production work

1. In every gems concession, a manager qualified with the specified management and supervisory skills in order to run the operation at the site shall be employed. The decision and action of that manager shall be deemed to the instruction of the permit holder. Gems production permit holder if he himself is qualified to operate the site, he may work as manager.
2. Children under the designated must not be employed.
3. Except health care and social care staffs, women must not be employed underground camps of the gems concession.
4. Health certificate which shows fitness for work and confirmation of age (18) completion shall be requested from and issued by the Department of Health. Only those health certificate and confirmation of age (18) completion recognition holders can be employed, under age employees shall not be employed in the gems tract concession.
5. (a) If between chief inspector or inspection in charge and gems tract concession manager that a person without birth certificate or any dispute whether that person is age (18) completed or not, is found, the decision must be sought from the doctor of the respected Department of Health.
(b) The decision of the doctor of the Department of Health on whether a person is 18 or not shall be final according to the power this notification.
6. (a) In the gems concessions, for all the employees, the registration books shall be kept as in the annexure form (1).

- (b) In the gems concessions, for the workers assigned for underground work, the registration books shall be kept as well as in the annexure form (2). During operation times, the worker's name shall be writing in the book without fail.
7. The permit holder of the Gems Tract production or the manager of the gems concession shall do the following for a worker employed at the site.
- (a) If the worker is asked to work more than designated hours, he/she shall be paid double wage and if the worker receives other provision or support, he/she shall be paid as usual.
- (b) If the worker has to work on the public holidays, for the days he works, the normal salary or other remunerations specified by the Ministry of Labor shall be paid.
8. If the workers are paid by quantity, the permit holder or the manager according to this notification, these workers shall be paid with the rate that is average wage to other workers as closed as possible. The rate specification shall be regarded as normal rate according to this notification.

Chapter (2)

Designation of workings days and hours for under and upper ground in the Gems Production work

9. The permit holder or manager of the gems tract production shall –
- (a) Nobody in the gems concession shall be asked to work more than (5) days in a week.
- (b) A worker employed at the Gems concession shall not be asked to work for (8) hours per day, more than (40) hours per week or shall not be allowed to work. However, according to the needs of the work, if a worker has to work for the whole day, (48) hours in a week can be allowed.
- (c) The working hour of a person working in on surface of the ground of the Gems Tract concession, including break time shall be arranged not exceeding (10) hours. If there is no (1) hour break, worker shall not be asked to work more than (5) hours.
- (d) One type of work underground in Gems Tract concession shall not exceed more than (8) hours. However, based on the need of the work, shifts can be arranged. When practicing shifts, it shall not be assigned more than (8) per shift.
- (e) No person assigned in the Gems tract concession shall not be in the underground mine except the designated time mentioned in the record sheet.
- (f) When practicing shift system, if a worker is asked to work beyond midnight, the calculation of hours for the shift shall be based on (24 hours), the hours of work shall be counted starting from when designated shift hours ends. The working hours shall be added to the previous working day.
- (g) In front of the Gems Tract concession office, as per annexure forms (3) and (4), the start and end of workings hours of upper and underground of Gems Tract concession, and if shift system is intended to use, shifts time of each shift shall be put on the notice board. A copy of working hours and shift notice shall be sent to Chief Inspector.

- (h) Referring to the above sub section (g), the notice shall be posted (7) before commencing the operation.
 - (i) In the Gems Tract Concession, if the start and end of working time is generally intended to change, changing the shift time, before doing that not less than (7) days, the amendment shall be posted outside of Gems Tract concession office in accordance with Gems Laws :- Annexure form (5). (7) days before amending the time, a copy of notice shall be sent to Chief Inspector.
 - (j) Without sending any notice in accordance with the sub section (g), no workers shall be allowed to work in the Gems Tract concession.
 - (k) If there is no off day (3) working days before and after Saturday and Sunday, the workers in a gems tract concession shall not work either on Saturday or Sunday.
 - (l) Replacement off as prescribed in the sub clause (o) cannot be allowed, the leave entitled worker shall get back the off days in lieu within one month. The number of off days shall be as the same number of days he worked as replacement.
 - (m) Before Saturday, Sunday or replacement off day (either earlier day), the notification letter of replacement of in a gems tract concession shall be posted for at least 24 hours before the start and end of working time in gems tract concession for that replacement of off:- Saturday, Sunday or the replacement off day. The workers shall not be asked to work for 10 days continuously without giving (2) rest days.
 - (n) The notice letter posted in a gems tract concession area can be cancelled one day before Saturday, Sunday or the replacement off day.
 - (o) When calculating the working hours of off day if a worker has to work on either on Saturday or Sunday, Saturday or Sunday that the worker works shall be calculated and included in the week that worker is entitled for replacement off day.
10. No matter how it is described in the above clause (9), if there is any emergency situation due to danger to the workers, Gems Production permit holders or the manager may alter working time against the restriction given in the above clause (9). When inspection comes to Gems tract concession site, to be able to present the facts, it shall be recorded immediately and as well as a copy shall be sent to Chief inspector as soon as possible.

Chapter (3)

Planning for prevention of accidents and safety at the Gems production worksite

11. The permit holder of gems production license or the manager shall have necessary planning for safety and prevention for accidents as needed for the gems concessions under his supervision. Especially, the followings shall be arranged and planned.

- (a) When carrying out the gems production activities, the Occupation Health and safety at the site, there must be design and plan for electricity, machinery management and including communication system and other necessary materials.
 - (b) When commencing the Gems Tract concession, operation, maintenance and suspension of work, there must be planning for the safety of workers and other persons without having health impacts and carry out their assigned task safely
 - (c) Maintenance of the stability of the haul road going into the worksite shall be done.
 - (d) In every underground mine, if possible, there must be two emergency exits that can be accessible out to the surface.
 - (e) Regular inspection shall be done whether there is possible danger for the workers at the worksite or not.
 - (f) It must be arranged to have enough oxygen in the permitted underground sites.
 - (g) In the worksite where there can be any unusual danger, to have safety for the workers, Procedure and Planning shall be prepared and posted near that area.
 - (h) To prevent from breaking of fire, spreading and explosion dangers, the pre-planning and procedure that is suitable for gems production worksite must be prepared and necessary things must be arranged in order to know the danger in advance and settle it in time.
 - (i) For health and safety, when it is a critical situation, the work must be stopped and workers shall be relocated to a safe place.
12. The permit holder of Gems Production license or the manager shall plan prevention measures for predictable natural and worksite dangers based on the characteristic of each gems concession.
13. With regard to body, chemical or dangers to biodiversity, if there can be any danger at worksite, the permit holder of Gems Production license or the manager shall –
- (a) All the workers shall be briefed with occupational health and safety in advance.
 - (b) When meeting with dangers, suitable planning shall be prepared for reduction of injury or complete remediation.
 - (c) If the dangers or health damage cannot be recovered by other ways efficiently, workers shall wear complete safety costumes, safety equipment and other safety measures free of charge.
 - (d) For the injured workers, to have proper medical treatment, they shall be sent to the treatment area as quick as possible.
 - (e) For the injured workers, free medical cares shall be arranged.
14. The permit holder of gems production license or the manager shall -
- (a) In addition to occupational health and safety of the workers, safety related to worksite and easy to understand notices shall be issued occasionally, sufficient training and occasional drilling and retraining shall be arranged.
 - (b) In order to have safe operation of the Gems Tract concession in accordance with the laws, enough number of in charge person for the shifts.

- (c) System to know number workers shall be prepared to know who are in the underground at all times.
- (d) If there is any accident, the event of accident shall be inspected; necessary precaution and repair shall be done and reported to the respected in charge person in accordance with laws.
- (e) To prevent from worksite health safety in the gems tract concession for all the workers, regular inspection system shall be used.

15. The permit holder of gems production license or the manager shall –

- (a) Brining ammonium nitrate and related materials to houses, keeping in the houses, to store them in the ammonium nitrate store houses, the place selected and permitted by ministry of Defense.
- (b) Ammonium nitrate and related materials shall be handled by the qualified person assigned by letter, that person name shall be registered in the specified record book in accordance with the law.
- (c) Detonators shall be kept in the chest locked. It shall not be kept together either with ammonium nitrate or other related materials. No detonators shall be kept in the ammonium if it is not to be used at once.
- (d) For all the blasting, the person who is qualified not under the age of (18) assigned by the manager or foreman shall carry out the procedures in accordance with further instruction. Their names shall be recorded in the record book.
- (e) With regard to ammonium nitrate and related materials, how many blast, how much is being used and how many which did not explode shall be recorded in the daily records book.
- (f) The excess ammonium nitrate and related materials shall be returned to the store houses without delay.
- (g) When allowing a person to carry ammonium nitrate and related materials to the underground mines, the chest, bucket or hand carry bag that can only carry 2.5 kg shall be allowed.
- (h) When carrying ammonium nitrate and related materials, it shall be put in the designated chest, bucket or hand carry bag and carried firmly and safely.
- (i) When inserting the ammonium nitrate into the hole, iron or steel shall not be allowed to use. Besides, no ammonium nitrate and related materials shall be pounded when inserting.
- (j) When blasting underground, before doing anything nearby people shall be notified and all the entrances that people can access to the blasting areas, people shall guard at the entrances.
- (k) When two underground mines, one is (3) meters far from the other, if people have not left or if there is no wall, the other place cannot blast at that place.
- (l) In the open cut mine, before doing the blasting, or after the blasting, good and systematic way warning shall be announced.
- (m) When blasting ammonium nitrate and related materials, at least two people shall count numbers of explosions. The least number of explosions counted shall be taken. Explosion is

- not observed to be exploded, within 30 mins nobody shall go into that place. If the explosion was done through electricity, nobody shall go into that place within 20 mins.
- (n) In the underground mine area, after the blasting is done, nobody shall be allowed to access to that place before blasting in charge who is qualified assigned by the Gems Concession manager through letter shall go and check the place. Assistant blasting in charge shall also make sure the place is safe. Only after thorough inspection and safety announcement is issued, people will be allowed to go in.
 - (o) In the ammonium nitrate hole, when ammonium nitrate and related materials is inserted, it shall not be attempted to remove again.
 - (p) Into the blasted old hole, it shall not be attempted to blast again.
 - (q) If it does not explode, ammonium nitrate and related materials, it shall be destroyed with air or water. Or if explosion does not happen, at least 0.3 meter distance, another hole shall be dug for another blasting. In this way, unexploded ammonium nitrate can be exploded and destroyed.
 - (r) Before destroying the unexploded blast hole, another hole with the distance of 0.3 meter shall not be dug. When digging another hole with the distance of 0.3 meter, but safety shall pay special attention when digging the hole. When digging the hole and inserting ammonium nitrate and related materials shall be accompanied by blasting in charge person.
 - (s) The unexploded blasting hole before completion of the clearance, it shall be left it as it is, there must be a person who warns everyone nearby or that place shall be fenced. If it is open cut mining, red flag shall be put up.

Chapter (4)

Management and Implementation of the disciplines, cleaning, health, staff and workers shop at the Gems production site

- 16. The permit holder of gems production license or the manager, before carrying out the gem production operation, staff, workers waived shops, healthcare, cleaning and disciplines plan shall be prepared and presented to Ministry of Mines.
- 17. The Ministry of Mines shall amend, add and confirm the planning proposed by the permit holder of gems production license or the manager as per the above clause (16).
- 18. The permit holder of gems production license or the manager shall implement the planning proposal approved the department for the staff and work waived shops, healthcare, cleaning and disciplines plan.

Chapter (5)

Planning for the environmental conservation work not to have impacts due to Gems Production work

19. The permit holder of gems production license shall –
- (a) The surfaces disturbances caused by the drill holes, pit, underground pit, back filling or to prevent from the dangers, through other ways mitigation must be done until the Ministry of Mines or the department of mines is satisfied.
 - (b) Within the forest land and forest covered land that can be managed by the government, the gems production work is done. If the trees were cut down, reforestation or compensation agreed with the Ministry of Forestry when it was negotiated.
20. The permit holder of the gems production license or the manager when discarding tailing, waste water, waste soil and gas emitted into the water, air and soil pollution and to have living animal safe, these shall be tested at the laboratory. When testing at the lab, if the poisonous and dangerous chemicals are found, it shall be neutralized by chemical way and when proved that it is safe to throw, waste can be discarded systematically.

Chapter (6) **Reporting the accidents**

21. (a) Inside the gems tract concession or near the gems tract concession area, if there is any death case due to accident or severe injury to the body, accidental explosion or fire, when water leaking out, the permit holder of the gems production license or the manager shall report to the ministry or the department of mines within 24 after the event of the accident. Moreover, with **annexure form (5)**, detailed account of the accident shall be reported within a week. A copy of report shall be sent to the ministry of labor in order to take suitable action.
- (b.) The permit holder of the gems production license or the manager as in the above clause (b) except the accident, if a person is absent from work for 48 hours, it shall be recorded in **annexure form (6)**.
- (c) According the above clause (b), a copy of recorded information in the annexure form (6), it shall be sent (7) days after the end of the month to the chief inspector.

Chapter (7) **Allowing inspectors in charge and chief inspect to inspect**

22. The permit holder of gems production license or the manager shall allow the inspector in charge or the chief inspector to inspect. When allowing this, the necessary administration arrangement shall be done when going into the gems concession, testing the soil or inspection works.
23. The permit holder of gems production license or the manager shall not stop or prohibit the chief inspector or inspector in charge in accordance with the above clause 22 when doing the inspection work probation, reject to inspect or disturbing by any ways.

Chapter (8) **Crime and Punishment**

24. Whoever breaches any provision in this notification clauses 2,3,4,7 and clause 9 – sub clause (a), (b), (c), (d) and (k), clauses 11,12,13,15,19,20 and 23, or fail to abide any of the duties, they shall be charged in accordance with Myanmar Gems Law, Law 43.
25. This notification is promulgated based on the decision of (14/99) times meeting of Management Committee of Ministry of Mines held on the 16 of September 1999.

General Ohn Myint
Minister
Ministry of Mines

Letter no 1 sub-group (2) 99 (law)
Date 1999 October 4

Distribution

- The chairman office of State Peace and development council
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- The high court
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- All the ministries
- Director general of the Department of Mines
- All the enterprises and the rest of the departments in the Ministry of Mines
- Managing Director, Press and publishing Enterprise , Myanmar Publishing house, request to include in the announcement .

According to command

(U San Thein)
Head of the office
Ministry of Mines

Annexure form (1)

Registration book for the workers

Date recorded	Name	Worker Number or NRC	Age	Male or Female	Type of work	Shift (or) group	Health certificate number	Working time	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

Annexure form (2)

Underground mine workers registration list

(On the same line with name of incoming underground mine workers, in the column "In" to show it with the cross) (on the same line with the name of outgoing underground mine workers in the column "Out" to show it with the cross)

Duration of work morning start at this hour
Evening

Duration of work	morning	end at this hour
Evening		

Begin on 199 , month , end on 199 , month .

[illegible]

Total number of Underground mines workers –

Notification of working hours

One shift system

Name of concession

Company name

Permit holder name

We would like to inform that the people from the below groups, their names and working hours are followed correctly.

Group	Working hours		Rest time		Weekly off day (if any specification)	Remark
	From	To	From	to		

Manager:
Date:

Notification of Weekly working hours

Rotational shift system

Name of concession

Company name

Permit holder name

We would like to inform that the following group of people, their names and working time are followed starting from 1999 , month () date.

Group	Shift number	Working hours		Next week shift number	Rest time when shift is changed	Remarks
		From	to			
	1				Hour	
	2				Hour	
	3				Hour	
	4				Hour	
	5				Hour	

Manager:
Date:

Notification
of the amendment in the workers' registration book

The following workers have changed their work and for the permanent change of work, it has been registration in the worker's registration book accordingly.

[illegible]

Manager:

Date:

Accident report

Date

To

Chief Inspector

I would like to report an accident happened on the gems concessions

Accident that caused deathAccident that caused severe injuriesAccidental explosion or FlameFireWater leakage

And the following related information.

1. Location of the concession (village, township, district, state/division)			
2. Type gems mined			
3. Name of owners and address			
4. Name / male or female			
Death	Injuries	Age	Job
1.			
2.			
5. Date and time of the event			
6. Place of the event			
7. The reason why this happened			
8. Type of event			
9. Amount of damage			
10. Type of injuries, if death the cause of death			
11. Action taken by owner, representatives and manager			

Owner:

Representative:.....

Manager:

Instruction

- (1) The method how to send the letter –

In the gems concession, near the gems concession, if severe injuries which can cause death occur suddenly or in the gems concession, near the gems concession, sudden explosion, sudden flame, and fire or water leakage happens, the owner or representatives or manager shall call with the telephone or other way communication to the chief inspector immediately. Within 24 hours, with this form, all the accident information shall be filled and sent it to Chief Inspector.

- (2) According to Electricity Law, Law (33), if death is caused by electricity and injured by it, it shall be reported to Myanmar Electricity inspector chief.

