

REHABILITATION AND CLOSURE PLAN
For The
KINGAMYAMBO MUSONOI TAILINGS PROJECT
KATANGA PROVINCE
DEMOCRATIC REPUBLIC OF CONGO

In partnership with:
SRK Consulting (Johannesburg, RSA)

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1 Closure Management Strategy

The purpose of the strategy is to derive the most appropriate option for closure in terms of performance and cost. The development of the strategy is a stepped approach based on:

- understanding of current and predicted future impacts;
- derivation of realistic objectives and targets set to manage identified impacts;
- setting an overall vision for closure;
- identifying and evaluating alternative closure scenarios based upon agreed criteria;
- providing a framework for ongoing consultation with all stakeholders (authorities, employees, communities and others);
- Establishing a system for the ongoing review and updating of the closure strategy and plan based on the above steps.

1.1 Current and future impacts

1.1.1 Environmental Impacts

Anticipated impacts during the life of the operation have been assessed and described in the ESIA. Current impacts at the time of decommissioning will depend on:

- The degree of success of mitigation measures during the operational phase.
- Any process or infrastructural changes that may occur during the operational phase.

In this situation, for closure planning, liabilities must be assumed to be as described in Chapter 5 of Volume 2: Environmental Baseline and as summarised below. Most impacts on the physical environment will no longer persist on closure of the Kingamyambo Musonoi Tailings Project, but those that will are shown in Table 1.1 below.

Table 1.1: Summary of biophysical impacts for the post-closure phase of the project and proposed mitigation measures/management activities required to reduce the significance of these impacts

Aspect/Impact	Significance post-closure	Mitigation/Management
G-2: Exposure of receptors to radioactivity /Potential litigation	Unknown	Address any residual radiation as required by prevailing DRC legislation and international best practice as appropriate. Requirements will be assessed in terms of on-going monitoring throughout the operational life of the mine. Monitor radioactivity levels of plant tailings and monitor background radioactivity levels at tailings dam (conduct a detailed radiometric survey across the proposed tailings dam site) prior to construction and implement an appropriate management plan based on results.
GP-1: Tailings dam failure due to poor design and/or operational management leading to loss of life at Samukonga village	Medium-low	The risk of loss of life amongst the Samukonga villagers in the events of a tailings breach is high enough to recommend the relocation of the village. Once this has happened the risk of significant damage due to a failure in the TSF can be considered low.
S-1: Loss of productivity of soils due to sterilisation	LOW	None. Rehabilitation of tailings dam.
A1- Increase in nuisance and health risks to residents due to increase in ambient dust concentrations	Medium-low	<p>Vegetate the top surface of the tailings dam as soon as is practicably possible after closure i.e. after the surface has dried and it is possible to work on it.</p> <p>Gradually rehabilitate and vegetate mined out footprint areas from the Kingamyambo tailings dam as soon as the area has been mined. However the revegetation must be practical so that it does not interfere with mining activities and at the same time future mining activities will not damage the rehabilitated areas.</p> <p>The present programme of dust monitoring will continue with regular audits and inspections of the equipment and monitoring system.</p>
SW-1a: Pollution of downstream water courses	LOW-MEDIUM	Contain run-off from the tailings dam and other potential sources of contamination. Maintain surface and ground water management programmes to ensure dirty run-off from the tailings dam is collected to prevent contaminated run-off from reaching the water courses. Conduct regular audits of water monitoring programmes.
SW-1b: Pollution of the Muninga stream downstream of the new tailings dam	MEDIUM	Retain the interception drain between tailings dam and Muninga/ Kanamyambo stream to collect contaminated ground water seepage and stop it entering the stream.
SW-3: poorer quality of water discharging to the Nzilo canal and into downstream Musonoi river	MEDIUM	<p>Regular monitoring of water quality and aquatic habitat status in the MusonoiLuilu and Lualaba rivers, upstream and downstream of the discharge points and confluences, and monitoring of water quality in community riparian wells along the river, will continue for the duration of the discharge, and for three years after its cessation.</p> <p>Should unacceptable water quality in any riparian wells be detected, KMT will provide alternate water supplies to the affected communities.</p>
GW-1a: pollution of groundwater resources	MEDIUM-LOW	Monitoring of groundwater should continue at least 5 years after closure, and remedial actions implemented if required.
GP-1b: pollution of groundwater resources in the vicinity of	MEDIUM-HIGH	Control of ground water seepage towards the Kanamwamwa River, to intercept potentially contaminated seepage entering the stream continuing at least 5 years

Kanamwamba river		after closure
GW-6:Reduced groundwater availability due to the restoration of the natural hydrogeological regime in the Musonoi river	MEDIUM-LOW	Monitoring of the situation will be conducted upto 5 years after closure. Should problems emerge; alternative water supplies to affected people will be provided.
F1: Destruction, degradation or fragmentation of natural (terrestrial) habitats	MEDIUM-LOW	Rehabilitation of degraded natural habitats. utilizing as many indigenous species as possible, including cultivation of trees and medicinally useful plants.
F2: Loss of plant and animal biodiversity	LOW	Rehabilitation and revegetation of exposed areas Monitoring water quality and habitat integrity in key affected areas continuing at least 5 years after closure.
F4: Loss of sensitive areas: wetland	MEDIUM_LOW	The dam on the lower Kanamwamba river should be retained and strengthened, The eastern dambo should be monitored when mining of the Musonoi is underway to establish if it is impacted. Should shrinkage and the loss of wetland species in its lower reaches occur, remedial measures will be undertaken. Wetland development will be monitored and should this not occur a habitat creation scheme will be put into place.

1.1.2 Social Impacts

The Kingamyambo Musonoi Tailings Project is a significant initiative in an environment where poverty is pervasive, unemployment is high, social services are limited and infrastructure is largely outdated and in poor condition.

Closure impacts in the socio-economic context are broadly the following:

- Loss of economic benefits to: the government (taxes and royalties); employees; communities; local service providers; and the local economy in general.
- Loss of social benefits in the form of: loss of access to general services (due to loss of income); and loss of access to company provided services (for example health care).
- Mitigation measures have been proposed to address all of these circumstances (Table 1.2). In general the mitigation measures are the following:
- Implementing measures to provide access to alternative employment opportunities;
- Ensuring that local government takes responsibility for infrastructure development and service delivery facilitation;
- Promoting collective and sustainable action to raise general levels of economic activity and service provision;
- Recognising the cumulative social impacts generated by other mining ventures, and linking with these to enhance the continuation of mining-related social and economic benefits.

Table 1.2: Summary of social impacts for the post-closure phase of the project and proposed mitigation measures/management activities required to reduce the significance of these impacts

Aspect/Impact	Significance	Mitigation/Management
SE-1: Jobs, secure livelihoods and employee benefits end with closure.	LOW-MEDIUM	<p>Mitigation of impacts in this context is largely taken up in the Environmental and Social Management Plan (ESMP).</p> <p>KMT will institute life skills and investment training as part of the closure plan. This will be linked to counselling regarding the implications of closure.</p> <p>Information on the life of the mine, its contribution, and the implications of closure will be disseminated locally, via a KMT communication strategy.</p> <p>Closure planning will be undertaken and this will be accountable to KMT management. The function will formulate and implement a closure strategy.</p>
SE-2: Increased disposable income benefits will end with closure.	MEDIUM-HIGH	<p>Mitigation of impacts in this context is taken up in the Environmental and Social Management Plan (ESMP). Some business development initiatives may be taken up in activities under the Community Development Plan</p> <p>During operations KMT will encourage and promote local cooperation around local economic planning and development, and will similarly promote the establishment of a small traders interest group. Both initiatives are to be led by appropriate local structures such as the Office of the Mayor or the Fédération des Entreprises du Congo (FEC).). See notes on mitigation for impact SE-1.</p>
SE-3: Local business opportunities arising from KMT procurement of goods and services. Benefits end with closure.	MEDIUM-HIGH	<p>KMT will clarify and elaborate policies and practices relating to the procurement of goods and services, ensuring fair access to information about tenders and opportunities, and to the work itself. The policy will be implemented in all phases. See notes on local economic development, small trader development and communication around closure above.</p>
SE-6: Increase in business confidence and attraction of investors. Reduction of confidence with mine closure.	MEDIUM-HIGH	<p>KMT public communication will ensure local awareness of investment and operational multipliers, and of local benefits. It will also contain information on the life of mine and the implications of closure. Businesses and investors will have access to this information.</p> <p>KMT will encourage and promote local development planning and small enterprise development, to be led by local government and business interests (see discussion under Disposable Income, above).</p>
SE-15: Payment for services by KMT income earners, improving viability of providers. Loss of payment capacity post closure	LOW-MEDIUM	<p>The proposed social services interest group should address closure implications and appropriate business responses.</p>
SE-17: Increased access to social facilities by salaried KMT employees.	LOW-MEDIUM	<p>KMT will institute a variety of closure mitigation measures aimed at preserving or replacing income (see discussion under Jobs and Livelihoods, above).</p>

Aspect/Impact	Significance	Mitigation/Management
Loss of access post closure		The proposed social services interest group will consider business strategies to deal with closure impacts.
SE-18: Improved employee and community access to health care via KMT facilities. Access ends with closure.	LOW-MEDIUM	The proposed social services interest group will address strategies to deal with post closure impacts. The Community Development Plan and Programme is likely to take up public health issues and initiatives, involving NGOs and other local structures. Sustainability beyond closure is a principle of the CDP.
SE-20: Income to government through payment of taxes by KMT and employees. Income ends with closure.	MEDIUM-HIGH	National impacts of loss of tax income post-closure have to be managed at that level. The proposed promotion of local economic planning will assist in the development of a forum within which stakeholders can discuss loss of tax income and other economic impacts of closure.

1.1.3 Employee Impacts

Employee impacts are addressed in Section 1.1.2 above. Impacts SE-1, SE-2, SE-17 and SE-18 relate specifically to KMT.

1.2 Vision for closure

To ensure a self-sustaining vegetative cover on areas disturbed by mining activities where this is appropriate;

To provide sustainable end land uses in keeping with the needs of local communities;

To ensure economic sustainability for affected communities.

1.3 Objectives and targets

The aim of post-closure site rehabilitation is to make the site safe and stable again and to restore its potential for enabling any activity compatible with existing activities in the region. The post-closure mitigation and rehabilitation measures aim to:

- Eliminate health and safety risks to people;
- Limit the production of substances likely to harm receiving water bodies and, in the long run, achieve a state in which monitoring is unnecessary.
- Restore the site to a condition acceptable to the community;
- Remove infrastructures, excluding the tailings dam and decant pond, to leave a condition compatible with future usage.

As far as possible, closure technologies will be selected which allow 'walk-away', and where this is not possible, 'passive after-care' will be selected over 'active after-care'. As the tailings are not anticipated to be acid generating based on current test work, it is believed that no active care of the tailings disposal facilities will be required in the longer term.

1.4 Consideration of alternatives and assessment criteria

Once the alternatives have been considered according to the criteria outlined above, consultations will be held with key members of the local community including local government, customary authorities and community groups. Their views and aspirations for post-mining land uses will be sought that incorporate realistic, cost effective and sustainable end uses.

The feasibility of different end uses will be considered in terms of:

- Engineering aspects
- Monitoring requirements
- Implications of return periods of, for example, rainfall and flood events
- Reliability of technology
- Capital costs
- Any ongoing costs
- Sustainability of land use

- End uses that may be considered include:
- Industrial development (a single large scale development, or a series of light industrial units using existing infrastructure)
- Housing (in appropriate areas)
- Recreational facilities
- Plantations for fuel wood
- Agricultural land (subject to suitability assessments including the potential for contamination of crops)
- Semi-natural vegetation

It is recognised that land use pressures may change significantly over the life of the project with population growth and technological development of the town i.e. a move away from rural economy.

In the last few years before the mining operations cease, discussions will be held with the authorities and the local population as to the best use for the infrastructure when the mine closes.

Agreements will be reached with the authorities and the local population in this regard, although this will be an ongoing process. The relevant authorities will be contacted through the appropriate channels and their final approval will be sought, as closure approaches.

This procedure assumes the mining activities are decommissioned as scheduled. However, in the event of an early or premature closure, these discussions will need to be initiated immediately the closure decision is taken, either through the Public Liaison Committee or the Kolwezi Foundation (if it has been established and is operating effectively at the time of closure).

1.5 Consultation and communications strategy

The mine will at all times during the operational life strive to maintain a good working relationship with the local population. The plan for ongoing liaison with the community is set out in the Public Consultation and Disclosure Plan (PCDP), although it should be noted that this is a living document and may be updated during the life of the mine.

Some of the Programmes / Plans will have their own consultation and communication provisions (for example the Community Development Plan and the Land Acquisition and Compensation Plan). For the purposes of general communication with stakeholders and the broad public KMT will undertake the following measures:

- Development and implementation of a corporate communication strategy, which will include a newsletter and regular radio slots. Activities under the strategy will continue throughout the operational phase and into the closure phase. The strategy will build on the foundation of the Stakeholder Engagement Plan (SEP) .
- Regular information sessions with the Office of the Mayor (also continuing throughout the operational phase and into the closure phase).

- Establishment and facilitation of a Public Liaison Committee (PLC). The role of the PLC is to provide a forum for interaction between stakeholders and the management of KMT. It will be managed through the HSEC (Health, Safety, Environment and Community Relations) function of KMT, and will address relationship matters not taken up by internal HR forums, or by the structures of the Kolwezi Foundation. In this context, the PLC will be a primary tool for the KMT external communication strategy, and will play a key role in conveying information about closure.

1.6 Reviewing and updating

This Conceptual Plan will be reviewed every 5 to 7 years during the proposed 23 year life of the mine, and will include a schedule for closure activities, an assessment of land use needs, the adequacy of closure funding, and available technologies for the disposal and treatment of difficult materials. It will also review the suitable available disposal sites for different materials, such as waste oils, concrete, structural steel and contaminated pipe work, tanks etc, from the SX-EW plant, within the DRC. This will be informed by the Waste Management Plan (Annexure G) which will be developed for the construction and operational phases of the project. Where necessary such facilities will be inspected for their suitability and capacity as part of the review of the Closure Plan. Existing KMT waste disposal facilities will remain open during the closure phase.

In order to make provision for the less likely event of early or premature closure, it is important that the initial conceptual Closure Plan is formulated in the first few years of the life of the Project to provide a sound basis for the decisions that would need to be taken at that time, and the activities required to achieve orderly and responsible closure and after-care.

2 Closure Management Plan

This section outlines the preferred closure activities for each operational area and facility. It links to the objectives and targets provided in Section 1.1.5 and explains why the particular closure option was chosen in preference to the other alternatives identified. Lastly it provides the detailed cost estimate for each area. This plan covers the regulatory requirements for articles 95 to 124 of the Mining Regulations.

The proposals in this section should be seen as being of a preliminary nature. The project is expected to have a life of approximately 23 years and many things are expected to change in that time which will influence the final proposals. Further investigative work and rehabilitation trials will be carried out. Ongoing rehabilitation will be carried out at the tailings dam and other areas as appropriate and lessons will be learned. There could be legislative changes and it is also anticipated that new technology will become available.

Towards the end of project life, around year 18, a more detailed assessment of such issues will be made, including a public consultation process, to establish land use requirements and possible after uses of buildings, infrastructure such as roads, railway lines, power lines, sewage treatment facilities etc. Acceptable hand over procedures can then be developed for these facilities at closure, which will include maintenance requirements and ongoing environmental control.

The Closure Plan will also include the details of monitoring and maintenance which will be required during the closure phase and post-closure. As far as possible, this will follow the monitoring network which is currently established and which will continue during operations. Monitoring will cover, *inter alia*, groundwater and surface water quality at selected points, dust deposition, erosion and run-off and reclamation success.

2.1 Rehabilitation

2.1.1 Objectives of rehabilitation

- Develop the final post closure land uses in conjunction with local communities¹.
- Ensure that all areas disturbed by mining or quarrying activities (i.e. tailings dam, plant, aggregate quarries etc.) are revegetated utilizing as many indigenous species as possible including cultivation of trees and medicinally useful plants.
- In order to minimise soil erosion and wind blown dust and establish the former vegetation of the site as far as possible, if this is deemed an appropriate end use at the time.
- Ensure a self-sustaining vegetative cover (six years after its establishment) requiring no further soil improvement.
- Where revegetation cannot occur, it needs to be demonstrated that rehabilitation objectives can be met.

2.1.2 Kingamyambo mining area

This site currently consists of the old Kingamyambo tailings dam which will be re-worked and removed during the life of this project. This will ultimately leave the already contaminated footprint to be rehabilitated in some twenty five years time.

¹ It is anticipated that the demands and needs for various land uses will have changed by the time the final closure plan is developed in detail (approximately 8 years before closure). The population of the greater Kolwezi area will almost certainly have increased substantially in 23 years time, so there may be additional pressures on land for housing, industrial (non mining) uses, fuel wood and food production as well as infrastructure developments. Therefore the suitability of the land for various purposes needs to be considered as a basis for the future closure plan, as a tool for allocating the most suitable areas for particular uses.

It will be possible to determine the level of contamination in the soil only once the complete dump has been removed. Experience with many gold tailings deposits which have been re-worked in South Africa suggests that contamination levels likely to be encountered could be readily rehabilitated. However, some test work and trials will be required before the best methodology can be determined.

In the absence of detailed information on site specific conditions, conservative measures which are considered likely to be successful have been proposed. Activities allowed for in the cost estimate include erosion control, ripping, ploughing and harrowing, application of lime, chemical and organic fertilisers and covering the site with a layer of soil, or soil-forming materials, prior to the establishment of vegetation.

It has been noted that trial work will be conducted over the life of the project. One of the aims of this trial work will be to identify suitable species for use in the rehabilitation programme. In particular the programme will aim at finding indigenous species and particularly local species. Experience has shown that, once a stable cover consisting of two or three indigenous species can be established, a process of plant succession is set in motion which will ultimately lead to a vegetation cover consisting of a set of species similar to those which occur in adjoining areas.

The site will be revegetated using the most suitable methods as identified by the various investigations and trials undertaken over the life of the mine. Following revegetation the site will be monitored to confirm the satisfactory progress of the programme. Should any areas be identified where additional treatments are required, the appropriate remedial actions will be taken. It is anticipated that within 3 to 5 years a sustainable vegetation cover will have been established, where this is appropriate.

It can be assumed that both the groundwater and the soil have been contaminated at the Kingamyambo site. High levels of copper and cobalt were identified in the ground water in the baseline study. In this case it must be recognised that the contamination is due to historic activities on site and that the current project will in fact be removing the source of contamination. The contamination is likely to have percolated throughout the full extent of the weathered zone both beneath the dump and for some distance adjacent to the dump. It is planned voluntarily to undertake further remedial action to mitigate the impact of this legacy. After the removal of the tailings from the Kingamyambo site the soil and groundwater may remain contaminated for many years to come.

2.1.3 Musonoi mining area

The Musonoi tailings deposit fills the valley of the Musonoi River. It is the intention of this project to remove these tailings and re-process them. At the northern end the Kasobantu Dam retains the tailings in the valley and forms a water body. The Musonoi River will return to being a conventional watercourse and should the Kasobantu Dam remain at its current level, the river valley will become a lake and the site will subsequently not require any revegetation. Should the dam overflow be retained at a lower level than at present, such as the level which will be maintained during mining of the tailings in the Musonoi, the lake will be smaller. There will therefore be land around the margins of the area, currently covered with tailings, which will become available for reclamation.

2.1.4 Plant area and linear Infrastructure

The plant will be designed and operated in such a way as to ensure that soil contamination does not occur. However, at closure an investigation will be carried out to confirm that no contaminated soils exist. Should any contaminated soils be found these will be appropriately dealt with in accordance with DRC and IFC regulatory requirements.

Prior to closure negotiations will be held with the authorities and the local population to identify the best possible post-mining use for the infrastructure. Negotiations will be held to make necessary arrangements to transfer useful infrastructure to new owners. It is anticipated that much of the plant infrastructure will be of no further use and will need to be demolished and removed from the site.

Once demolition is complete a further survey will be conducted to identify any additional contaminated areas that emerge once infrastructure is removed and if identified these areas will be remediated in accordance with DRC and IFC regulatory requirements.

The site will be rehabilitated using the most suitable methods as identified by the various investigations and trials undertaken over the life of the mine. Following rehabilitation the site will be monitored to confirm the satisfactory progress of the programme. Should any areas be identified where additional treatments are required appropriate remedial actions will be taken.

It is anticipated that within 3 to 5 years a sustainable vegetation cover will have been established, where this is appropriate.

2.1.5 Tailings Storage Facility (TSF)

The proposed rehabilitation, closure and aftercare measures for the Kolwezi TSF are described below in terms of the current and proposed post-closure land use and the works to be carried out. Estimates of the costs associated with those works and the financial provisions that will be required for closure are presented in subsequent sections.

The development of the conceptual closure plan and implementation strategy for the Kolwezi TSF has taken place in the context of the proposed post-closure land use for the areas disturbed by mining and related activities, FQM's commitment to best practice environmental management, the accounting policies applicable to listed entities, and the key environmental issues as identified during the EIA process.

Closure of the tailings dam will follow international best practice. The sides of the new tailings dam will be rehabilitated in an ongoing manner during the life of the operation. Experience gained during this operation will be used to design the most suitable plan for the remaining top section of the tailings dam.

Following closure the penstock will be sealed. A drainage channel will be constructed in the north western corner of the dam in order to remove all runoff water from the dam. The top of the dam will then be covered with a layer of soil approximately 300 mm thick.

The site will then be revegetated using effective methods and species.

Environmental Issues

The key environmental risk issues related to the rehabilitation, closure and aftercare of the TSF include:

- The potential for surface and groundwater contamination due to the geo-chemical characteristics of the tailings product;
- The potential contamination of surface water and soils due to uncontrolled runoff from the facility;
- The potential for the erosion of exposed tailings and / or cover soils leading to long term structural instability of the TSF and contamination of the surrounding environment;
- The potential contamination of groundwater resources in the vicinity of the TSF due to excessive infiltration of rainfall into the facility and subsequent groundwater recharge;
- The potential safety issues associated with access to the facility by people unaware of the dangers associated with facilities such as penstocks;

- The potential aesthetic impact of the facility on its surrounds.

In the context of the Kolwezi TSF the main issue of concern is that of ensuring that the facility is able to withstand the effects of the intense rainfall in the area which, together with the nature of the soils available for use as cover material, will make the facility vulnerable to erosion. Close attention will be paid to the management of runoff from the facility. The potential use of the TSF for agricultural activity after closure is also of concern and will be discouraged.

The design of the facility has been based on information supplied by the compilers of the project ESIA which indicate that the geochemistry of the tailings product is not expected to result in the generation of acid leachate. Based on the information supplied it has not been deemed necessary to line the footprint of the TSF. Should it be found that the tailings product does produce an acidic leachate it will be necessary to amend the cover design to incorporate the inclusion of an engineered moisture retention layer to control the rates of oxidation of the tailings.

The rehabilitation, closure and aftercare process

The proposed rehabilitation, closure and aftercare process for the Kolwezi TSF is described in terms of the activities that will take place during the development, operation and closure of the facility to ensure its successful rehabilitation and closure, regardless of whether the closure is scheduled or premature.

Progressive rehabilitation

The ongoing rehabilitation of the TSF during the construction and operational phases is important in that it reduces the project's overall liability for rehabilitation, while at the same time reducing the environmental impacts associated with the facility and enabling the refinement of the proposed methods of rehabilitation and closure. Ongoing rehabilitation of the facility will also enable improvements in the accuracy of estimates of the costs of rehabilitation, closure and aftercare as time progresses.

Rehabilitation activities that will be carried out concurrently with the development and operation of the facility will include:

- The stripping of sufficient soil from the footprint of the facility to enable the placement of a soil cover to the outer slopes and top surfaces of the facility;
- The placement of a mixture of soils and selected waste materials to the outer slopes of the starter embankments during the construction phase in preparation of the establishment of vegetation to the slopes;
- The supply and hand planting of vegetation to the outer slopes of the starter embankments to assist in the prevention of erosion of the slopes;
- The aftercare and maintenance of the cover layers and vegetation.

The nature of the available soils likely to be stripped from the footprint of the TSF requires that they are protected against erosion. This will be done by a combination of mixing with selected waste material and the establishment of vegetation to the cover. The mixing of soil with material of a gravel/rocky nature has been found to be effective in improving the erosion resistance of cover layers to sloped areas. The establishment of vegetation to the side slopes of the facility could be done by hand planting, seeding or hydro-seeding and should comprise a mixture of grass and shrubs. The most effective method of covering and vegetation establishment will be arrived at during the operational life of the facility by a process of trial and error. The vegetation used in the establishment of the vegetative cover will all be indigenous and should not require irrigation.

Closure activities at cessation of operations

At the cessation of operation of the TSF the focus will be on the completion of the cover and vegetation of the sides and top surface of the facility, the decommissioning of facilities associated with the TSF and the construction of stormwater control measures as required. Specific activities that will be carried out will include:

- Cover and re-vegetation of the last slope areas, which will always lag slightly behind the development of the TSF;
- The dismantling and removal from site of all pipes and supports associated with the slurry delivery and return water systems;
- The decommissioning and plugging of all penstock inlets and outfall pipes;
- The construction of stormwater decant points to the TSF basin. The decant points will be located so as to control the rate of decant from the basin and will be constructed along the up-gradient side of the facility to minimize the flow velocities associated with the decanting process. The spillways will be designed to accommodate the peak design flows from the facility area and will be rock and/or concrete lined.;
- The placement of a vegetated cover to the basin of the TSF basin; and
- Minor earthworks to drains, roads, silt trap dam, trenches etc.;

The duration of the final closure process may be affected by the length of time required for the basin of the facility to dry sufficiently to enable the placement of cover material in preparation for the vegetation establishment.

Aftercare and maintenance requirements

On completion of the final rehabilitation and closure works an aftercare and maintenance program will be required to assist in ensuring that the closure measures are robust, have performed adequately and that no further liabilities arise. The aftercare period is normally not less than 5 years but can extend into decades depending on the physical and chemical characteristics of the facility. The aftercare and maintenance program for the Kolwezi TSF is expected to include:

- Periodic inspection of the cover and vegetation for signs of erosion damage and failures of the vegetation establishment process;
- Repairs and amendments to the closure works as necessary;
- Re-planting of areas of vegetation where required;
- Periodic inspection and monitoring to confirm the effectiveness of the closure works in achieving the stated closure objectives, including:
 - Collection and analysis of ground and surface water samples;
 - Measuring of phreatic surfaces within the TSF and assessment of the overall structural stability of the facility;
 - Inspection of stormwater decant facilities for signs of damage.

The maintenance requirements for the facility should decrease with time and should be confined to minor earthworks to repair erosion damage and upgrade facilities as required, as well as replanting of areas of vegetation damaged due to erosion.

Stability of the tailings dam

- The tailings dam will be designed according to acceptable stability standards which are in compliance with DRC and IFC regulatory requirements.
- The decant pond and storm water dam will also be designed and built according to acceptable stability criteria.
- All facilities will be maintained in good condition throughout the life of the project. Possibly the main area of risk throughout the operational phase will be the position of the phreatic surface within the dam. The phreatic surface will be carefully monitored by means of piezometers which will be installed at strategic positions. Deposition of tailings on the dam will be managed in such a manner as to ensure that the phreatic surface remains within an area where it does not threaten the stability of the dam in any way. Following closure, once water is no longer being placed on top of the dam, the phreatic surface will slowly recede. With time the stability of the dam will increase. However, there will be some seasonal fluctuations in the phreatic surface due to changes in rainfall seasons.
- Drainage on the surface of the tailings dam will be constructed after closure to ensure that water is not ponded on the surface. This will minimise the risk of any significant rise in the piezometric surface.
- Following the closure of the dam stability monitoring will continue for a period of approximately 5 years and until an appropriately qualified and experienced engineer has attested to the long term stability of the dam.
- Following closure the entire dam will have been covered with a layer of soil and all rainfall runoff from the dam can be considered to be clean water if the topsoil is still in place.
- The results of Acid Based Accounting (ABA) tests on the existing tailings indicated that there is currently no potential for significant production of acid (which results in acid drainage) from the oxidation of the tailings material.
- An underdrainage system will be installed to minimise seepage to the ground water system. Water collected in the drainage system will be stored in the storm water dam prior to being utilised in the process water system, prior to being treated for as long as required and discharged. Discharge will likely only occur during the rainy season after closure.
- The tailings will be geochemically stable and once the tailings delivery water is stopped at closure, the pore water in the tailings will progressively improve in quality. Water treatment required during operations will also be required during the closure period but will not be required in the longer term.

Water and waste management of the tailings dam post-closure

- On closure the penstock (decant tower) will be sealed and a channel will be constructed in the north western (lowest) corner of the tailings dam to remove rainfall runoff water. This channel will be designed and constructed in such a manner as to ensure that it does not erode and design will be in compliance with international best practice and DRC regulatory requirements. Seepage water will be collected in the stormwater dam.
- Supernatant quality is anticipated to meet the requirements of the DRC Mining Regulations and also the WBG guidelines.

2.1.6 Quarries

Two possible quarry sites have been investigated as part of the DFS, a former aggregate quarry which has undergone natural regeneration, and a new site. The exploration licences are, and any exploitation licences will be, owned by Roan Prospecting and Mining (RPM), a wholly owned subsidiary of FQM. Separate environmental documentation will be prepared to cover these facilities, but as they are likely to be used only during the construction phase, their closure will take place early in the project life. Therefore it is useful to consider their closure briefly here.

The old existing quarry is partly overgrown with vegetation and this appears to have happened naturally. The quarry site will not be as easily rehabilitated as the tailings dam. The flat rock areas (benches) below the steep rock faces may be ripped or shallowly blasted or covered with a thin layer of soil or quarry fines and re-vegetated, but on the steep bare rock faces this will not be possible. It may be possible to plant trees at the tops of the faces and together with the re-vegetation at the base of the rock faces, the impact could be minimized. Some restoration blasting may be appropriate if the faces are very high and/or unstable.

All quarry equipment will be removed and disposed of as appropriate (sold for use or scrapped) and any remaining stockpiles of graded material removed or levelled. Any soils contaminated as a result of the use of fixed plant, such as crushers and graders, will be restored as described below. Any fencing will be dismantled and reused or disposed of and the access road ripped and reclaimed.

2.2 Restoration of contaminated soils

2.2.1 Objectives

- Ensure that soils and land contaminated by the project activities (excluding the tailings dam and decant pond which are permanent structures) are not harmful to health and the environment after closure and they are compatible with future utilisation;
- Establish the necessity for mitigation and rehabilitation of contaminated soils post-closure by undertaking the following characterisation during the definitive cessation of mining activities:
- Determine the contamination level (and whether this exceeds the parameters described in Article 98 of the DRC Mining Regulations);
- Locate contamination more accurately and determine its spatial distribution;
- Establish the volume of contaminated soil according to each type of contaminant².
- Establish intervention objectives, as required, and the necessary mitigation measures undertaken.
- The only area where contaminated soils are anticipated is the already contaminated Kingamyambo site, Musonoi River and plant area. During the life of the mine all operations in the plant area will be carried out on concrete floors where suitable in order to prevent contamination of soils occurring in these areas.
- Once the existing tailings have been removed from the Kingamyambo tailings site (and the original substrate exposed) soil samples will be collected and analysed to determine whether there are any contaminant levels which may preclude the establishment of a satisfactory vegetation cover.³

² Where contaminated soil is the same as the final tailings, this could be deposited on the tailings dam.

³ A comprehensive detailed characterization of the entire site is not considered necessary as the contamination is expected to be of a very uniform nature. Differences may however be related to different soil forms. If significantly different soil forms are found to be present, these will be sampled separately.

- Results of soil analyses will be used to design a series of vegetation trials including the identification of suitable local plant species and the most appropriate method for their establishment.
- Following removal of the tailings material specific *in-situ* remedial measures may be required to render the soils suitable for sustaining a stable vegetation cover.
- Temporary erosion control measures will be constructed if necessary to protect the area while re-vegetation trials are being conducted.
- The site will be thoroughly ripped to a depth of approximately 500 mm in order to loosen the soil which may have been compacted by the tailings dam.
- The soil will be appropriately treated with fertilisers, or soil conditioners selected to ameliorate any site specific conditions which might exist. These treatments will be ploughed in and be thoroughly mixed with the soil.
- The site will be covered with a layer of soil, the thickness to be determined after investigation and trials.
- Following revegetation the site will be monitored to confirm the satisfactory progress of the programme. Should any areas be identified where additional treatments are required appropriate remedial actions will be taken. Progressive soil investigation and rehabilitation will be undertaken where practicable.
- It is anticipated that within 3 to 5 years a sustainable vegetation cover will have been established.

2.3 Waste water and waste management of the remainder of the site post closure

- All sanitary facilities, including the sewage plant, will be rehabilitated post-closure in accordance with DRC regulatory requirements as stipulated in Article 120 of Annexe IX of the Mining Regulations and in line with international best practice.
- During the operational phase of the operation fuels and oils will be stored in appropriately lined and bunded above- ground facilities. The system will be appropriately operated and maintained. In the event of any significant accidental spillage the extent and severity of the spillage will be investigated and suitable remedial measures will be implemented. Suitable remedial measures could include containment, removal of spillage to a mine waste disposal site or in situ remediation.
- On closure all unused fuel and oil will be returned to the supplier. Old used oils will be sent to an authorised recycling company or re-use at site. The storage facilities will be dismantled and any residual soil contamination will be remediated.
- Any dangerous wastes will be treated and/or disposed of in accordance with the applicable regulations. Solid wastes produced during the life of the operation will be disposed of in one of the two onsite disposal sites. These are the general waste site and the lined waste site. It is expected that these sites would remain operational until rehabilitation of the site is complete before they are finally completely rehabilitated.

2.4 Removal of infrastructure

- Any surface buildings and infrastructure which are no longer required will be demolished, unless specific directives to the contrary are received from the authorities. Such directives may result from communities requests.
- Foundations will either be removed or will be covered with a layer of soil, or soil forming material, the depth to be determined following trials to be undertaken.
- Non-re-useable materials including rubble and waste will be disposed of at suitable sites in accordance with the waste management and disposal plan which is in practice at the operation.
- Following the removal of the infrastructure a soil contamination assessment will be undertaken and remediation and revegetated.
- Support infrastructure buried underground such as tanks and their pipes, other pipes and service tunnels will, depending on the proposed future use of the site, either be kept as is or be unearthed and removed from the site.
- Remaining openings and access ways of support infrastructure will be blanked.
- The mine will supply a plan indicating the location of any remaining infrastructure.
- Agreements will be reached with the local population and the authorities regarding which roads and railway lines should remain. The relevant authorities will be contacted through the correct channels and their approval will be sought.
- Any roads and railway lines which will no longer be required, will be rehabilitated as described below:
- Bridges, culverts and ducts will be removed where they are no longer required;
- The natural water flow will be restored and any disturbed section of the watercourse will be stabilised and revegetated;
- The road surface, shoulders and embankments will be graded to a slope suitable to prevent erosion. Cuttings will be assessed and where necessary measures to improve safety and erosion stability will be implemented.
- Electrical equipment and infrastructure such as transmission towers, electric cables and transformers which are no longer required will be demolished and removed from the site. The soils in the vicinity of transformers will be assessed for contamination and appropriate decontamination measures will be implemented, if necessary, in accordance with DRC and IFC regulatory requirements.
- All disused mining plant and equipment such as winches, pumps and conveyors, concentrator equipment such as, thickeners, and heavy machinery in particular motor vehicles will be removed from the site. It is not anticipated that any of this machinery or equipment will be contaminated. However, the mine will confirm this before any machinery or equipment is removed from the site. If any of the machinery or equipment is found to be contaminated it will be appropriately decontaminated before being removed.
- During the mitigation and rehabilitation works, particular attention will be paid to the places where equipment will be parked. The mine will assess these sites and if the soils are contaminated appropriate remedial measures will be taken in compliance with DRC and IFC regulatory requirements.

- The water storage reservoirs at Kingamyambo and the plant will be rehabilitated. All associated infrastructure such as pump stations and pipelines will be removed. Any contaminated sediments found in the dams will be removed to the tailings dam. The earth embankments will be graded to fill or partially fill the dam basin. Once grading is complete the land form will closely approximate the pre-mining land form.
- The site will be revegetated in the same manner as applied to other areas, subject to the condition of contractors on site.
- There will be two waste dumps (landfills) on site. One will be for general waste and the other will be a lined dump for potentially contaminating wastes. The designs of these dumps have not yet been finalised, however the design principles described below will apply.
- The dumps will be designed according to generally acceptable environmental standards and in compliance with DRC and IFC legislation. The dumps will be well managed at all times and wastes deposited will be covered in an ongoing manner. On completion of the land fills the covers will be completed and the revegetation of the cover will be completed. The slopes of the dumps will be designed to ensure that erosion is properly controlled at all times and stability of the slopes ensured.

2.5 Budget and Accounting Policy

In terms of standard accounting and reporting practices applicable to listed entities, FQM is required to recognize a provision for the restoration, rehabilitation and environmental costs arising from damage caused by the development and ongoing production related activities associated with the project. Accounting standards make a distinction between decommissioning costs and restoration costs as follows:

- Decommissioning costs are those costs which must be incurred to make good the environmental damage caused at the pre-production stage: and
- Restoration costs which are those costs related to making good damage associated with the ongoing operation of the project.
- The estimate of rehabilitation, closure and aftercare costs documented in this report has been structured to distinguish between works that will be carried out during the development, operation, closure and aftercare phases of the TSF. By tracking progress in the development of the TSF and also in the execution of rehabilitation and closure works it will be possible to calculate, at any point in time, the current and life of mine liability for closure of the facility where:
- The current liability is based on the TSF layout and associated environmental damage as it stands at the date of the assessment and is in essence the aggregate of the decommissioning costs as described in the accounting policies and the accrued restoration costs;
- The life of mine liability is the aggregate of the current liability and the additional liabilities that are expected to be incurred during the remainder of the productive life of the TSF.

The estimated costs of the mitigation and rehabilitation plan have been summarized in Table 2.1 below, assuming that closure is as projected, at the end of the 23-year project. These costs have been prepared by SRK by personnel familiar with costing mine closure in Africa. This shows the main tasks associated with closure such as demolition, preparing land for rehabilitation and carrying out revegetation where appropriate. The costs of items such as demolition and revegetation include all associated costs such as staff costs, materials, waste disposal etc. as it is assumed that these will be carried out by contractors. It also shows the present day estimated costs of ongoing monitoring for dust, surface water and groundwater quality for up to 5 years after cessation of operations. A cost has also been included for an environmental department to continue carrying out monitoring and associated activities, but this will be with a reduced staffing.

Table 2.1: Budget for the mitigation and rehabilitation plan of the site

Activity	Amount USD
KINGAMYAMBO TAILINGS FACILITY	
Soil ripping	26,500
Placing soil cover	732,000
Temporary erosion control prior to re-vegetation	42,500
Dust monitoring USD 10,000pa for 5 years	53,000
Surface water monitoring for 5 years	26,500
Re-vegetation of soil layer	806,500
Demolition of infrastructure	10,500
MUSONOI TAILINGS	
Surface water monitoring for 5 years	53,000
Re-vegetation	469,000
PLANT SITE	
Placing top soil	16,000
Surface water monitoring for 5 years	37,000
Ground water monitoring for 5 years	26,500
Erosion control measures	16,000
Demolition of plant	5,198,500
Re-vegetation	127,500
NEW TAILINGS DAM	
Dust monitoring for 5 years	16,000
Surface water monitoring for 5 years	21,000
Groundwater monitoring for 5 years	13,000
Sealing penstock	48,000
Drainage canal to remove water from top of dam	106,000
Evapotranspirative cap	2,055,000
LINEAR INFRASTRUCTURE	
Dust monitoring for 5 years	16,000
Demolition of all infrastructure	755,500
ENVIRONMENTAL MANAGEMENT	
Maintain reduced environmental staff, transport, consultants and sundries	265,000
TOTAL	10,936,500

The Closure Plan will be developed in more detail as described in Section 2.1 above during the detailed engineering phase. This will include a schedule of activities, details of the procedures to be carried out and monitoring requirements. This plan will be reviewed at regular intervals as described although it is suggested that for a project designed to last 23 years, that a review every 6 months would be unnecessary. A review every 5 years would still ensure that the Plan is reviewed up to 4 times during the life of the project. Any change to, or new development associated with the project as it is currently proposed, would automatically trigger a revision of the Closure Plan and its budget to ensure that sufficient funds are available to cover any additional costs.

The Closure Plan will be reviewed regularly and this will include an assessment of costs and of the adequacy of the rehabilitation fund. This fund will be accrued according to the requirements of the table in Annex II, Chapter III, Article 12 of the Mining Regulations, and using one of the methods specified in Article 7 (Table 2.2). The financial guarantee for the rehabilitation of the environment as per the conditions of Annex II on Financial Guarantee for the Rehabilitation of the Environment (Mining Regulations) is outlined in Table 2.2 below. KMT will notify DPEM of its choice of funding guarantee at least 10 working days prior to the date on which the annual payment to the fund is due.

Table 2.2: Annual instalments (US\$) per portion of 1US\$ assessed for rehabilitation and restoration, showing the financial surety for rehabilitation of the environment

Duration of activities (year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Portion per year	-	-	-	0.008	0.025	0.041	0.058	0.074	0.091	0.107	0.124	0.141	0.157	0.174	-
US\$ per year				87492	273413	448396	634317	809301	995222	1170206	1356126	1542047	1717030	1902951	
US\$ Cumulative					360905	809301	1443618	2252919	3248141	4418347	5774473	7316520	9033550	10936500	