KCGM

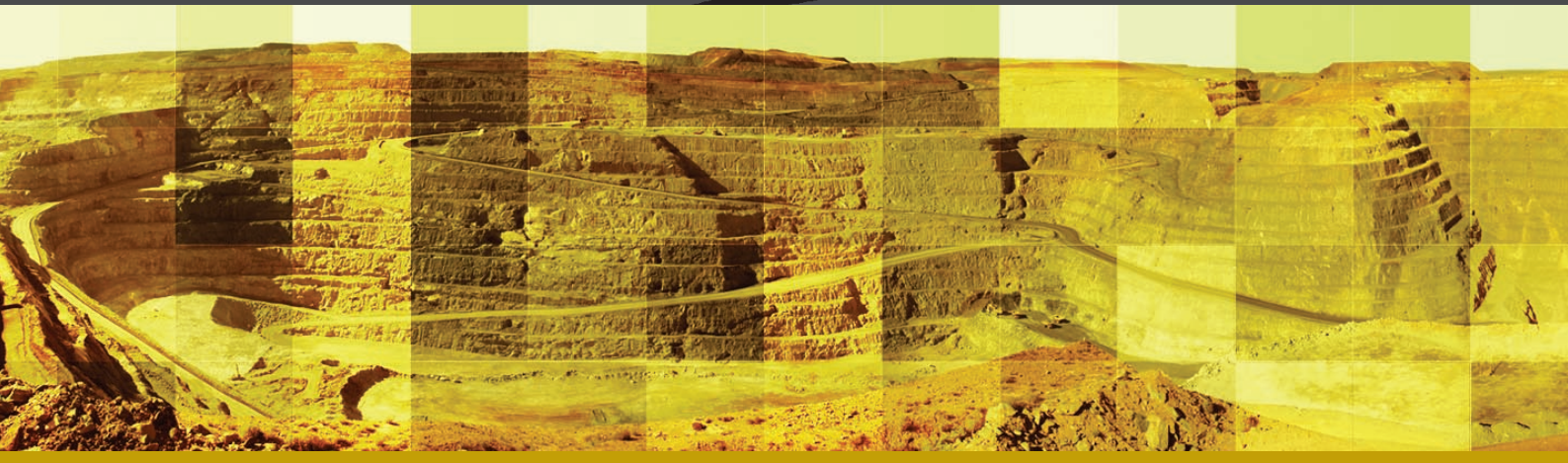
PUBLIC ENVIRONMENTAL REVIEW

FIMISTON GOLD MINE OPERATIONS EXTENSION (Stage 3) AND MINE CLOSURE PLANNING

SEPTEMBER 2006

FOR KALGOORLIE CONSOLIDATED GOLD MINES PTY LTD

ENVIRON



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FIMISTON GOLD MINE OPERATIONS EXTENSION (Stage 3) AND MINE CLOSURE PLANNING

for

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Ref: KCGM Fimiston Open Pit Extension PER Sept 06.doc
September 2006

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Invitation to make a submission

The Environmental Protection Authority (EPA) invites the public to make a submission on this proposal.

Kalgoorlie Consolidate Gold Mines Pty Ltd (KCGM) proposes to undertake an extension of the Fimiston Open Pit located 600 km east of Perth, on the eastern boundary of the City of Kalgoorlie-Boulder. The extension will include a westerly cutback (known as the 'Golden Pike Cutback'), the creation of additional waste rock dumps and provide additional tailings storage capacity for the Fimiston Operations. This Project also outlines KCGM's commitment and strategy for mine closure currently scheduled for 2017. In accordance with the *Environmental Protection Act*, this Public Environmental Review (PER) has been prepared which describes the proposal and its likely effects on the environment. The PER is available for a public review period of 8 weeks from 4 September 2006 closing on 30 October 2006.

Comments from government agencies and from the public will assist the EPA to prepare an assessment report in which it will make recommendations to government. If you are able to, the EPA would welcome electronic submissions in particular, emailed to the project assessment officer or via the EPA's Website (see address below).

Where to get copies of this document?

Printed copies of this document may be obtained from KCGM's Super Pit Shop at 2 Burt St, Boulder or from Danielle van Kampen at KCGM:

Black Street
PMB 27
Kalgoorlie WA 6433
Tel: 08 9093 3488

Copies may also be obtained from www.superpit.com.au

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Electronic submissions will be acknowledged electronically. The proponent will be required to provide adequate responses to points raised in submissions. In preparing its assessment report for the Minister for the Environment, the EPA will consider the information in submissions the proponent's responses and other relevant information. All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence subject to the requirements of the *Freedom of Information Act*, and may be quoted in full or in part in each report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in this PER. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal more environmentally acceptable.

When making comments on specific elements of this PER:

- clearly state your point of view;
- indicate the source of your information or argument if this is applicable;
- suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- refer each point to the appropriate section, chapter or recommendation in this PER;
- if you discuss different sections of this PER, keep them distinct and separate, so there is no confusion as to which section you are considering;
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name;
- address;
- date; and
- whether and the reason why you want your submission to be confidential.

The closing date for submissions is: 30 October 2006

The EPA prefers its submissions to be sent electronically. You can either email the submission to the following address:

eia@dec.wa.gov.au

OR

use the submission form on the EPA's website:

www.epa.wa.gov.au/submissions.asp and click on the EIA Assessment Submission option

OR

You can post your submission to:

The Chairman
Environmental Protection Authority
PO Box K822
PERTH WA 6842

Attention: Kirsty Quilan

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EXECUTIVE SUMMARY

Introduction

Kalgoorlie Consolidated Gold Mines' (KCGM) Fimiston Operations are located immediately east of the City of Kalgoorlie-Boulder in the Goldfields Region of Western Australia, approximately 600 km east of Perth. KCGM is the largest gold producing operation in Australia with an annual gold production in 2005 of about 834,000 ounces (26 tonnes) and is supported by an estimated gold reserve of around 10 million ounces. KCGM has the ability to maximise the potential of the Golden Mile resource through the development of the Golden Pike orebody and thereby extending the life of the Fimiston Open Pit (also called the Super Pit) operations in Kalgoorlie-Boulder for an additional five years.

KCGM proposes to mine a cutback along part of the western edge of the Fimiston Open Pit, referred to as the Golden Pike Cutback. This will allow for both the widening and deepening of the pit and will extend the life of the mine from 2012 to 2017. The Project will also require additional areas for the storage of waste rock and tailings.

This PER has been prepared in accordance with the EPA guidelines for *Preparing a Pubic Environmental Review / Environmental Review and Management Programme, Version 2, November 2004* and the Project's Scoping document approved by the EPA on 9 February 2006. This PER is intended to allow the public to review the potential environmental impacts of the Project and the proposed management measures made by KCGM.

Project Description

The Fimiston Operations Extension Project has been separated into three distinct stages to enable KCGM to meet current and future operational requirements in a structured and timely manner. The three stages are outlined below:

- Stage 1: Environmental Noise Bund Realignment and Loop Line Railway Access;
- Stage 2: Fimiston II TSF Height Increase; and
- **Stage 3: Fimiston Operations Extension and Mine Closure Planning.**

Stage 1 has been approved and Stage 2 is currently progressing through the regulatory approval processes. Stage 3, the Fimiston Operations Extension and Mine Closure Planning (the Project) is the subject of this PER. To ensure the continued economic viability of the operation it is important that mining as part of Stage 3 commences no later than 2008.

Table E1 outlines the key characteristics of the Fimiston Operations Extension and Mine Closure Planning Project (Stage 3). Characteristics of the current operation that will remain unchanged from the Project include power consumption, water consumption, the storage capacity of fuels, and the provision of ancillary services.

Table E1: Project Key Characteristics

ELEMENT	DESCRIPTION
General	
Project Life	Additional 5 years open pit mining to 2017
Mining Production Rate	Up to 89 Mtpa
Milling Production Rate	Up to 13.5 Mtpa
Mining Operation	7 days/wk 365 days/yr
Fimiston Open Pit	
Golden Pike Cutback	As shown on Figure 3
Final Pit Depth	Approximately 600 m deep (-670 mRL)
Waste Movement	
Northern Waste Rock Dumps	14.6 million m^3
In-Pit Backfill	26.8 million m^3 (covering 57 ha)
Tailings Storage Facilities (TSFs)	
Option 1	
Fimiston I TSF	Height increase from 40 m to 50 m
Fimiston II TSF	Height increase from 45 m to 60 m
Option 2	
Fimiston I TSF	No further height increase (i.e. 40 m)
Fimiston II TSF	No further height increase (i.e. 45 m)
Kaltails TSF	Height increase from 25 m to 45 m
Ground Disturbance Area	
Golden Pike Cutback	46 ha
Northern Waste Rock Dumps	115 ha
Workforce	Existing workforce (approximately 725 employees and full time contractors)
Accommodation	Existing residences in Kalgoorlie-Boulder

Golden Pike Cutback

KCGM intends to undertake a cutback along a section of the western edge of the existing Fimiston Open Pit, referred to as the Golden Pike Cutback. This will allow for both widening and deepening of the pit to a depth of around 600 m (-670 mRL) and will cover an area of 46 ha. The extension is proposed for the western wall of the Fimiston Open Pit and not the eastern wall due to the geometry and geology of the “Golden Mile” ore bodies.

Northern Waste Rock Dumps

To meet the life of mine waste dumping requirements, additional waste rock dump areas will be required. Opportunities for the location of additional waste rock dumps are limited by the existing dumps encompassing the southern and eastern surrounds of the Fimiston Open Pit. Extensions to or increases in the height of these dumps is restricted by airport regulations and geographic constraints of the eastern and southern drainage lines associated with Hannan's Lake.

It is therefore proposed to construct two waste rock dumps to the northwest and northeast of the pit covering approximately 115 ha of land that is historically degraded but has been subsequently rehabilitated by KCGM. The maximum height of the new waste rock dumps will be no greater than the currently approved waste rock dump heights.

Pit backfilling will be maximised for the northern and southern parts of the pit. This reduces truck haulage, minimises greenhouse gas emissions and reduces the total footprint of the Project. The central section of the pit will not be filled as this will be the last area to be mined, and could be used as a possible portal into underground mining operations in the future.

Tailings Storage

Two options have been considered to provide additional tailings storage capacity for the Project. The preferred option is to continue to raise the perimeter embankment height of the Fimiston I and Fimiston II TSFs. The contingency option is to acquire the Kaltails TSF and raise the perimeter embankment height. The Kaltails TSF would be used in conjunction with the Fimiston I and Fimiston II TSFs. Both options are contingent upon approval of the Stage 2 height increase for the Fimiston II TSF to 45 m, which is currently being assessed and the incremental height increase of the Fimiston I TSF to 40 m.

In-pit disposal of tailings was investigated as an option however no nearby open pits of sufficient size could provide the required storage capacity. The construction of a new TSF (Fimiston III TSF) requiring approximately 150 ha of native vegetation to be cleared was originally proposed, however further assessment of tailings storage opportunities has identified alternatives that have significantly better environmental outcomes.

Mine Closure

In December 2004, KCGM presented the Fimiston Operations Extension Project outlining the vision for the final development of the Fimiston Open Pit with the public release of *KCGM's Concept Plan - Sharing Our Vision for the Future.* The Conceptual Mine Closure Strategy (presented as an Appendix to this PER) formalises KCGM's commitment and approach towards closure of all aspects of its operations. The Strategy will remain a fluid document that will be reviewed and updated every three years to ensure changes in areas such as the regulatory environment, community expectations or technical closure planning information are captured and incorporated into decision making processes.

Existing Environment

General

The KCGM operation is located immediately east of the City of Kalgoorlie-Boulder in the Goldfields Region of Western Australia, approximately 600 km east of Perth. The area known as the "Golden Mile" has a long association with gold mining since the first discoveries during the late 1800's. Mining continues to be a key land use of the region. Kalgoorlie-Boulder, with an approximate population of 30,000, is the major regional centre in the Goldfields Region.

Aboriginal people from Coolgardie, Kalgoorlie, and Coonana, who have long term associations with the region, have been consulted on a number of occasions regarding the Fimiston Operations, and local elders who have detailed knowledge of the region's totemic geography have visited the area. Eight sites of ethnographic significance have been identified in close proximity to KCGM's operations. One site is close to the Project area however this will not be disturbed by the Project.

Climate

The Kalgoorlie area climate is classified as semi-desert Mediterranean and is characterised by dry conditions with cool winters and hot summers. Surface winds in the Kalgoorlie area are predominantly from the east to southeast for most of the year with a lower frequency of winds from the north, northwest and south.

Surface Water and Topography

The Fimiston Operations is located in a catchment of Hannan's Lake, which is a saline playa lake located about 10 km south of Kalgoorlie. This catchment is about 18 km long and between 8 km and 13 km wide. Drainage in the area to the east of the Fimiston Open Pit flows easterly and then to the south after joining an ephemeral creek. This eastern creekline drains directly to Hannan's Lake. A gently undulating topography is broken up with occasional ranges of low hills. Sand plains are more prominent in the western part with some large playa lakes.

Geology

The geological structure of the Fimiston area is dominated by the large Kalgoorlie Anticline and Kalgoorlie Syncline, the major Golden Mile Fault which strikes sub-parallel to formation boundaries, and numerous cross-cutting faults (e.g. Golden Pike). The rock mass in the pit region consists of Paringa Basalt, Golden Mile Dolerite, shales and porphyry dykes.

The Fimiston Open Pit extension will be predominantly hosted by Golden Mile Dolerite with a small percentage to the west hosted by Williamstown Dolerite and the Black Flag Beds sedimentary sequence. The Black Flag Beds contain bands of pyritic shale which have acid generation potential. However, any exposed mineralisation within the dolerite will contain sulphide minerals in conjunction with carbonates which have a neutralising effect. Non-mineralised material will not contain significant amounts of sulphide minerals and therefore has little to no acid generation potential.

Groundwater

The Golden Mile is a south-plunging ridge of mostly ultramafic rocks forming part of the Kalgoorlie-Kambalda Greenstone Belt. The Greenstones along the Golden Mile are overlain by Tertiary and younger sedimentary deposits to the west, south and east. Groundwater often occurs in these deposits at shallow depths. Some exchange of groundwater occurs between Tertiary sedimentary deposits and the older Greenstones which form the Golden Mile and other bedrock formations in the Kalgoorlie area.

The historical underground workings below the Fimiston Open Pit have provided a conduit for groundwater and surface run-off. Dewatering from the 25 level in Chaffers Shaft has been ongoing since 1989 and this has maintained groundwater levels well below current mining operations within the bedrock aquifer. With the recent removal of the Chaffers head frame as part of the Chaffers Cutback, dewatering is now undertaken by a dewatering bore located 700 m below surface on the south-eastern edge of the Fimiston Open Pit.

Natural groundwater in the catchment is saline, with total dissolved salts concentrations in the range of 20,000 mg/L to 200,000 mg/L (seawater has about 35,000 mg/L to 40,000 mg/L of total dissolved solids). This groundwater is naturally acidic, with pH generally between 2 and 4. KCGM maintains groundwater monitoring bores near the Fimiston I and II TSFs and a groundwater monitoring network is also present at the Kaltails TSF.

Flora and Vegetation

KCGM is located within the Coolgardie Botanical District's Coolgardie Vegetation System, in the southwest interzone. This botanical district is predominantly eucalypt woodland becoming open towards the more calcareous soils, where a cover of saltbush-bluebush understorey is evident. Extensive timber cutting occurred in the Kalgoorlie region at the turn of the century for mineshaft supports and for firewood, therefore much of the woodland has been historically cleared.

The areas proposed to be disturbed by the Project have been historically cleared and degraded by mining activities. These areas were rehabilitated between 1990 and 1999, as part of KCGM's "Greening the Golden Mile" revegetation programme. The flora survey defined the vegetation as cleared/modified native vegetation in "good" condition.

Fauna

Fauna habitats provided by the Project area are widespread and occur extensively around Kalgoorlie and throughout the Coolgardie Botanical District. Rare fauna species in the broader Kalgoorlie region tend to be associated with healthy vegetation, rock outcrops, sand dunes and fresh-water wetlands, rather than disturbed areas. The area under the control of and surrounding the KCGM operations has been degraded by historical mining, pastoral and urbanisation activities.

Conservation Areas

The Lakeside Miscellaneous Conservation Reserve (No. 19214) is located approximately 800 m to the south-southeast of the Kaltails TSF. This reserve was declared in 1957 and is managed by Department of Environment and Conservation (DEC) (formerly Department of Conservation and Land Management [CALM]) for the preservation of sandalwood (*Santalum spicatum*).

Community Consultation

The Fimiston Operations Extension Project has progressed through the Integrated Project Approvals System that was established by the Minister for State Development in 2004. This process is coordinated through Office of Development Approvals Coordination (ODAC) (formerly the Project Approvals Co-ordination Unit (PACU)) established within the Department of the Premier and Cabinet.

KCGM has an established community consultation network and utilises a range of mechanisms to facilitate consultation and capture community input on an ongoing basis including the Community Reference Group; Public Inquiry Line; KCGM Super Pit Shop; media management; and public speaking opportunities.

Initial consultation with key interest groups and government stakeholders for this Project commenced in October 2004 and continued with the release of *KCGM's Concept Plan - Sharing Our Vision for the Future* to the wider community in December 2004. The Concept Plan outlined KCGM's vision and process for the final development of the mine until closure in 2017.

Feedback received to date from community and government consultation through both formal and informal means has been incorporated into the planning of the Project and considered as part of the Project's environmental and social impact assessment. All issues raised to date have been examined within this PER.

Environmental Issues and Management

The principles of environmental protection established in the *Environmental Protection Act 1986* have been considered by KCGM in the planning and design of the Project and during the environmental impact assessment. KCGM has undertaken an assessment of the Project in accordance with the EPA's Position Statement No. 6 Towards Sustainability, August 2004.

KCGM has an established system for the management of environmental, safety, community and indigenous relations aspects of the operation. This is the system within which the Fimiston Gold Mine Operations Extension Project will be managed.

A summary of the key environmental factors, potential issues and proposed management measures are presented in Table E2 and summarised below.

- Flora and Vegetation

  KCGM has restricted the footprint of the Project to current mining areas and historically disturbed areas. Approximately 46 ha will be required for mining of the Golden Pike Cutback and 115 ha for construction of the Northern Waste Rock Dumps (NWRD). Both these areas have been historically disturbed by mining activities and have been rehabilitated by KCGM. The preferred tailings storage options will also utilise existing facilities which will eliminate the need to clear approximately 150 ha to construct a new TSF.

  There is a potential risk of impact to vegetation health from a rise in groundwater levels associated with the operation of the TSFs. KCGM will implement its Seepage and Groundwater Management Plan (SGMP) to ensure that seepage does not affect the health of adjacent native vegetation.

- Fauna

  Clearing of vegetation for the Golden Pike Cutback and NWRD has a very low potential to impact on localised fauna habitats due to the historical disturbance and clearing that has occurred within these areas.

There is the potential for impacts to fauna from the TSFs as avian or other fauna can be attracted to the water ponding on the surface of the TSF. KCGM currently has a very low incidence of fauna fatalities on the Fimiston TSFs (two incidents each involving one animal, in 10 years). The risk to fauna will be managed in accordance with existing licence conditions and the International Cyanide Management Institute's (ICMI) Cyanide Management Code.

- Surface Drainage

  There is one significant ephemeral creekline located between the Fimiston Mill, open pit and waste rock dumps to the west and the Fimiston II TSF to the east. This creekline drains directly to Hannan's Lake, and only flows after significant rainfall events, generally associated with northern tropical depressions. The Project has been designed to take into account the natural surface drainage features, specifically the location of the NWRD.

  Where necessary, earthworks will be undertaken as part of this surface drainage management so as not to starve native vegetation of surface water or create prolonged saturated areas. Any surface diversions will direct water towards existing and natural drainage paths. The design performance of the waste rock dumps will be routinely inspected especially following periods of heavy precipitation to identify any areas of ponding or erosion.

- Groundwater

  Potential groundwater issues associated with the Project relate to the elevation of the local saline water table as a consequence of seepage from operation of the TSFs. A network of monitoring and dewatering bores currently exists around the perimeter of each of the TSFs.

  Based on the primary beneficial use of the groundwater in the area (for mining and mineral processing), potential impacts on groundwater are not considered to be significant. The existing SGMP establishes performance targets for the long-term management of seepage from the TSFs including the monitoring of vegetation adjacent to the facilities.

- Environmental Noise

  Noise emissions will primarily be generated during mining of the Golden Pike Cutback and waste rock dumping in proposed northern areas. Noise modelling undertaken by Herring Storer Acoustics indicated that mining of the Golden Pike Cutback both at the ground surface and 20 m below the ground surface would comply with the day time and evening Assigned Noise Levels in the *Environmental Protection (Noise) Regulations 1997*. However, some levels may be higher than the most stringent night time Assigned Noise Levels when mining at ground level. Compliance with the assigned night time noise levels will start to be achieved once mining drops below 20 m below ground level.

  It should be noted however that the ambient noise levels in Kalgoorlie-Boulder with no mining activity occurring are mostly above the night time assigned noise levels. KCGM is currently working with the Department of Environment Noise Branch in the preparation of an application to the Minister under Regulation 17, to allow a variation from the assigned noise levels for the mining operations as a whole.

  Construction of the Northern Waste Rock Dump (NWRD) will be undertaken in two stages. The first stage, which is construction of the outer wall to act as a noise bund, will result in noise levels that exceed the criteria stipulated in the *Environmental Protection (Noise) Regulations 1997.* This activity will therefore require a Regulation 17 variation. However, KCGM will use similar noise control measures proposed for the recently approved Loop Line Noise Bund and will implement KCGM's Noise Management Plan to minimise noise impacts as far as practicable. The second stage of the NWRD will involve dumping of waste rock behind the outer wall which is expected to comply with the assigned noise levels in the *Environmental Protection (Noise) Regulations 1997.* Operating restrictions will apply once dumping behind the outer wall reduces the effective height of the barrier, to ensure compliance with the Regulations.

  Modelled noise levels from mining of Golden Pike in isolation were less than, or within the current residential noise levels measured by KCGM. However, modelling of existing operations, Golden Pike Cutback and waste dumping at the NWRD indicates that some residential areas may experience a slight increase in noise levels.

KCGM has undertaken measures to ensure that noise emissions from their operations are as low as reasonably practicable such as the construction of an Environmental Noise Bund and implementation of a Noise and Vibration Monitoring and Management Programme. Approval to realign the Environmental Noise Bund (Stage 1) to the west of the proposed Golden Pike Cutback has recently been granted.

- Blasting Noise and Vibration

  Blasting noise (or airblast overpressure) and ground vibration will be generated during the operation of the Project as a result of blasting activities. The current airblast and vibration standards and limits specified in the KCGM Noise and Vibration Monitoring and Management Programme take into consideration both human response and structural damage criteria.

  The ground vibration assessment undertaken by Terrock Consulting Engineers, has shown that with worst case assumptions blasting of the Golden Pike Cutback will comply with the current vibration standards and limits specified in the KCGM Noise and Vibration Monitoring and Management Programme. Since these standards and limits take into consideration human response to airblast and vibration, they are considered conservative for the protection of structural (building) integrity.

- Air Quality

  Mercury
  At Kalgoorlie, mercury occurs naturally in the mineral coloradoite. Analysis of mercury concentrations from KCGM's orebody indicates that low concentrations of mercury exist in the Western Lodes of the Fimiston Open Pit which includes the area of the Golden Pike Cutback. Mercury is soluble in the cyanide solution used to dissolve the gold from the ore and can be released from the kiln during regeneration of the activated carbon. Preliminary air dispersion modelling has indicated that ground level mercury concentrations from KCGM's existing operations are below World Health Organisation standards. Investigation by KCGM shows that the concentration of mercury in the ore will not increase with the proposed Project.

  KCGM has undertaken extensive investigations regarding effective controls for reducing mercury emissions. This resulted in a trial scrubber system being installed in December 2005 in the duct circuit between the carbon kilns and the emission stack to capture mercury and enable it to be encapsulated within the tailings stream.

KCGM will continue to liaise with relevant stakeholders to ensure that mercury emissions are being effectively managed to the satisfaction of the regulatory authorities and the community.

Dust

The potential sources of dust emissions from the Project include land clearing, blasting operations, transportation of ore and waste and rehabilitation works. Dust from tailings storage facilities is not considered a significant source because much of the surface of the tailings remains moist during operation and the use of hypersaline water in processing promotes the formation of a salt crust.

Air dispersion modelling undertaken by ENVIRON Australia to predict the impacts of the Project indicated that the 24 hour average PM_{10} ground level concentrations are predicted to be below the NEPM standard at the nominated locations for both the current and proposed operations with the exception of the Hewitt St dust monitoring location. The modelling had indicated that there is a marginal increase in the predicted ground level concentrations of PM_{10} due to the proposed extension at the Hewitt St location. However at other locations to the west of pit the emissions from the proposed extension will be marginally lower than current emissions.

Similarly, the predicted 24 hour average TSP concentrations for both the current and proposed scenarios are at or below the nominated guideline values (Kwinana EPP) for all locations with the exception of Hewitt St. In general the model predicted marginally lower ground level concentrations for the proposed scenario compared to the current scenario due the reduction in the mining rates and the increased depth of the pit.

Dust generated from blasting of the Golden Pike Cutback, land clearing and waste dumps construction will be managed under the existing *Revised Dust Monitoring and Management Programme June 2004*. KCGM commits to undertake all reasonable, practicable and safe measures to minimise dust emissions from its operations. Measures include a dust monitoring network; blasting or conducting earthworks under favourable wind conditions; use of water trucks and water cannons; progressive rehabilitation; and use of dust binding agents.

- Greenhouse Gas Emissions

Greenhouse gas emissions from the Project include combustion of diesel fuel for the mining vehicles; combustion of diesel and gas to meet the Project's power requirements; the detonation of explosives used in blasting; and the decomposition of cleared vegetation.

The quantity of CO_2 emissions from the Project will remain consistent until 2011, after which CO_2 emissions will decrease as mining is able to more effectively target ore at depth. Pit backfilling also reduces truck haulage and therefore diesel consumption which assists in minimising greenhouse emissions. There will be no significant change to the current power requirements of the Fimiston Operation which is one of the main contributors of greenhouse gas emissions.

The Fimiston Operations Extension Project has been designed to minimise the land area and total amount of biomass cleared particularly by utilising existing TSFs for tailings storage rather than clearing vegetation for a new TSF. The majority of cleared areas will be progressively rehabilitated. KCGM will continue to look for ways to improve energy efficiency, reduce greenhouse gas emissions and investigate offset opportunities, as part of the continuous improvement and strategic energy management programme.

- Rehabilitation and Decommissioning

The Project extends the KCGM life of mine for an additional five years until the closure of open pit mining operations in 2017. Progressive rehabilitation of disturbance and waste rock dump areas is currently undertaken by KCGM in conjunction with the rehabilitation of historical mining areas located on KCGM's leases. This programme will be extended to include rehabilitation of additional areas disturbed by the Project.

KCGM is currently developing a Fimiston Rehabilitation Management Plan that formalises KCGM's strategy of progressive rehabilitation on waste rock dumps and other disturbed areas. The Plan also describes the process for achieving and monitoring rehabilitation success. Decommissioning will be undertaken in accordance with the Conceptual Mine Closure Strategy and closure plans to be developed for specific components of KCGM's operations.

- Aboriginal Heritage

No ethnographic or archaeological sites of significance will be disturbed by the Project. However, KCGM recognises the value of consulting the Aboriginal community with regards to management of KCGM's operations. In conjunction with local Aboriginal groups and the Department of Indigenous Affairs (DIA), KCGM is establishing a site-wide management plan to ensure Aboriginal ethnographic and archaeological sites within the immediate vicinity of KCGM's operations are protected and respected. The plan will include annual site inspections and audits.

- Seismicity

  A geotechnical assessment undertaken by BFP Consultants examined geotechnical stability of the Golden Pike Cutback and the location of the Open Pit abandonment bund in view of the seismic activity experienced at KCGM. The results of a stress analysis during this assessment concluded that the anticipated seismic activity is not expected to have a detrimental effect on the pit wall stability.

  The Fimiston Open Pit has been equipped with a microseismic recording system since 1997 which measures any seismic events above a certain magnitude. The potential impact of seismicity upon long term pit wall stability will continue to be monitored and reviewed throughout the operation of the Fimiston Open Pit.

  Seismic events have the potential to impact on the structural stability of tailings storage facilities. An assessment of the Fimiston I and II TSFs by Golder Associates confirmed that both facilities met the recommended factors of safety required for pseudo-static (earthquake) loading conditions. KCGM will undertake further modelling of stability and a risk-based dam break assessment for the TSFs at final maximum height as part of the design evaluation process.

- Public Safety

  KCGM is supportive of the proposed independent public safety review process, whereby KCGM will provide the flyrock and pit wall stability studies to the Department of Industry and Resources (DoIR). These studies will be reviewed by independent consultants prior to the forwarding of a recommendation to the State Government. This will ensure that public safety issues are considered in a rigorous and properly independent manner.

  Flyrock
  Flyrock refers to rock that is generated from within the blast and projected varying distances beyond the blasting area. Terrock Consulting Engineers examined current blasting practices which demonstrated that improved blasting procedures (such as those used for the recent Chaffers Cutback) could minimise flyrock throw to 50 m. Allowing for a safety factor for personnel, this indicates that a 200 m blast clearance zone would be required to maintain public safety. The horizontal flyrock throw would be further limited by the pit wall when blasting below ground level.

KCGM will adopt the practices recommended by specialist consultants to minimise flyrock generated during blasting. Many of these practices were utilised during the recent Chaffers Cutback. Modified blasting practices will be introduced during blasting particularly in the zone identified near the pit perimeter to ensure that the throw of flyrock is limited to 50 m and that the personnel safety factor is maintained. In addition, the Environmental Noise Bund will provide further protection from flyrock generated from blasting.

Pit Wall Stability

KCGM commissioned BFP Consultants to undertake a geotechnical analysis of the Golden Pike Cutback to assess pit wall stability. An initial study concluded that the slope design of the Golden Pike Cutback was conservative and that the stability of the oxide material was not considered to be compromised by the presence of the Environmental Noise Bund.

A follow-up study assessing the geotechnical issues relating to the location of the proposed pit abandonment bund concluded that the proposed location would meet the requirements of the Department of Industry and Resources guidelines.

Monitoring of pit wall stability will continue with development of the Project. To reduce the potential impact of long term weathering in the Golden Pike Cutback, sections of the crest of the pit may be backfilled with fresh waste rock to minimise the potential deterioration of the weathered material if a pit lake should form.

TSF Embankment Stability

The issue of TSF embankment stability relates to the continued structural integrity of the TSFs under conditions of increased loading and seismicity. Preliminary modelling of the stability of the TSFs for the proposed maximum embankment heights for the Project was undertaken by Golder Associates. The investigation concluded that the slopes of the TSFs would maintain stability, even under maximum credible seismic (earthquake) loading.

KCGM will undertake further modelling of stability and a risk-based dam break assessment for the TSFs at final maximum height as part of the design evaluation process.

Table E2: Summary of Environmental Factors and Management

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
BIOPHYSICAL					
Vegetation and Flora	To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	Rehabilitated areas of the Golden Pike Cutback and the Northern Waste Rock Dump (NWRD) locations.	Disturbance to 161 ha of historically cleared, disturbed and rehabilitated areas will cause a minor loss to vegetation in the area. No Declared Rare Flora have been identified within the Project area. Two priority flora species which were planted during rehabilitation activities in the Golden Pike area were recorded. Potential impacts on vegetation from seepage from the Kaltails or Fimiston I and II TSFs.	Clearing will be minimised where possible. Vegetation will be re-established by rehabilitating available areas as soon as practicable after disturbance. The use of Fimiston I and II TSFs or Kaltails TSF is preferred over construction of a new TSF, to eliminate impacts from vegetation clearing. Potential seepage impacts on vegetation will be managed and monitored through the Seepage and Groundwater Management Plan.	

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
Terrestrial Fauna	To maintain the abundance, diversity and geographic distribution of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	Rehabilitated habitats in the Golden Pike Cutback and the NWRD areas.	Minor impacts on fauna within rehabilitated areas and areas historically disturbed.	Clearing of fauna habitats will be minimised where possible. Management of impacts on vegetation as outlined above. Vegetation and the creation of fauna niches will be established during post rehabilitation activities, as soon as practicable after disturbance. Fauna management in the vicinity of TSFs will be in accordance with licence conditions and the International Cyanide Management Code.	

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
Water Resources	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected.	Groundwater is naturally hypersaline. Primary beneficial use of this water is for mining and mineral processing.	No increase in the use of potable or saline water is required; however annual consumption will be extended for the additional life of mine for five years. This consumption of primarily hypersaline groundwater is not expected to impact on the resource.	Continue to implement water conservation strategies throughout the operation and continue to identify opportunities for conservation and reuse	
Surface Drainage	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected.	Fimiston Operations are in the catchment of the Hannan's salt lake. An ephemeral drainage line flows from north of the operations, south towards Hannan's Lake and passes between Fimiston II TSF and the rest of the operations.	The Project will not have a significant impact on any major surface drainage features. Localised alteration of surface water flow cause water starvation or prolonged saturation of the surface and adverse impacts on native vegetation.	The Project will be designed to ensure altered surface drainage does not adversely impact on native vegetation.	

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
Conservation Areas	To protect the environmental values of areas identified as having significant environmental attributes.	Lakeside Conservation Reserve located near the Kaltails TSF.	Potential impacts on vegetation health due to a rise in water levels from seepage from the Kaltails TSF.	A network of production bores established around the Kaltails TSF will be operated to maintain groundwater at levels to protect vegetation should Option 2 for tailings management be selected. The Seepage and Groundwater Management Plan will be revised should Option 2 for tailings management be selected.	
POLLUTION MANAGEMENT					
Air Quality	To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Fimiston Operations	Ore characteristics from the Golden Pike Cutback are expected to be similar to ore that is currently mined and processed. Therefore no significant change in mercury emissions from processing this ore is anticipated.	Introduction of additional emission controls and continued investigation of opportunities for emission reduction for the Carbon Regeneration Kiln.	

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
Air - Particulate Dust	To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Regional dust emissions are high due to the arid climate, large number of industries and fugitive dust sources in the region.	Land clearing, blasting, earthmoving, waste dumping and tailings deposition have the potential to create a dust nuisance for adjacent land uses.	All operations will be undertaken in accordance with the *Revised Dust Monitoring and Management Programme*. Specific procedures will include blasting under favourable wind conditions, dust suppression measures, progressive rehabilitation and measures to reduce dust generation from haulage.	*5. KCGM will revise and implement the existing Dust Management Plan for the Fimiston Operations Extension Project*

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
Environmental Noise	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.	The Kalgoorlie area is subject to noise from existing industrial and urban sources. Existing measured noise levels from these sources generally exceed the assigned noise levels in the *Environmental Protection (Noise) Regulations 1997.*	Noise generated from the use of mobile equipment such as drills, excavators and haul trucks has the potential to impact on adjacent residential communities. Noise emissions from the open pit will reduce as mining gets deeper.	All operations will be undertaken in accordance with the *Revised Noise and Vibration Monitoring and Management Programme.* Specific management measures may include using 'quietest reasonably available' equipment, fitting mobile equipment with 'Smart Alarms' and noise bunding.	*2. KCGM will revise and implement the Noise and Vibration Monitoring and Management Programme for the Fimiston Operations Extension Project.* *3. KCGM will submit an application for a Regulation 17 exemption for noise in accordance with the Environmental Protection (Noise) Regulations 1997.*

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
Blasting Noise (Overpressure) and Vibration	To protect the amenity of nearby residents from impacts resulting from blasting activities associated with the proposal by ensuring the noise and vibration levels meet statutory requirements and acceptable standards.	KCGM's blast times for existing operations are scheduled for 1pm and/or 5pm each day, subject to favourable wind conditions for dust management.	Blasting has the potential to impact on the nearby community through noise and vibration.	All operations will be undertaken in accordance with the *Revised Noise and Vibration Monitoring and Management Programme*. Blasting requirements outlined in this plan are based on AS2187.2/1993. Specialist techniques for blasting in areas sensitive to noise and vibration may be adopted for selected blasts at the Golden Pike Cutback.	*4. KCGM will revise and implement the existing Noise and Vibration Monitoring and Management Programme for the Fimiston Operations Extension Project.*

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
Waste Management	To ensure that liquid and solid wastes do not affect groundwater or surface water quality or lead to soil contamination.	Existing operations have waste rock dumps located around the open pit. Tailings are deposited in Fimiston I and Fimiston II TSFs.	A risk evaluation of the Fimiston operations has identified that there is a very low to low risk of acid rock drainage. Potential impacts to the groundwater quantity and quality from the use of Fimiston I and II or Kaltails TSF for the Project.	An acid rock drainage strategy is implemented at KCGM for existing and proposed operations. Potential impacts from TSFs will be managed through the Seepage and Groundwater Management Plan.	
Groundwater	To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Groundwater is naturally hypersaline. Primary beneficial use of this water is for mining and mineral processing. Impacts on groundwater in the vicinity of the Fimiston I, Fimiston II and Kaltails TSFs have historically been observed. This is currently controlled by groundwater abstraction bores.	Potential impacts to the groundwater quality and quantity from potential seepage from the Kaltails or Fimiston I and II TSFs.	The Fimiston I and II TSFs or Kaltails TSF will be managed in accordance with the Seepage and Groundwater Management Plan.	*1. KCGM will manage the Fimiston and Kaltails TSFs (if used) in accordance with a Seepage and Groundwater Management Plan.*

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
SOCIAL SURROUNDINGS					
Aboriginal Heritage	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	Eight sites of ethnographic significance have been identified in the vicinity of KCGM's operations.	No impact on any sites of Aboriginal heritage significance.	KCGM will consult with appropriate Aboriginal people as required in respect to the management of ethnographic sites in the vicinity of the Project.	*8. KCGM will consult with Aboriginal groups as required in respect to the management of ethnographic sites in the vicinity of the Project.*
Seismicity		The background level of natural earthquake activity in the Kalgoorlie area is considered above average for Australia due to the presence of the Kalgoorlie fault complex.	The results of a stress analysis concluded that the expected seismic activity will have no detrimental effect on the pit wall stability. Preliminary stability modelling of the TSFs indicated these would remain stable at proposed heights under maximum credible earthquake loading.	Continue to monitor seismic events with the microseismic recording system. Detailed design of TSFs will consider seismic loading.	

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
Amenity	To ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonable practicable.	The region has been affected by mining operations for more than 100 years. Mining is an integral part of the region's economy and tourism.	Visual amenity is not expected to be significantly altered by the Project. A small number of closures of the Eastern Bypass Road will be required during the initial stages of blasting. Impacts from dust, noise and blasting are not expected to change significantly from existing operations.	Progressive rehabilitation will ensure adverse visual amenity is reduced. Management through existing Dust, Noise and Vibration Programmes. Road closures will be managed by standard procedures previously utilised by KCGM.	

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
Public Safety		A 400 m Safety Exclusion Zone was historically applied around the Fimiston Pit to exclude non-compatible land-uses.	Low risk from flyrock during blasting. Improved blasting measures mean the current Blast Clearance Area is conservative. Low risk of pit wall instability along the western boundary of the Fimiston Open Pit. Low risk of TSF instability with increased embankment height.	KCGM will adopt recognised management strategies to ensure the risk from flyrock is maintained at acceptable levels. The Blast Clearance Area has been revised to 200 m. The 24-hr Automatic Slope Monitoring System will continue to monitor the stability of the Fimiston Open Pit walls. Detailed design of increased TSF embankment heights will be required as part of DoIR approvals.	

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	MANAGEMENT ACTIONS
OTHER					
Rehabilitation and Decommissioning	To ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values	Historically disturbed areas have been rehabilitated by KCGM as part of 'Greening of the Golden Mile' revegetation programme. Progressive rehabilitation of KCGM's existing operations has commenced and is ongoing.	This Project has defined the closure of the open pit mining operations in 2017. Planning for closure in conjunction with regulators and the community is required to ensure closure criteria are established for the KCGM operation.	KCGM has developed a Conceptual Mine Closure Strategy that outlines KCGM's commitment and approach to mine closure and forms the basis on which to commence detailed mine closure planning in conjunction with regulators and the community. KCGM will prepare and implement a Rehabilitation Management Plan for Fimiston Operations (revised annually).	*6. KCGM will implement a Rehabilitation Management Plan for the Fimiston Operations.* *7. KCGM will implement the Conceptual Mine Closure Strategy for the Fimiston Operations.*

Conclusions

KCGM recognises the unique situation of the Fimiston Operations being located close to the City of Kalgoorlie-Boulder, where mining has been part of the landscape for over 100 years. The design of the Project and proposed management measures have been developed keeping in mind the principles of environmental protection outlined in the State's *Environmental Protection Act 1986*, and the Environmental Protection Authority's Position Statement No. 6 Towards Sustainability. KCGM's ongoing commitment to responsible development of its projects and environmental excellence is demonstrated in the Corporate Policies of KCGM, and its JV owners, Newmont and Barrick.

KCGM believes that the proposal can be implemented in an environmentally and socially responsible manner which will contribute to the long-term social, economic and tourism value of the Kalgoorlie area and protect the natural environment in the vicinity of the Project.

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PUBLIC ENVIRONMENTAL REVIEW

**Fimiston Gold Mine Operations Extension (Stage 3)
and Mine Closure Planning**

**For
Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM)**

1. INTRODUCTION

1.1 BACKGROUND

Kalgoorlie Consolidated Gold Mines' (KCGM) Fimiston Operations are located immediately east of the City of Kalgoorlie-Boulder in the Goldfields Region of Western Australia, approximately 600 kilometres (km) east of Perth as shown on Figure 1.

Gold was discovered in Kalgoorlie in 1893 by Paddy Hannan, Tom Flanagan and Dan Shea, 42 years after the first discovery of gold in Australia. Mining and prospecting was initially concentrated at the northern end of the field near Hannan's Find. However, the real potential of the area was recognised after further digging commenced south of Hannan's Find. This area became famous worldwide and is known as "The Golden Mile".

By the mid 1980's, all mining operations in Kalgoorlie, from Mt Percy and Mt Charlotte at the northern end to Chaffers at the southern end, were effectively controlled by three companies. With a common goal of maximising the return on investments for their respective shareholders, these companies had developed a rather loose relationship concerning the sharing of facilities and exchanging technical knowledge. Through a number of entrepreneurial deals, this relationship was formalised on 29 March 1989 by the creation of a new management company, Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM). The current Joint Venture owners of KCGM are Barrick Gold of Australia Ltd and Newmont Australia Ltd, each having an equal 50% share of the operation.

KCGM is the largest gold producing operation in Australia with an annual gold production in 2005 of about 834,000 ounces (26 tonnes) and is supported by an estimated gold reserve of around 10 million ounces. At a local level, during 2005 KCGM contributed more than $260 million to the local economy of the City of Kalgoorlie-Boulder through wages and the use of Kalgoorlie-Boulder based suppliers. KCGM is recognised as a major employer within Kalgoorlie-Boulder with the majority of the 725 employees and full-time contractors residing within the local community.

1.2 PROJECT OVERVIEW

KCGM proposes to mine a cutback along part of the western edge of the Fimiston Open Pit, referred to as the Golden Pike Cutback. The 46 hectares (ha) westerly extension will allow for both the widening and deepening of the pit to a depth of around 600 metres (-670 RL). The Golden Pike Cutback will extend the mine life of the Fimiston Open Pit (also called the Super Pit) by five years, from 2012 to 2017.

The Project will also require additional areas for the storage of waste rock from the Fimiston Open Pit. Sites north of the pit have been identified as potential storage areas which includes the provision for backfilling waste into the northern part of the pit. Additional waste rock dump areas will cover approximately 115 ha.

Additional tailings storage capacity is also required to meet processing requirements for the projected 2017 mine life. KCGM has examined two primary options, these being;

- a further height increase of the existing Fimiston I and Fimiston II Tailings Storage Facilities (TSFs); and
- acquire and recommission the Kaltails TSF with a height increase.

The analysis of tailing storage options throughout the feasibility and design studies for this Project has eliminated the option to construct a new TSF (Fimiston III) that was put forward in the initial referral for the Project. KCGM considers that raising the height of the Fimiston I and Fimiston II TSFs or the recommissioning of the Kaltails TSF provides significantly better environmental outcomes that far outweigh the justification for a new TSF.

1.3 PURPOSE OF THIS DOCUMENT

A Project Definition Document (PDD) outlining KCGM's proposal for the Fimiston Operations Extension (Stage 3) was referred to the Environmental Protection Authority (EPA) on 1 July 2005. Based on the review of the PDD, the EPA advertised the level of assessment of the Project as Public Environmental Review (PER) in July 2005. Nine appeals against this level of assessment were lodged with the Appeals Convenor. The appeals for a higher level of assessment for the Project were dismissed by the Minister for the Environment on 11 November 2005. A Draft Environmental Scoping Document outlining the proposed scope of works for the environmental impact assessment was also prepared and submitted to the EPA on 15 December 2005. This was revised based on a number of requests from the EPA and resubmitted on 20 January 2006. The Scoping Document which forms the basis of this PER was approved on 9 February 2006 (Appendix A1).

This PER has been prepared according to Part IV Division I of the WA *Environmental Protection Act 1986* for proposals of local or regional significance that raise a number of significant environmental factors, some of which are considered complex and require detailed assessment. The EPA considers that such proposals should be subject to a formal public review period, and the setting of environmental conditions under Part IV of the Act to ensure they are implemented and managed in an environmentally acceptable manner. The public review period for this Project was set at eight weeks.

This PER has been prepared in accordance with the EPA guidelines for *Preparing a Pubic Environmental Review / Environmental Review and Management Programme, Version 2, November 2004* and the Project's Scoping document approved by the EPA on 9 February 2006.

This PER is intended to allow the public and government agencies to review the potential environmental impacts of the Project and the proposed management measures made by KCGM. Guidelines for making a submission are presented at the front of this document.

1.4 THE PROPONENT

The proponent for the Project is:

Kalgoorlie Consolidated Gold Mines Ltd (KCGM)
ABN: 97 009 377 619

KCGM is the manager of a joint venture between Newmont Australia Ltd (50% ownership) and Barrick Gold of Australia Ltd (50% ownership).

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The relevant contact is:

Ms Michelle Birch
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Email: mbirch@kalgold.com.au

1.5 PREVIOUS ENVIRONMENTAL APPROVALS

KCGM was granted environmental approval by the Western Australian Minister for the Environment on 24 October 1991 for the *Consultative Environmental Review Mine and Waste Dumps - Fimiston August 1990* (KCGM, 1990). The Fimiston Open Pit operations have been managed in accordance with the requirements of Ministerial Statement 188 and Department of Industry and Resources (DoIR) tenement conditions since that time.

Additional environmental approvals for the Fimiston Operation include the following:

- Environmental Licence and various project Works Approvals pursuant to Part V of the *Environmental Protection Act 1986* (EP Act);
- Surface and groundwater licences pursuant to *Rights in Water and Irrigation Act 1914*;
- Dangerous Goods Licence pursuant to the *Explosives and Dangerous Goods Act 1961*; and
- Various project approvals pursuant to the *Mining Act 1978.*

The Kaltails TSF is not part of the current KCGM operation. The leases held for this operation are owned by joint venture partners, Newmont (90%) and the Western Australian Mint (10%). The Kaltails Project was operated under *The Tailings Treatment (Kalgoorlie) Agreement Act 1988.*

1.6 TIMING AND STAGES OF THE PROJECT

The Fimiston Operations Extension Project has been separated into three distinct stages to enable KCGM to meet current and future operational requirements in a structured and timely manner. The three stages are outlined below:

- Stage 1: Environmental Noise Bund Realignment and Loop Line Railway Access;
- Stage 2: Fimiston II TSF Height Increase; and
- **Stage 3: Fimiston Operations Extension and Mine Closure Planning.**

Stage 1 has been approved and Stage 2 is currently progressing through the regulatory approval processes.

KCGM referred Stage 2, Fimiston II TSF Height Increase, to the EPA for assessment. This height increase of Fimiston II (to 45 m) is required to meet the current life of mine (2012) tailings storage requirements. On 24 October 2005, the EPA determined that the project did not require formal assessment and could be managed under Part IV of the EP Act. Appeals on this level of assessment are currently being considered by the Minister for the Environment. Pending the Ministers decision, a higher level of assessment may be set or Stage 2 will be assessed under Part V of the EP Act (as recommended by the EPA) and the *Mining Act 1978*.

Stage 3, the Fimiston Operations Extension and Mine Closure Planning (the Project) is the subject of this PER. Table 1 outlines the proposed schedule to undertake the required assessments for the Project. Timing is critical for KCGM to receive approval through the EPA process (Part IV) by early 2007. This will enable further approvals to be sought through the DoIR and Department of Environment and Conservation (DEC) process and KCGM to commence the Project in the 2008.

Table 1: Indicative Project Schedule

MILESTONE	INDICATIVE TIMEFRAME
Commence Stakeholder Consultation	December 2004 - ongoing
Project referred to EPA	1 July 2005
Approval of Environmental Scoping Document	9 February 2006
Release of PER for Public Review (8 weeks)	4 September 2006 - 30 October 2006
Release of EPA Report and Recommendations	16 February 2007
Minister for the Environment sets Conditions	11 May 2007
Minister for the Environment issues Ministerial Statement	29 June 2007
DoIR/ DEC Assessment	May 2006 - May 2007
Final Project Approval	August 2007

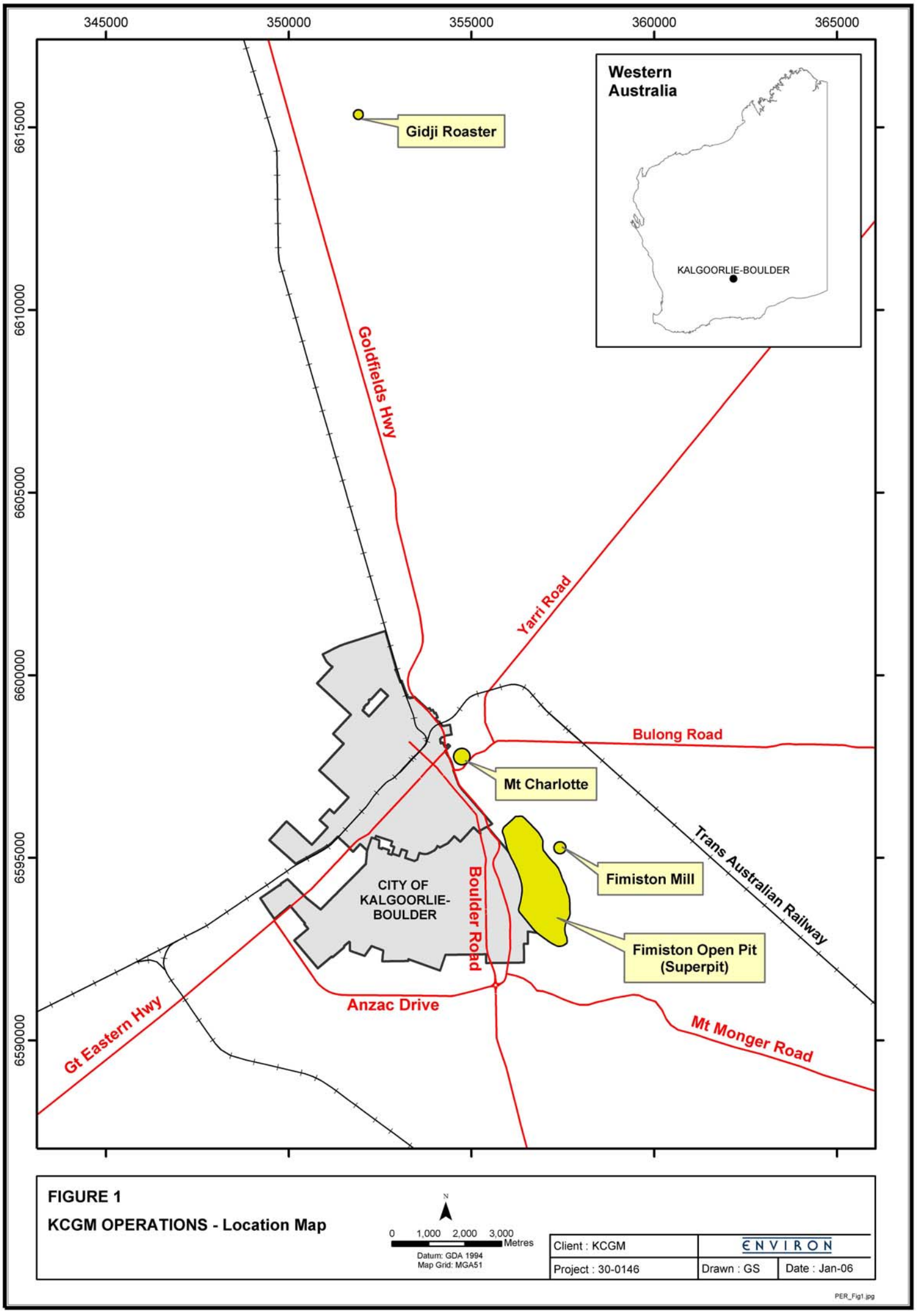

FIGURE 1

KCGM OPERATIONS - Location Map

N

0 1,000 2,000 3,000 Metres

Datum: GDA 1994
Map Grid: MGA51

Client : KCGM	ENVIRON	
Project : 30-0146	Drawn : GS	Date : Jan-06

PER_Fig1.jpg

2. PROJECT JUSTIFICATION, BENEFITS AND ALTERNATIVES

2.1 PROJECT JUSTIFICATION

In 2004, KCGM was the largest gold producer in Western Australia and contributed to Australia being the second largest gold producer in the world, behind South Africa. At a local level, during 2005 KCGM contributed more than $260 million to the local economy of the City of Kalgoorlie-Boulder through wages and the use of Kalgoorlie-Boulder based suppliers. KCGM is recognised as a major employer within Kalgoorlie-Boulder with the majority of the 725 employees (including full-time contractors) residing within the local community.

KCGM has the ability to optimise the potential of the Golden Mile resource through the development of the Golden Pike orebody and thereby extending the life of the Fimiston Open Pit mining operation in Kalgoorlie-Boulder for an additional five years.

2.2 STATE, REGIONAL AND LOCAL BENEFITS

2.2.1 Economic Benefits

KCGM is a significant contributor to economic development in the Goldfields-Esperance Region, through the creation of jobs, income and expenditure in the local community. The benefits of KCGM activities are experienced on two levels; the direct investment in local purchases and salaries and through regional flow on expenditure. Flow on impacts are presented through output, or consumption of goods and services; household income and employment.

Through the Goldfields-Esperance Development Commission an assessment of the multiplier or flow on impacts of KCGM's operations was undertaken using REMPLAN software developed by La Trobe University. This revealed that the direct investment has many additional regional benefits (Goldfields-Esperance Development Commission, 2005).

The study provided information on the additional economic benefits that result from both the flow on effect of the goods and services that KCGM acquire locally and the expenditure of KCGM salaries in the region. The flow on effect occurs when local providers make additional local purchases, generating flow on investment and salaries in the Goldfields-Esperance region.

The REMPLAN model shows the overall impact on local consumption to be approximately $416 million which includes KCGM's investment in local industries and the flow on expenditure. While all industry sectors experience some activity, the industries that experience the greatest impact of the direct and flow on investment are; property and business services ($48M), retail trade ($30M), other machinery and equipment ($29M), construction ($26M), electricity, gas and water ($24M), wholesale trade ($23M), accommodation, restaurants and cafes ($22M) and transport and storage ($20M).

The portion of KCGM wages and flow on earnings from other local wage earners (associated indirectly with KCGM activities) that are spent in the region is also picked up in increased business activity of industry sectors such as retail trade, cafes, restaurants and accommodation and education services.

Modelling indicates that this generates a flow-on effect of an additional $76M annually in household income in the Goldfields-Esperance Region. This income is shared across 33 industry sectors other than mining with the most significant in retail trade ($10M) and property and business services which includes ownership of dwellings ($10M). Other key areas include wholesale trade ($4.7M), accommodation, restaurants and cafes ($4.5M), personal and other services ($4.0M), education ($3.6M), construction ($3.5M) and health and community services ($3.4M).

In addition to the 725 KCGM employees (including full-time contractors), a further 1,823 positions are generated through both direct and flow-on demand for local goods and services. While all industry sectors experience some activity, the most significant sectors that experience an employment impact in persons are; retail trade (434 persons), property and business services (182), accommodation, restaurants and cafes (182), wholesale trade (108), construction (104), mining (98), transport and storage (93), personal and other services (93), health and community services (85) and education (75).

Value added impacts show the benefits of a regional activity that contribute to the Gross Regional Product. Modelling shows that the KCGM activities in direct and flow on impacts contribute a total of $309M to value adding which is approximately 9.7% of Gross Regional Product. KCGM directly contributes $168M and the flow on contribution is $141M. In addition property and business services, retail trade and 31 other industry sectors will experience further processing of their goods and services to the value of up to $17M.

2.2.2 Tourism

The Super Pit Tourist Lookout has become a major tourist attraction for the Goldfields with approximately 10,000 visitors per month. Open days, guided tours, the Super Pit Shop and the Super Pit Lookout provide visitors with information on KCGM and increase awareness of the KCGM operation and the mining industry as a whole. KCGM has been publicly acknowledged for its commitment to tourism, and was the recipient of the Kalgoorlie-Boulder's Chamber of Commerce & Industry's Tourism Award in 2004.

KCGM also encourages its staff to volunteer in the community. KCGM has a group of volunteers that were recognised in the recent 2005 Kalgoorlie-Boulder Volunteer Centre (KBVC) tourism awards for services to the community.

Planning for the Fimiston Operations Extension Project resulted in the formation of a collaborative partnership with the Golden Mile Loopline Railway Society. The proposed realignment of the Environmental Noise Bund (Stage 1) highlighted an opportunity for the Loopline Society to construct the historical Loopline Railway along part of the new bund. The railway will provide patrons with expansive views of the City of Kalgoorlie- Boulder, the KCGM operations, and provide access to the relocated Super Pit Lookout.

KCGM has been a major sponsor of the Loopline Railway Project that aims to restore part of the historical railway that was first constructed in 1897 and operated along the Golden Mile. This partnership between KCGM and the Loopline Society endeavours to enhance the experience of visitors to the region and become a tourist legacy for the City of Kalgoorlie-Boulder.

2.3 EVALUATION OF ALTERNATIVES

The westerly extension of the Fimiston Open Pit is defined by the location of the Golden Mile orebody which constrains the consideration of alternatives for the proposed mining area. Evaluations of potential waste rock dump locations and opportunities for acquiring additional tailings storage capacity have continued during planning and feasibility stages of the Project. KCGM aims to continuously examine and improve Project opportunities to ensure that the best outcomes are identified and implemented.

2.3.1 Waste Rock Dumps

Opportunities for the location of additional waste rock dumps are limited by the existing dumps encompassing the southern and eastern surrounds of the Fimiston Open Pit. Extensions to or increases in the height of these dumps is restricted by airport regulations and geographic constraints of the eastern and southern drainage lines associated with Hannan's Lake.

The proposal to locate additional waste rock dumps in identified areas north of the operation aims to restrict KCGM's footprint area central to the existing operation. Using the northern waste dumps is considered the most environmentally sound and economically feasible option.

The location of the dump and the proposal to also backfill waste into the northern end of the Fimiston Open Pit reduces truck haulage distances from the open pit. This provides environmental benefits including the minimisation of greenhouse gas emissions by reducing diesel consumption and avoids further clearing of native vegetation due to the dumps being located on historically disturbed land, rehabilitated by KCGM.

2.3.2 Tailings Storage Facilities

KCGM has considered several opportunities for the provision of additional tailings storage capacity to meet life of mine tailings production. These options include:

- raise the perimeter embankment height of Fimiston I and/or Fimiston II TSFs;
- construct a new TSF (Fimiston III);
- acquire Kaltails TSF and raise the perimeter embankment height; and
- in-pit tailings disposal.

In-pit disposal of tailings was investigated as an option however there were no nearby open pits of sufficient size that would provide the required storage capacity. The construction of a new TSF (Fimiston III) was originally identified as a feasible option, however further assessment of possible opportunities for tailings storage has highlighted the alternatives that are considered to have significantly better environmental outcomes. The elimination of the new TSF option will avoid the need to clear approximately 150 ha of undisturbed native vegetation.

KCGM has approval to progressively raise the height of Fimiston I TSF to 40 m (if performance targets are met on 2.5 m incremental lifts) and has an application before the DoIR and EPA to raise the height of Fimiston II TSF from 30 m to 45 m. The capacity provided by the current proposed increase in height of these facilities is sufficient only to meet tailings requirements of the current 2012 life of mine. KCGM's preferred option, pending the outcome of further investigations, is to raise the embankment height of the Fimiston I and Fimiston II TSFs. This option would reduce the overall footprint for the Project.

The recommissioning of the existing Kaltails TSF and increase the height of its perimeter embankments is proposed as KCGM's contingency option for tailings storage. The Kaltails TSF has an established and operational monitoring bore network and no additional clearing of vegetation is required.

If the initial application for a height increase to the Fimiston II TSF is not approved (i.e. to 45 m), KCGM will need to re-examine the feasibility of the Fimiston Operations Extension Project as the Kaltails TSF alone is unable to provide the required total tailings storage capacity for the 2017 life of mine.

2.3.3 No Development Option

The “no project” option would result in the loss of opportunity to develop an accessible world class gold resource tradable on a global scale and bringing economic benefits to Western Australia. The economic loss to the local regional community would be high as a result of a substantial decrease in employment opportunities and funding support for local organisations and events. There would most likely be a reduction in the population of the City of Kalgoorlie-Boulder as people would be forced to seek employment in other regional locations, or Perth.

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3. LEGISLATIVE FRAMEWORK

3.1 STATE GOVERNMENT LEGISLATION

State legislation relevant to the Project includes the following:

- *Aboriginal Heritage Act 1972*
- *Agriculture and Related Resources Protection Act 1976*
- *Bush Fires Act 1954*
- *Conservation and Land Management Act 1984*
- *Contaminated Sites Act 2003*
- *Environmental Protection Act 1986*
- *Explosives and Dangerous Goods Act 1961* (to be replaced by *Dangerous Goods Safety Act 2004*)
- *Dangerous Goods (Transport) Act 1998* (to be replaced by *Dangerous Goods Safety Act 2004*)
- *Land Administration Act 1997*
- *Mining Act 1978*
- *Mines Safety and Inspection Act 1984*
- *Planning and Development Act 2005*
- *Rights in Water and Irrigation Act 1914*
- *Soil and Land Conservation Act 1945*
- *Tailings Treatment (Kalgoorlie) Agreement Act 1988*
- *Wildlife Conservation Act 1950.*

The *Environmental Protection Act 1986* is the principal statute relevant to environmental protection in Western Australia. The Act makes provision for the establishment of the EPA, for the prevention, control and abatement of pollution and for the conservation, preservation, protection, enhancement and management of the environment.

The *Tailings Treatment (Kalgoorlie) Agreement Act 1988* makes provision for tenure over the Kaltails TSF for joint venture partners Newmont Kaltails Pty Ltd (90%) and the Western Australian Mint (10%). This Agreement needs to be "determined" in accordance with Clause 19 of the Agreement, prior to the transfer of the General Purpose lease to enable KCGM to operate the facility.

3.2 COMMONWEALTH GOVERNMENT LEGISLATION

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), an action requires approval from the Federal Environment Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance such as:

- World Heritage properties;
- Ramsar wetlands of international importance;
- Listed threatened species and communities;
- Migratory species protected under international agreements;
- Nuclear actions; and
- Commonwealth marine environment.

The Project is not considered to trigger the EPBC Act as no threatened species or communities have been identified within the Project area or have the potential to be impacted by the Project.

The National Pollution Inventory (NPI) is a collaborative initiative of the Commonwealth, State and Territory Governments and requires industries across Australia to report emissions data and other details of reportable substances for posting on the Internet for public review. KCGM reports to the NPI on an annual basis.

Other agreements and treaties related to the Project are:

- National Greenhouse Response Strategy;
- National Strategy for the Ecologically Sustainable Development (NSESD);
- United Nations Framework Convention on Climate Change;
- Hope for the Future - The Western Australian State Sustainability Strategy; and
- The Greenhouse Strategy for Western Australia.

3.3 GUIDELINES AND STANDARDS

A number of State and National guidelines and standards are applicable to and have been considered during planning and design of this Project. The following EPA Position and Guidance Statements are applicable for the assessment of environmental impacts for the Project:

Position Statements

- Environmental Protection of Native Vegetation in Western Australia, No. 2, December 2000 (EPA, 2000);
- Terrestrial Biological Surveys as an Element of Biodiversity Protection, No. 3, March 2002 (EPA, 2002);
- Environmental Protection and Ecological Sustainability of the Rangelands in Western Australia, No. 5, November 2004 (EPA, 2004);
- Towards Sustainability, No. 6, August 2004 (EPA, 2004a);
- Principles of Environmental Protection, No. 7, August 2004 (EPA, 2004b);
- Environmental Protection in Natural Resource Management, No. 8 June 2004 (EPA, 2004c); and
- Environmental Offsets, No. 9 January 2006 (EPA, 2006).

Guidance Statements

- Separation Distances Between Industrial and Sensitive Land Uses, No. 3, June 2005 (EPA, 2005a);
- Rehabilitation of Terrestrial Ecosystems, No. 6, June 2006 (EPA, 2006a);
- Minimising Greenhouse Gas Emissions, No. 12, October 2002 (EPA, 2002a);
- *Draft* Environmental Guidance for Planning and Development, No. 33, June 2005 (EPA, 2005b);
- Linkage between EPA Assessment and Management Strategies, Policies, Scientific Criteria, Guidelines, Standards and Measures Adopted by National Councils, No. 34, April 1998 (EPA, 1998);
- Assessment of Aboriginal Heritage, No. 41, April 2004 (EPA, 2004d);
- Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51, June 2004 (EPA, 2004e);
- Implementing Best Practice in Proposals Submitted to the Environmental Impact Assessment Process, No. 55, December 2003 (EPA, 2003); and
- Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56, June 2004 (EPA, 2004f).

The Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia (ANZMEC/ MCA) guideline on a Strategic Framework for Mine Closure (2000) has also been considered as part of the mine closure planning aspect of this Project.

3.4 KEY DECISION MAKING AUTHORITIES

The key Decision Making Authorities (DMA's) involved in the environmental assessment of the Project are the EPA and the DEC (formerly Department of Environment [DoE] which provides advice to the EPA, and Department of Conservation and Land Management [CALM]).

Other DMA's involved in the Project Approvals include:

- Department of Industry and Resources (DoIR);
- Department of Indigenous Affairs (DIA);
- Department of Health (DoH);
- Department of Consumer and Employment Protection (DoCEP);
- Department of Land Information (DLI);
- Department of Planning and Infrastructure (DPI); and the
- City of Kalgoorlie-Boulder.

3.5 APPROVALS PROCESS

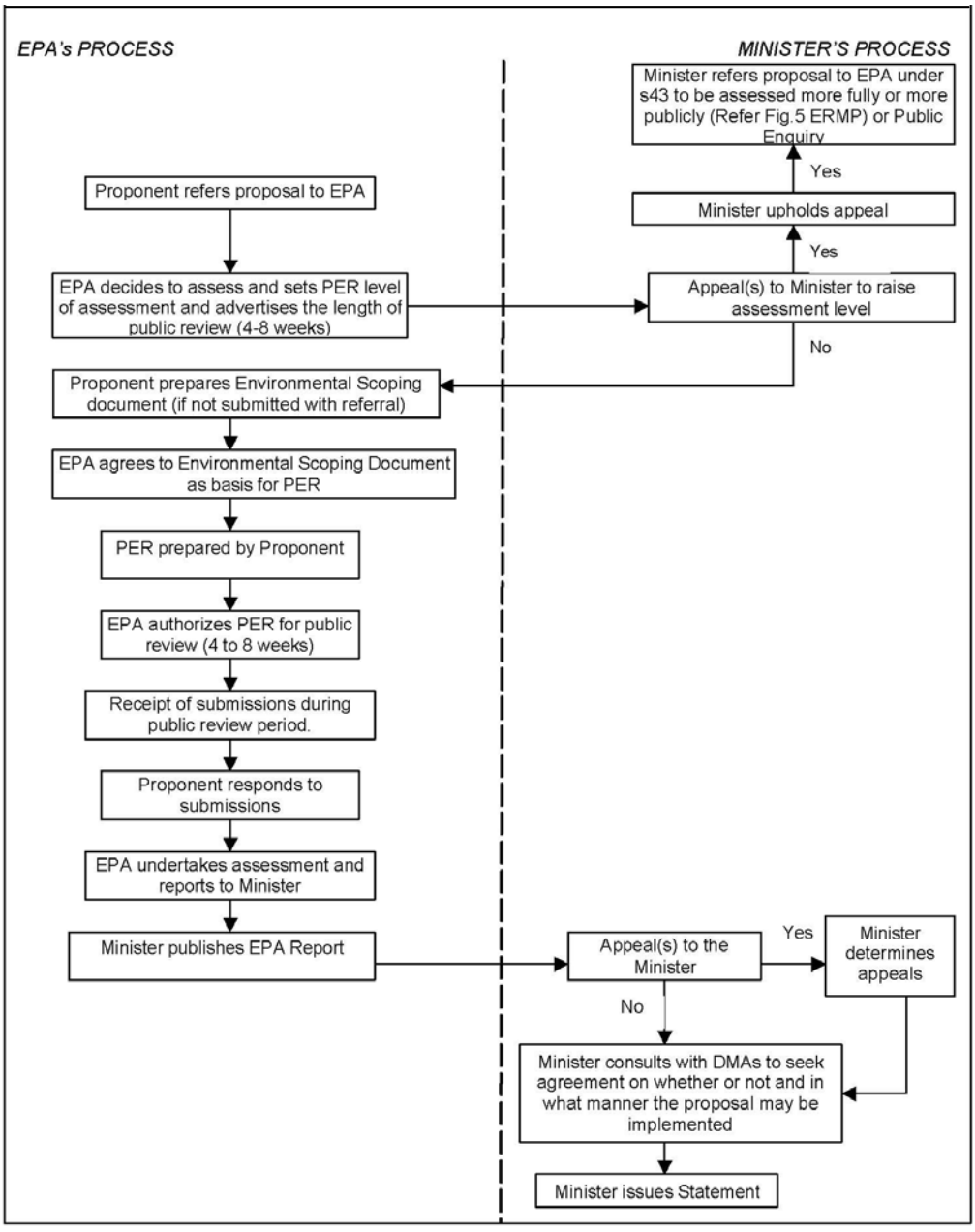
The EPA has determined that the Project requires a formal level of environmental assessment and this has been set as a PER. The process for submission and assessment of a PER is determined by the EPA process (Figure 2) and is outlined below for this Project:

1. The Proponent refers the proposal to the EPA to set the level of assessment (an Environmental Referral (the PDD) for this Project was submitted on 1st July 2005);
2. The EPA determines the level of assessment and advertises this decision and the length of the public review period (a PER level of assessment with a public review period of 8 weeks was advertised on 25 July 2005);
3. The Minister for Environment determines the appeals against the level of assessment. On 11 November 2005 the Minister for Environment dismissed the appeals and confirmed the level of assessment as a PER with an 8 week public review period.
4. The Proponent prepares an Environmental Scoping Document outlining the scope of works for the PER assessment (revised document submitted 20 January 2006);
5. The EPA agrees to the Environmental Scoping Document as a basis for the PER (9 February 2006);
6. The Proponent undertakes studies and investigations into the PER document;
7. The PER is prepared by the Proponent;
8. The PER is submitted as a final draft to the EPA for authorisation to release as a public document;
9. The PER is released for a public review period (8 weeks);
10. The Proponent responds to any submissions made on the Proposal at the end of the public review period;
11. The EPA undertakes an assessment of the PER and the Proponent's response to any submissions and makes a recommendation to the Minister for Environment;

12. The Minister for Environment publishes the EPA Report;
13. The Minister for Environment determines any appeals, and consults with the key Decision Making Authorities to seek agreement on whether or not, and in what manner the proposal may be implemented; and
14. The Minister for Environment issues a Statement determining if the Proposal may proceed, and details the conditions associated with the approval.

Once approval for a Project is obtained under Part IV of the *Environmental Protection Act 1986*, licensing of prescribed premises for construction and operations is required under Part V of the Act. TSFs are listed as prescribed premises and require a Works Approval Application to be submitted to the DEC prior to commencement of construction works. An amendment to KCGM's existing Licence to Operate for the Fimiston Operations may also be required from the DEC. A Mining Proposal will be submitted to the DoIR for approval for aspects of the Project regulated under the *Mining Act 1978*.

An exemption may also be required for noise levels under Regulation 17 of the *Environmental Protection (Noise) Regulations 1997*. An application will be made to the DEC subsequent to the release of this PER.



Source: EPA Environmental Impact Assessment (Part IV Division 1) Administrative Procedures 2002

Figure 2
EPA Process for PER Assessment

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: - FT	Date: Jan -06

4. PROJECT DESCRIPTION

4.1 KEY CHARACTERISTICS

Table 2 outlines the key characteristics of the Fimiston Operations Extension and Mine Closure Planning Project (Stage 3). Characteristics of the current operation that will remain unchanged from the Project include power consumption, water consumption, the storage capacity of fuels, and the provision of ancillary services.

Table 2: Project Key Characteristics

ELEMENT	DESCRIPTION
General	
Project Life	Additional 5 years open pit mining to 2017
Mining Production Rate	Up to 89 Mtpa
Milling Production Rate	Up to 13.5 Mtpa
Mining Operation	7 days/wk 365 days/yr
Fimiston Open Pit	
Golden Pike Cutback	As shown on Figure 3
Final Pit Depth	Approximately 600 m deep (-670 mRL)
Waste Movement	
Northern Waste Rock Dumps	14.6 million m^3
In-Pit Backfill	26.8 million m^3 (covering 57 ha)
Tailings Storage Facilities	
Option 1	
Fimiston I TSF	Height increase from 40 m to 50 m
Fimiston II TSF	Height increase from 45 m to 60 m
Option 2	
Fimiston I TSF	No further height increase (i.e. 40 m)
Fimiston II TSF	No further height increase (i.e. 45 m)
Kaltails TSF	Height increase from 25 m to 45 m
Ground Disturbance Area	
Golden Pike Cutback	46 ha
Northern Waste Rock Dumps	115 ha
Workforce	Existing workforce (approximately 725 employees and full time contractors)
Accommodation	Existing residences in Kalgoorlie-Boulder

4.1.1 Area of Disturbance

The area of disturbance on relevant KCGM tenements is provided in Table 3.

Table 3: Additional Area of Disturbance per Tenement

TENEMENTS	ACTIVITY	PROPOSED GROUND DISTURBANCE (ha)
M26/316	Golden Pike Cutback	16
M26/359	Golden Pike Cutback	13
M26/405	Golden Pike Cutback	17
M26/131	Waste Rock Dump	12
M26/87	Waste Rock Dump	3
M26/359	Waste Rock Dump	20
M26/383	Waste Rock Dump	80

4.2 GOLDEN PIKE CUTBACK

KCGM intends to undertake a cutback along a section of the western edge of the existing Fimiston Open Pit as shown on Figure 3. The cutback, referred to as the Golden Pike Cutback will allow for both widening and deepening of the pit to a depth of around 600m (-670 mRL). The surface extent of the Golden Pike Cutback is 46 hectares (ha). The cutback will extend the open pit mine life of the KCGM operation until 2017, an additional five years from the current mine life of 2012. The proposed final outline of the Fimiston Open Pit is shown on Figure 4. A plan layout view is shown in Figure 5.

The extension is proposed for the western wall of the Fimiston Open Pit and not the eastern wall due to the geometry and geology of the "Golden Mile" ore bodies. The eastern wall of the Fimiston Open Pit roughly corresponds to the eastern orebody boundary, and the ore dips away under the western wall. The Fimiston Open Pit surface footprint has reached the maximum economic limits on the eastern side. The proposed western boundary marks the maximum economic limits of the Fimiston Open Pit based on the expected future gold price. It is anticipated that any further mining beyond this will be via underground mining methods should this be considered economical.

To ensure the continued economic viability of the operation it is important that mining of the Golden Pike Cutback commences no later than 2008. This will allow timely removal of the waste material to enable access to the ore (gold bearing material) at a time when ore production at depth is reduced.

4.3 NORTHERN WASTE ROCK DUMPS

To meet the life of mine waste dumping requirements approval is required for additional waste rock dump areas. In addition to existing areas to the south and east of the operation, areas north of the open pit have been identified to provide capacity for the remaining 908 Mt of waste rock expected to be generated from the Fimiston Open Pit Extension (Figure 6). Waste will also be backfilled into a portion of the northern end of the open pit and this will assist in reducing the overall surface footprint of the waste rock dumps.

The area proposed for the construction of the Northern Waste Rock Dumps (NWRD) will cover approximately 115 ha of land that is historically degraded but has been subsequently rehabilitated by KCGM. The maximum height of the North West and North East waste rock dumps will be 40 m and 100 m respectively. This maximum height is no greater than the waste rock dump heights currently approved. These maximum heights also comply with the airport height restrictions.

KCGM has presented the maximum capacity of waste rock dump storage area for the remaining life of mine of the Fimiston Operations. However, KCGM will continue during mine planning, to investigate other feasible and strategic options to reduce the NWRD footprint as much as possible.

Waste dumping segments are designed within the overall KCGM waste dumping footprint. Waste blocks from each mining bench within a given cutback are scheduled for dumping locations via ramps and haul roads during the dump optimisation process. Typically, waste is sent to the nearest available dump with the shortest haulage route chosen to minimise trucking (and diesel) requirements.

Pit backfilling is maximised as much as possible, as it has the advantage of providing a short haul dumping location and minimises the final surface waste rock dump footprint and greenhouse gas emissions. There are two areas within the final pit scheduled for in pit dumping; the northern and southern backfill locations which have a capacity of 184 Mt, equivalent to 34% of total waste dumping requirements.

The anticipated total extent of waste rock dumps at KCGM (currently approved and proposed) is shown on Figure 7.

4.4 TAILINGS STORAGE

Two options have been considered to provide additional tailings storage capacity for Fimiston Gold Mine Operations Extension (Stage 3). The preferred option is to raise the perimeter embankment height of the Fimiston I and Fimiston II TSFs. The contingency option is to acquire the Kaltails TSF and raise the perimeter embankment height to use in conjunction with the Fimiston I and Fimiston II TSFs.

Two other options; in-pit tailings disposal and construction of a new TSF, were also considered, but not pursued (Section 2.3.2).

Both options are contingent on approval of the Stage 2 project for height increase for the Fimiston II TSF, which is currently being assessed. If the initial application for a height increase to 45 m for the Fimiston II TSF is not approved, KCGM will need to re-examine the feasibility of the Fimiston Operations Extension Project as the Kaltails TSF alone is unable to provide the required total tailings storage capacity for the 2017 life of mine.

Figure 8 shows the location of the Fimiston I, Fimiston II and Kaltails TSFs.

KCGM currently has a pipeline corridor to the Fimiston TSFs to transport tailings to, and return decant water from the TSFs. Similarly a pipeline corridor already exists between the Kaltails TSF and the KCGM's operations for the transport of borefield water and smaller amounts of seepage recovery water. Water abstracted by the Kaltails borefield and groundwater bores, is used in the Fimiston operations. These pipeline corridors will be used for the Project and no additional disturbance for corridors is expected to be required.

4.4.1 Option 1: Height Increase Fimiston I and Fimiston II

KCGM has approval to progressively raise the height of the Fimiston I TSF to 40 m subject to performance criteria being met, and has an application before the DoIR and EPA to raise the height of Fimiston II TSF from 30 m to 45 m. This will provide sufficient tailings storage for the current 2012 life of mine.

An additional 750 Mt of tailings would require disposal as part of the Fimiston Operations Extension Stage 3 Project. Option 1 for additional tailings storage is to further raise the height of the Fimiston I and Fimiston II TSFs. This is the preferred option as it minimises the overall footprint for the Project.

It is proposed to increase the embankment heights to:

- 50 m for Fimiston I TSF; and
- 60 m for Fimiston II TSF.

Fimiston I TSF is a single cell facility, and Fimiston II has three cells. Tailings deposition would be rotated between the cells of the two facilities to ensure adequate drying time. The maximum rate of rise for the Fimiston I TSF would be 3.3 m per year, and for the Fimiston II TSF, 3.4 m per year. The Fimiston I TSF covers an area of 110 ha and the Fimiston II TSF covers 350 ha.

Preliminary investigations indicate that the TSFs will be stable to the proposed heights under maximum credible earthquake loading (Section 11.4.3). Detailed design for increasing the height of the Fimiston I and Fimiston II TSFs will be undertaken as part of the DoIR approval requirements if this is determined to be the preferred option.

4.4.2 Option 2: Kaltails TSF

KCGM's contingency option is to acquire and recommission the Kaltails TSF, increasing the height of the perimeter embankments. This option would be used in conjunction with deposition to the Fimiston I and Fimiston II TSFs. The maximum embankment heights under this option would be:

- 45 m for Kaltails TSF;
- 40 m for Fimiston I TSF (i.e. no further height increase); and
- 45 m for Fimiston II TSF (i.e. no further height increase).

The use of Kaltails TSF would eliminate the need for a new TSF to be built on undisturbed land and hence reduce the direct impact on the natural environment. Additionally, the infrastructure (roads, decant ponds, groundwater abstraction and monitoring bores) associated with a TSF are already present at Kaltails further minimising impacts from vegetation clearing and disturbance. It is expected that this infrastructure will be further optimised based on KCGM's current seepage management plans.

Tailings deposition would be rotated between the Kaltails facility (Figure 9) and the Fimiston I and II facilities to allow for sufficient drying time. Decant water and seepage abstraction from the Kaltails TSF will be pumped to the Kaltails decant ponds to the Fimiston processing plant.

Detailed design for increasing the height of the Kaltails TSF will be undertaken as part of the DoIR approval requirements if this is determined to be the preferred option.

4.5 CONCEPTUAL MINE CLOSURE STRATEGY

In December 2004, KCGM presented the Fimiston Operations Extension Project for the final development of the Fimiston Open Pit with the public release of *KCGM's Concept Plan - Sharing Our Vision for the Future.* The Concept Plan marked the first time that KCGM had announced a closure date for the open pit operations, and presented graphical images of the final Fimiston Operation in 2017. KCGM sought and received feedback from the community on the content of the Concept Plan.

The Conceptual Mine Closure Strategy (provided in Appendix B1) formalises KCGM's commitment and approach towards closure of all aspects of its operations. KCGM aims to continue the discussion on mine closure to identify regulatory and community expectations and ideas for operation closure in 2017. The Strategy will remain a fluid document that will be reviewed and updated every three years to ensure changes in areas such as the regulatory environment, community expectations or technical closure planning information are captured and incorporated into decision making processes.

The Strategy covers all operations on tenements under the control of KCGM and it provides the basis from which detailed Closure Plans for specific areas will be developed. Regulatory authorities and the community will be involved in developing agreed commitments and targets for closure. The main operational areas are outlined below:

- Open Pits;
- Processing Plants;
- Underground Mines;
- Tailings Storage Facilities;
- Waste Rock Dumps;
- Historical Mining Activities; and
- Infrastructure and Utilities.

Although the current expected mine life of the Fimiston Open Pit is to 2017, planning is underway to consider opportunities to extend the mine life. It is already public knowledge that KCGM is looking at the underground mining potential from the open pit, while the toll treating of ore has also been proposed to prolong mine life. The key to KCGM's closure planning is flexibility and further development of stakeholder awareness as the operations draw closer to an actual resource depletion end date. It is intended that a more definitive timeline of environmental, social and financial studies will be created when the Fimiston Operations are within 5 years of closure.

In summary, the Conceptual Mine Closure Strategy addresses the following elements:

- Closure Objectives;
- Commitment and Legal Obligations;
- Operational Overview;
- Stakeholder Involvement;
- Risk Assessment;
- Closure Planning;
- Financial Provisioning;
- Proposed Land Use;
- Closure Timetable;
- Closure Criteria; and
- The development of Closure Plans.

Due to the size and spatial spread of operations and the degree of historical mining activity on KCGM's leases, KCGM will develop a series of Closure Plans for different aspects of the operation. Different closure timing of some aspects of the operation will also influence the development of these plans.

For example, separate closure plans for the Gidji and Fimiston Operations may be more applicable than creating one closure plan for the entire operation, as many of the areas may be at various stages of closure or continued operation before the expected end of mine life of 2017. Closure Plans will be developed at least three years prior to closure, in line with the ANZMEC *Strategic Framework for Mine Closure* (2000).

KCGM aims to commence the development of Preliminary Site Specific Closure Plans within at least five years prior to closure, with the aim of finalising the Site Specific Closure Plans at least 3 years prior to closure. Community and regulatory consultation will be undertaken between the release of the preliminary closure plan and the finalisation of the site specific closure plans.

Additional plans will also be developed to provide support for closure operations at various levels. These include the Rehabilitation Management Plan, Decommissioning Plan and Maintenance and Monitoring Plan.

Progressive rehabilitation is being undertaken throughout the life of the mine and includes historically disturbed areas, waste rock dumps and tailings storage facilities. A Rehabilitation Management Plan will be developed to formalise KCGM's strategy for progressive rehabilitation. This plan will provide regulators and the community with an understanding of KCGM's strategy for rehabilitation prior to the development of detailed closure plans.

A Decommissioning Plan and a Maintenance and Monitoring Plan will be completed approximately 12 months prior to scheduled closure. Maintenance and monitoring will be undertaken for at least five years post-closure to measure the progress of rehabilitation, landform management and any other aspects against the specified closure criteria. The need for continued maintenance and monitoring will be reassessed at the end of five years.

The summary of the closure documents which will be prepared is outlined below:

- Conceptual Mine Closure Strategy – February 2006 (see Appendix B1), reviewed every 3 years;
- Rehabilitation Management Plan – July 2006, reviewed annually;
- Community Consultation Strategy – (commenced with release of KCGM's Concept Plan *Sharing Our Vision for the Future*, to be reviewed in December 2006 and then every 2 years; see Section 5);
- Community Consultation Plan – 5 years prior to closure, reviewed every 2 years (see Section 5);
- Preliminary Site Specific Closure Plans – 5 years prior to closure, reviewed every 2 years;
- Final Site Specific Closure Plans – 3 years prior to closure;
- Employee and Business Transition Plans – 3 years prior to closure, reviewed annually;
- Decommissioning Plan – 12 months prior to closure; and
- Maintenance and Monitoring Plan – 12 months prior to closure for a minimum of 5 years post-closure.

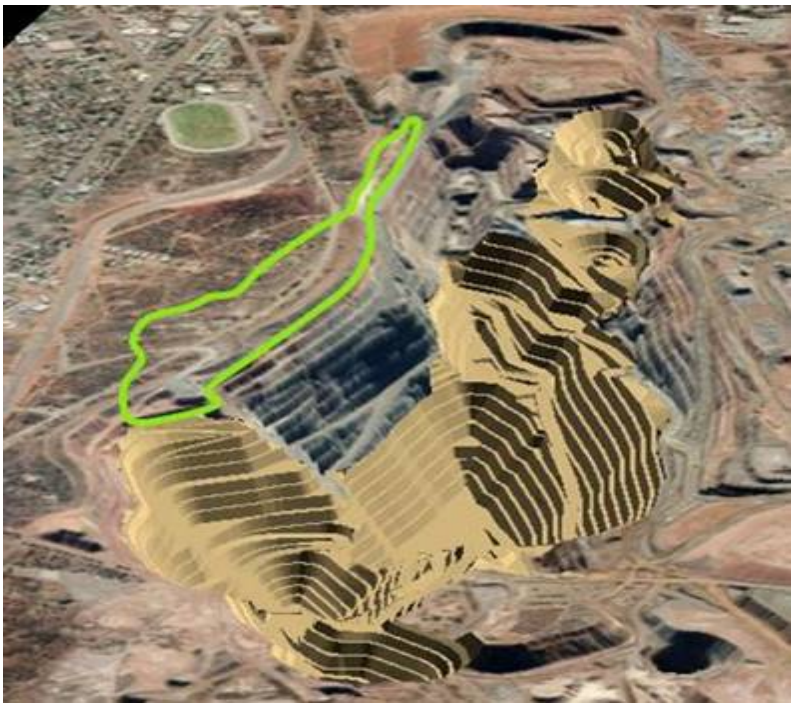


Figure 3
Surface Extent of the Golden Pike Cutback

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: FT	Date: Jan-06

Figure 4
Proposed Fimiston Open Pit 2017

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: FT	Date: Jan-06

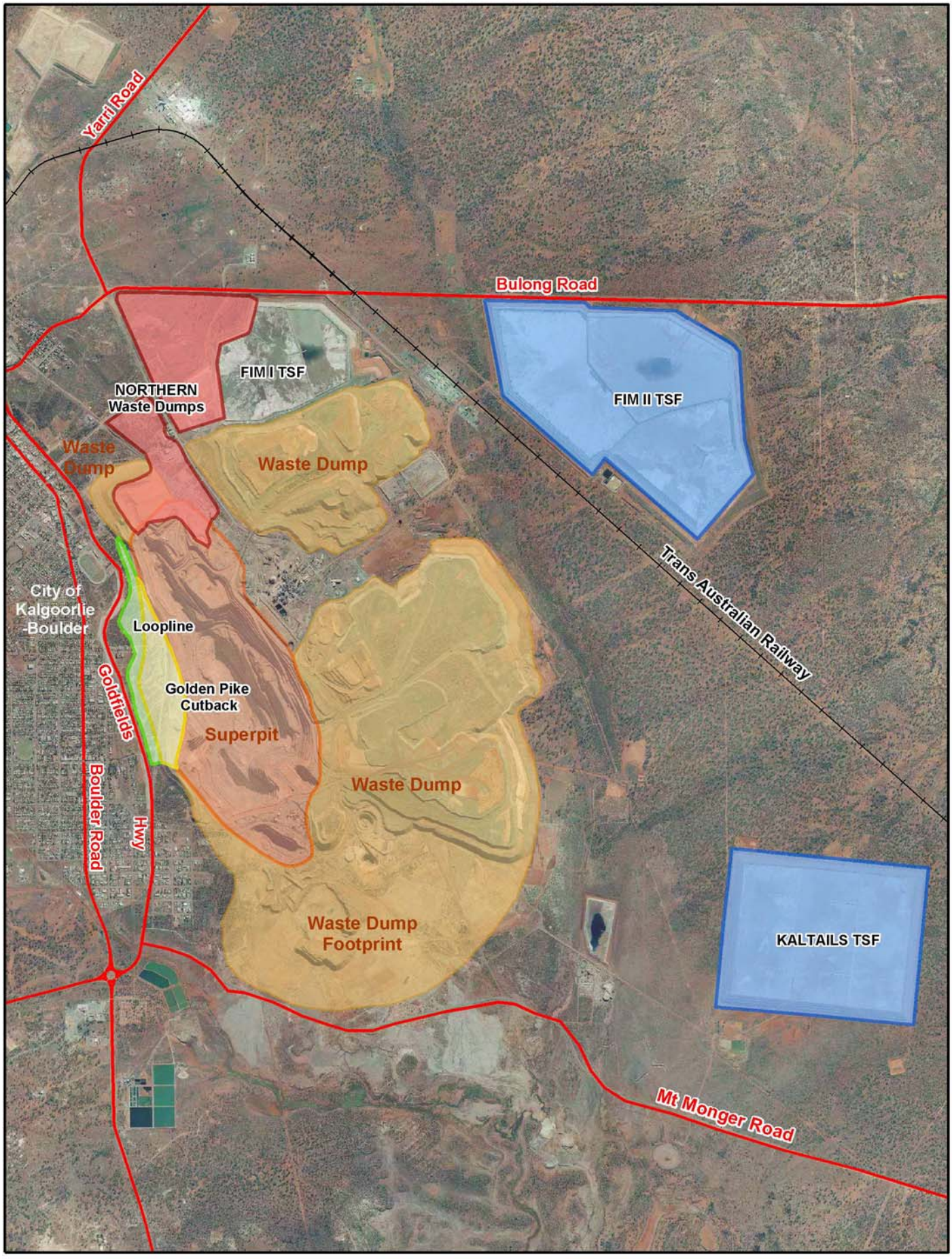


FIGURE 5

Plan View of the Proposed Project

N

0 500 1,000 1,500 Metres

Client : KCGM	ENVIRON	
Project : 30-0146	Drawn : GS	Date : Jan-06

PER_Fig5.jpg

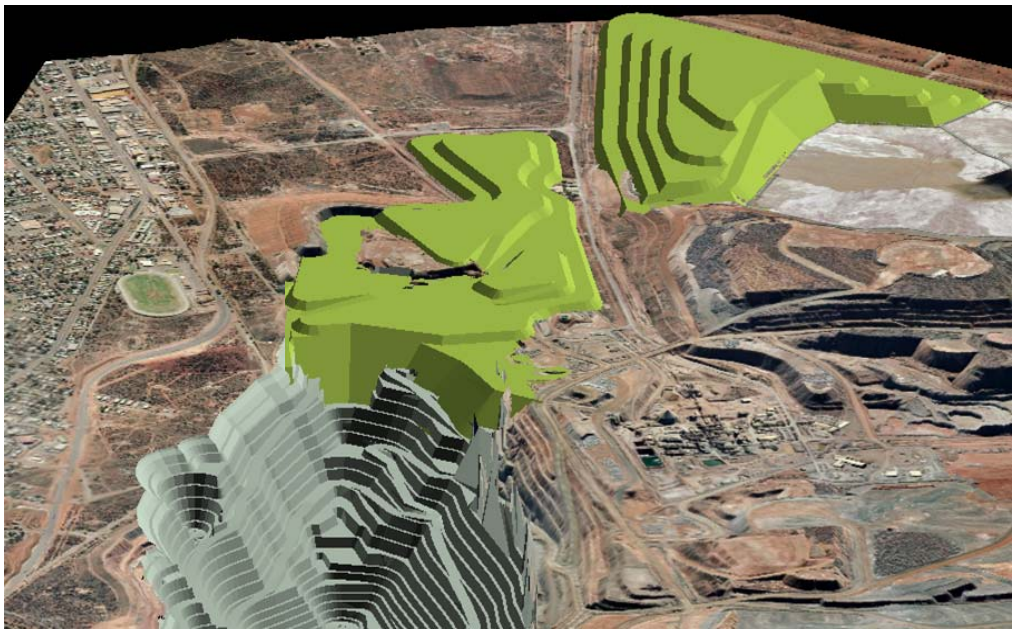


Figure 6
Location of Proposed Northern Waste Rock Dumps

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: FT	Date: Jan-06

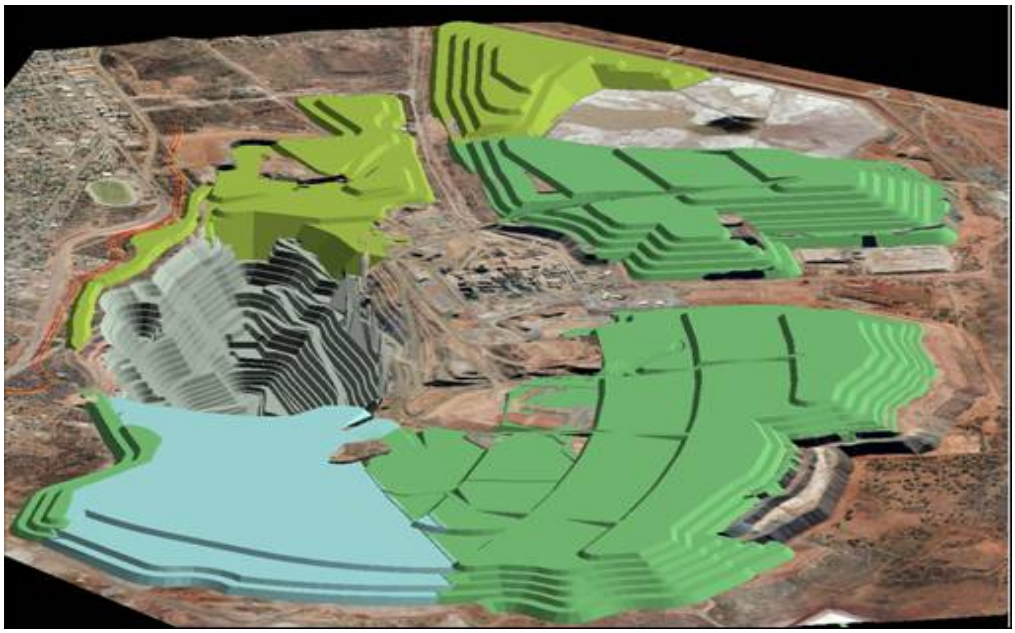


Figure 7
Proposed Final Waste Rock Dump and Open Pit Landform

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: FT	Date: Jan-06

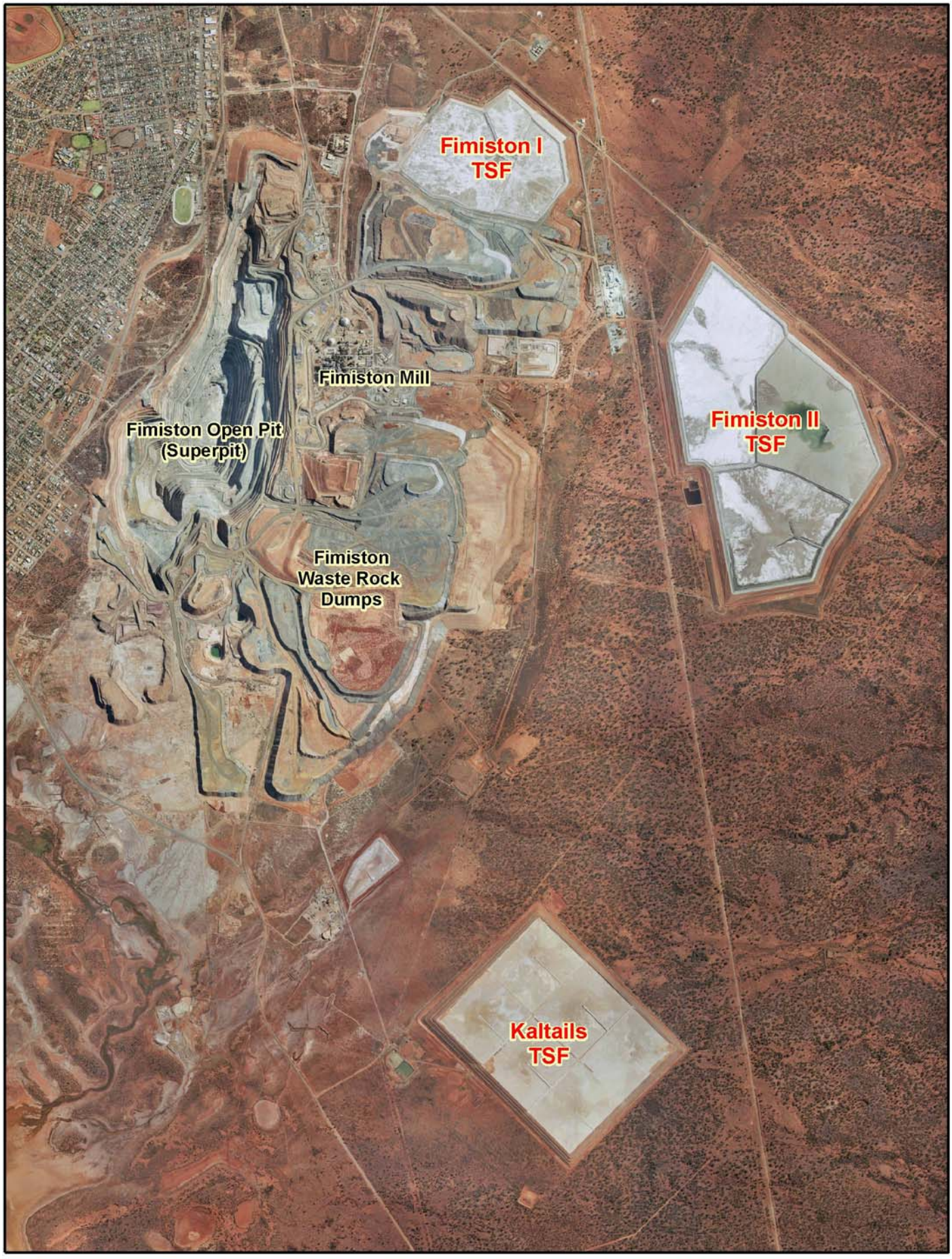


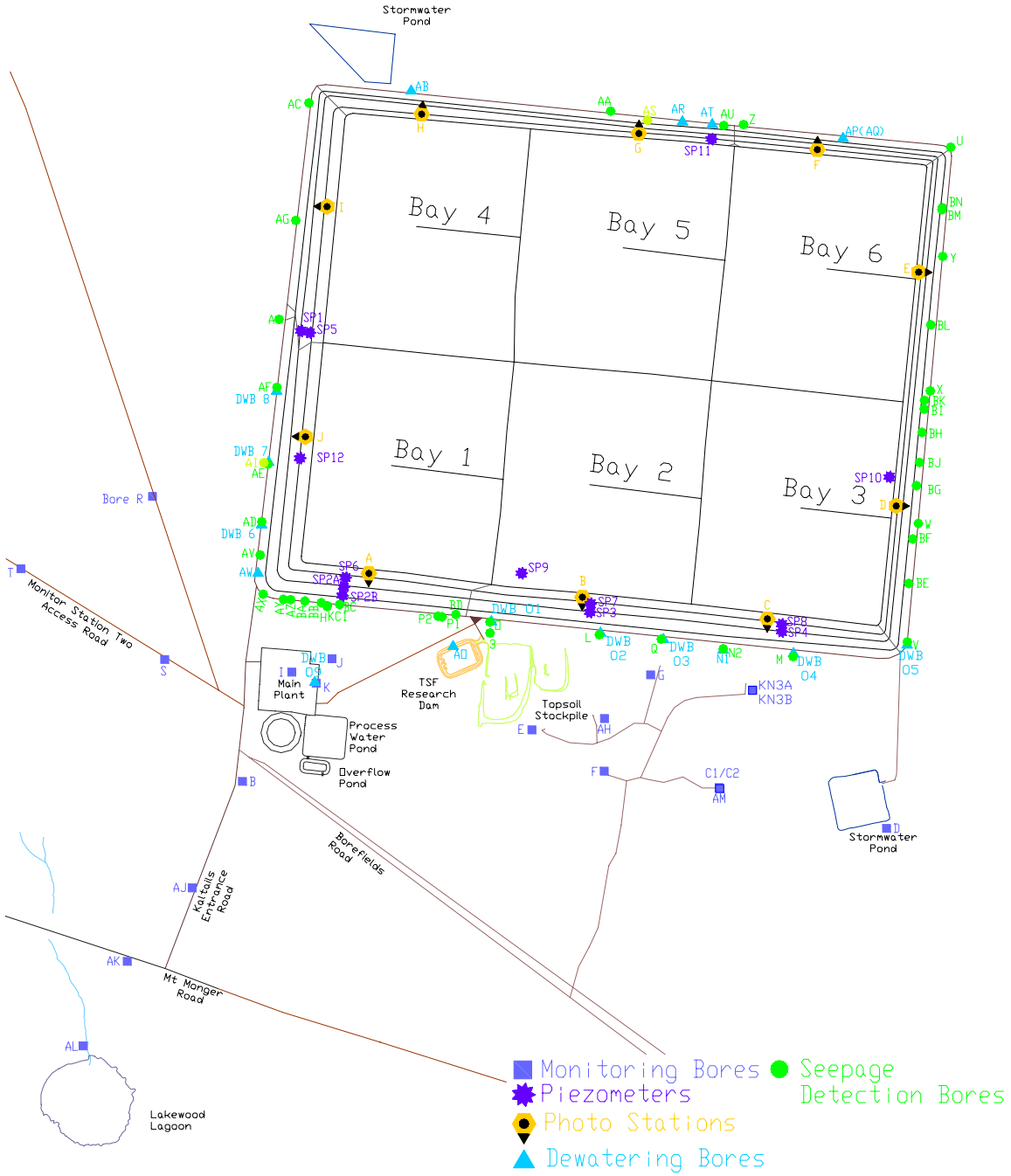
FIGURE 8

Tailings Storage Facility Locations

0 125250 500 750 1,000
Metres

Client : KCGM	ENVIRON	
Project : 30-0146	Drawn : GS	Date : Jan-06

PER_Fig8.pdf



(Adapted from original drawing by Aquaterra)

Figure 9

Kaltails TSF Bore Locations

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: -	Date: Jan -06

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5. COMMUNITY CONSULTATION

The Fimiston Operations Extension Project has progressed through the Integrated Project Approvals System that was established by the Minister for State Development in 2004. This process is coordinated through Office of Development Approvals Coordination (ODAC) (formerly the Project Approvals Co-ordination Unit (PACU)) established within the Department of the Premier and Cabinet. Consultation under this process commenced in October 2004.

5.1 COMMUNITY CONSULTATION FRAMEWORK

KCGM has an established community consultation network and utilises a range of mechanisms to facilitate consultation and capture community input on an ongoing basis. The most significant mechanisms include:

- The Community Reference Group - a self-selected group of local community members and invited guests from the DEC, DoIR and DIA. The group meets monthly to discuss current KCGM planning, operational activities and feedback from the community. The Mission Statement of the CRG is as follows*:*

  "The Community Reference Group will be a link between KCGM and the community to provide information and open two way communication, to ensure all views are heard and to create an atmosphere of trust and harmony. This will be achieved through consultation on issues of importance to the community in relation to KCGM's performance and future planned activities so that the community and KCGM achieve as far as possible each others long term needs and expectations."

- The Public Inquiry Line (PIL) (Ph. 9022 1100) - is a 24 hour, 7 day a week system that is available for anyone to register queries and enables KCGM to track responses to issues and queries that are raised. The PIL is also used to record significant interactions with the public at the Super Pit Shop and both formal and informal meetings. The electronic database records are analysed as to the nature of the queries and reported in a number of internal management meetings and to the Community Reference Group.

- The KCGM Super Pit Shop - is situated in Burt St Boulder and provides an easy access for the community to review approval and planning documentation, and to discuss queries with a range of KCGM staff. The Shop also hosts a 1:2,000 scale model of the Super Pit as it would look in 2017, based on the Life of Mine plans. This model is a centrepiece that has generated public inquiries on the post closure options.

- Media Management - KCGM has actively engaged the media to promote discussion on planning and project issues, and all media mentions have been recorded and are available electronically through the Super Pit Shop.

- Public Speaking Opportunities - KCGM actively works to participate in a number of local forums to discuss ongoing approvals and issues of interest to the community. Of particular note is the annual "What's Down the Track" forum at the Goldfields Mining Expo which outlines the next 3 years for development for mining and related operations. The KCGM General Manager has presented KCGM plans to 2017 and opportunities to extend the mine life in the last two years. Other forums include Rotary, the Kalgoorlie-Boulder Chamber of Commerce & Industry and the Goldfields-Esperance Development Commission.

A summary of KCGM's community consultation framework is provided in Table 4.

Table 4: KCGM Community Consultation Framework

TOOLS	DESCRIPTION
Public Inquiry Line	KCGM has a 24 hour, 7 day a week Public Inquiry Line (PIL) (Ph. 9022 1100) which is available to record stakeholders' queries and track responses.
Community Reference Group	A group of local community members and guests from the DEC, DoIR and DIA. Meets monthly to discuss KCGM planning and feedback from the community.
Super Pit Website	KCGM publishes project plans and reports on the Super Pit website which also has a feedback mechanism direct to the Public Relations Department. Web, phone and personal feedback is incorporated into PIL reporting.
The Dirt (Internal Newsletter)	A bi-monthly employee/contractor newsletter which is also posted on the Super Pit website. Major issues are captured and reported both internally and externally.
News & Views	Public Quarterly publication distributed to all Kalgoorlie-Boulder households (13,000 copies).
Presentations	"What's Down the Track" graphically illustrates the current vision for KCGM's future. This presentation has also been updated for targeted audience issues.
Direct Letter Drops	KCGM has identified target stakeholder groups for direct communications.
Super Pit Shop	The KCGM Super Pit Shop operates as a public front in Boulder for queries on future approvals or general information (open 9am-5pm Monday to Friday).
Information Sessions	With the opening of a Super Pit Shop, KCGM can conduct information sessions with key stakeholders at this venue as needed.
Surveys	KCGM sponsored a poll telephone survey of the local community to discover any environmental concerns with the operation. Web based surveys are utilised to get opinion from employees and key stakeholder groups on an as needed basis. Door to door or postal surveys are conducted on an as needed basis. Surveys at displays or open days may be conducted.
Media	KCGM coordinates with the local media (radio and newspaper) as a means of consultation to the wider community on future plans.

5.2 CONSULTATION UNDERTAKEN TO DATE

Initial consultation with key interest groups and government stakeholders for this Project commenced in October 2004 and continued with the release of the "KCGM Concept Plan" to the wider community in December 2004. KCGM has also utilised the media to attain wider community interest and exposure of the Project. The KCGM Concept Plan outlined KCGM's vision and process for the final development of the mine until closure in 2017. Details of consultation undertaken to date are provided in the following sections.

5.2.1 Project Approvals

To date, KCGM has undertaken consultation as outlined in Table 5 regarding project approvals.

Table 5: Project Consultation

CONSULTATION	DATE
Presentation at the Mine Expo "What's Down the Track" Forum	October 2004 October 2005
Attitudinal Phone Survey on KCGM (available on website)	December 2004
Release of the KCGM Concept Plan *With approximately 1,000 downloads from the KCGM website*	December 2004
Key stakeholder interviews with near neighbours	March/April 2005
Concept Plan mail out to near neighbours (approx. 350) *23 completed questionnaires received to date (12 neutral, 8 negative, 3 positive). Many responses relate to the existing operation*	March 2005
Project Definition Document Released *With approximately 2,100 downloads from the KCGM website*	April 2005
KCGM Approvals Displays and Information Australian Gold Council National Mine Open Day at KCGM Australian Miners and Prospectors Hall of Fame Open Day Chamber of Minerals and Energy Mine Open Day	 April 2005 May 2005 October 2005
"News & Views" Newsletter to Kalgoorlie-Boulder households (approx. 10,000) Issue 1 – Social Impact Assessment and Fimiston TSFs Issue 2 – Blasting and Approvals Issue 3 – Mercury Update and Consultation Update	 December 2004 June 2005 March 2006
"The Dirt" Newsletter (available on website) Issue 18 – Approvals Update Issue 19 – Environmental Noise Bund and Loopline	 July 2005 September 2005
Discussion at monthly Community Reference Group meetings (minutes provided on KCGM website)	Monthly
Mail out to project near neighbours (approx 350) *Regarding Stage 2 Environmental Noise Bund Realignment*	September 2005

5.2.2 Media

KCGM has coordinated with the local media as a means of consultation with the wider community on the future plans. Media reporting that has been undertaken is presented in Table 6.

Table 6: Media Consultation

CONSULTATION	DATE
Kalgoorlie Miner *"KCGM looks to go under Super Pit"*	22 October 2004
046KG Radio Interview "Concept Plans available at Super Pit Shop"	23 December 2004
Kalgoorlie Miner *"Super Pit Plans to 2017"*	4 January 2005
6KG Radio Interview "Concept Plans available at Super Pit Shop"	13 January 2005
Golden Mail *"KCGM Releases Concept Plan"*	14 January 2005
Kalgoorlie Miner *"Kaltails an Option : KCGM"*	6 May 2005
Kalgoorlie Miner *"Loopline Delay"*	14 May 2005
Kalgoorlie Miner Special Mining Feature *"KCGM From Strength to Strength"*	14 May 2005
Gold Mining Journal *"KCGM Plans to Keep Mining Super Pit to 2017"*	April – June 2005
Kalgoorlie Miner Advertisement *"KCGM Fimiston II TSF Height Increase"*	10 August 2005
Kalgoorlie Miner *"Loopline No Closer to Re-Opening"*	27 August 2005
Kalgoorlie Miner Advertisement *"Noise Bund Realignment and Loopline"*	27 September 2005
Kalgoorlie Miner *"Approval Processes Overhaul"*	1 November 2005
Kalgoorlie Miner *"Expansion Subject to Review*"	12 November 2005
Environmental Management News Website *"Super Pit Expansion to Undergo Public Scrutiny"*	14 November 2005
Golden Mail *"Super Pit Expansion Being Assessed"*	18 November 2005
Golden Mail Doug's Diary*: "Save the Subway or Sink It?"*	2 December 2005
Golden Mail *"The Super Pit's $38 Billion Windfall"*	13 January 2006
Kalgoorlie Miner *"Rail on Track"*	9 February 2006

5.2.3 Government Agencies

Consultation, undertaken with key Government Agencies is outlined in Table 7. The ODAC has assisted with the co-ordination and facilitation of the majority of these meetings.

Table 7: Government Agency Consultation

CONSULTATION	SCOPE	DATE
Meeting: DoIR, DoE, City of Kalgoorlie-Boulder	Meeting with the Government Liaison Committee to discuss the Project approval strategy and broad issues involved.	12 October 2004
Meeting: DoIR, DoE, City of Kalgoorlie-Boulder, PACU	Update briefing for Government Liaison Group discussing location of Loopline Railway; Blasting flyrock clearance zones; Waste rock dumps, TSF, Community Consultation	25 January 2005
Meeting: EPA	Project staging and approval process	8 April 2005
Meeting: DoIR, DoE, City of Kalgoorlie-Boulder, PACU, CALM, DIA, DPI	Scoping meeting discussing approvals process for each stage of Project and key issues to be considered.	9 June 2005
Meeting: DoIR, DoCEP, City of Kalgoorlie-Boulder	Safety Exclusion Zone	4 August 2005
Phone Conference: PACU	Follow on discussion from Scoping meeting.	29 August 2005
Meeting: PACU, City of Kalgoorlie-Boulder, DoCEP, EPASU	Safety Exclusion Zone	28 October 2005
Meeting: PACU, EPASU, DoIR	Finalising timing of Project approvals process	25 November 2005
Meeting: EPA, EPASU, ODAC, DoE	Meeting on Scoping Document: Noise and Regulation 17 application; dust screening assessment; issues with TSFs; mercury.	15 December 2005
Meeting: DoE (Air Quality Branch)	Scope of Dust Impact Assessment, including modelling methodology.	15 December 2005
Meeting: DoE (Noise Branch)	Noise and Regulation 17 application	23 January 2006
Site visit: DoE Noise Branch	Clarification of issues and management measures for PER	12 June 2006
Site visit: EPASU, DoE, DoIR, DoCEP, ODAC, DIA, City of Kalgoorlie-Boulder	Clarification of issues and management measures for PER	16 June 2006

5.3 CONSIDERATION OF ISSUES RAISED

Feedback received to date from community and government consultation through both formal and informal means has been incorporated into the planning of the Project and considered as part of the Project's environmental and social impact assessment. Formal notification from the EPA regarding issues raised from appeals on the level of assessment and the Environmental Scoping Document has been received by KCGM.

All issues raised to date have been addressed within this PER. Table 8 outlines these issues and the relevant Section where they have been addressed.

Table 8: Summary of Issues Raised and Relevant Section of Report

CATEGORIES OF ISSUES RAISED	ADDRESSED IN SECTION OF REPORT
Dust Amenity and health impacts, TSP, PM_{10}, $PM_{2.5}$, cumulative impacts	10.8.2
Noise Waste rock dump construction, sensitive premises, tonal noise, Regulation 17 exemption.	10.6
Vibration Man-made structures, historic buildings	10.7
Acid Mine Drainage Waste rock dumps, management strategy	10.10.2
Mercury Characteristics of waste rock and ore	10.8.1
Groundwater TSFs, Conservation reserve	10.5, 10.1
TSFs TSF management, groundwater management, seepage modelling Kaltails, standards for a new TSF, tailings characteristics.	4.4, 6.4, 10.5, 10.10.3, 11.4.3
Seismicity Man-made structures, historic buildings, isostatic rebound	11.3
Amenity Visual, impacts to nearby residents and leaseholders	11.5
Surface Drainage Waste rock dumps, new TSF	10.4
Fauna Significant fauna and fauna habitats management	10.2
Flora Targeted survey for new TSF	No Longer Applicable

CATEGORIES OF ISSUES RAISED	ADDRESSED IN SECTION OF REPORT
Waste Management Pit backfill justification	2.3.1, 4.3
Aboriginal Heritage Heritage issues, consultation with DIA	11.1
Blasting Blast Clearance Zone, road closures	10.7, 11.5
Public Safety Flyrock, Pit Stability	11.4
Rehabilitation Rehabilitation techniques, site specific rehabilitation issues	10.11, Appendix B1
Decommissioning and Closure Timeframe for planning, long term pit stability	10.11, Appendix B1

6. EXISTING OPERATIONS

6.1 FIMISTON OPEN PIT

The Fimiston Open Pit is located on the eastern boundary of the City of Kalgoorlie-Boulder as shown on Figure 10. The current footprint of the Fimiston Open Pit extends approximately 1.5 km in width, 3.4 km length and to a depth of approximately 360 m and is the largest open pit gold mining operation in Australia. The current approved Fimiston Open Pit surface footprint will enable open pit mining until 2012.

About 89 Mt of ore and waste are removed from the Fimiston Open Pit each year. About 13 Mt of ore are treated at the Fimiston Mill and the remaining 70 Mt of waste and low grade ore are transported to various rock dumps surrounding the operation.

Mining is undertaken using Komatsu PC 8000 hydraulic shovels that load Caterpillar 793 haul trucks that can carry approximately 225 t of ore and waste rock. These trucks transport the high-grade ore, over 1.2 grams of gold per tonne (g/t) to the mill for processing. The low grade ore (0.9 - 1.2 g/t) is placed on separate stockpiles for later treatment and 'sub-grade' material (0.5 - 0.9 g/t) is also separated with ongoing investigations into treatment options for this material. Waste (material with less than 0.5 g/t) is trucked to various waste dumps. Mining is carried out 24 hours per day, 365 days a year.

Drilling and blasting of the rock material is undertaken to break and loosen the material for extraction by the hydraulic shovels. The blast pattern depends on the type of material being mined, either oxide material (weathered rock from near the surface), or the harder sulphide material from the lower levels. Blasting in the Fimiston Open Pit is restricted to daylight hours. However, KCGM aims to blast at regular times to maintain consistency for the community and for visitors that are often able to view blasts from the 'Super Pit Lookout'. The scheduled blast times are 1pm and/or 5pm each day; however these are subject to change pending favourable wind conditions for dust management.

6.2 ENVIRONMENTAL NOISE BUND

An Environmental Noise Bund is located to the west of the Fimiston Open Pit between the residential areas and the open pit operation. It has been a key part of KCGM's noise management programme since it was first established in the early 1990's. Since this time there have been a number of modifications and extensions to the Environmental Noise Bund.

Approval to realign the Environmental Noise Bund to the west of the proposed Golden Pike Cutback (Stage 1) has been granted under the *Mining Act 1978* and under Section 45C of the *Environmental Protection Act 1986*. The Environmental Noise Bund requires realignment to ensure that the protection for the community from mine noise is maintained during the development of the proposed Golden Pike Cutback.

6.3 FIMISTON WASTE ROCK DUMPS

The Fimiston waste rock dumps were outlined within the *Consultative Environmental Review Mine and Waste Dumps – Fimiston August 1990* (KCGM, 1990), and this project was approved by the Minister for Environment in October 1991. Since that time, there have been modifications to the waste rock dump footprint via the assessment process under the *Mining Act 1978*. More recent modifications, in closer proximity to the community, have been approved by the DoIR and the Minister for Environment under Section 45C of the *Environmental Protection Act 1986*. Approved waste rock dump areas are shown on Figure 11. These areas are managed in accordance with the requirements of Ministerial Statement 188 and DoIR tenement conditions.

Approved waste rock dumps areas at KCGM cover approximately 1,510 ha. The maximum heights of the waste rock dumps that encompass the southern and eastern extents of the Fimiston Open Pit are restricted by airport regulations. These waste rock dumps are in various stages of construction and rehabilitation.

6.4 TAILINGS STORAGE FACILITIES

KCGM currently operates two TSFs at the Fimiston Operations; Fimiston I and Fimiston II as shown on Figure 8.

6.4.1 Fimiston I TSF

The Fimiston I TSF is situated on mining lease M26/383 to the north of the Fimiston Mill. Approximately 12 Mtpa of tailings solids are pumped as a slurry from the Fimiston Mill to both of the Fimiston I and Fimiston II TSFs. While this may vary annually, the ratio has generally been of the order of 20% to the Fimiston I TSF and 80% to the Fimiston II TSF.

The Fimiston I TSF comprises an amalgamation of six cells; Croesus North and South and the four Fimiston I cells, A and B (Fimiston I West) and C and D (Fimiston I East). It is estimated that approximately 28 Mt of tailings solids have been deposited into the combined Fimiston I TSF since deposition commenced into the Croesus cells in 1988. Seepage is monitored and managed via a network of groundwater bores around the facility (refer to Section 7.5.3).

The Fimiston I TSF is approximately 110 ha in size and approved (subject to meeting performance targets) to a height of 40 m. Height increases from 30 m to 40 m are limited to 2.5 m lifts with each subsequent lift subject to KCGM's performance with the Seepage and Groundwater Management Plan (SGMP) (Appendix D1) and Works Approval applications.

The east wall embankment of the Fimiston I TSF has currently been rehabilitated up to 25 m. Rehabilitation works are scheduled to commence on the north and northwest walls in 2006. Rehabilitation works on the Fimiston I TSF have been undertaken using KCGM's mining fleet to place rock armouring and contractor equipment to complete the earthworks, topsoil placement and ripping. Up to 4 m of rock armour was used and then covered by 0.2 m of topsoil to act as the initial growth medium for revegetation.

6.4.2 Fimiston II TSF

The Fimiston II TSF is located east of the Fimiston operations and is bounded along much of the north eastern side by Bulong Road and along the western side by the Trans-Australian Railway line and corridor. The Fimiston II TSF occupies (or overlies in part) the following leases: M26/308, M26/451, G26/44 to 68, G26/70 to 71, G26/73 to 78 and G26/82 to 86.

The Fimiston II TSF is approximately 350 ha in size and is currently approved to a height of 30 m. An application to increase the height of the Fimiston II TSF by 15 m (to 45 m) is currently being assessed by the EPA. This application is Stage 2 of the Fimiston Operations Extension Project and the approval is required to provide adequate tailings storage capacity for the current life of mine operation (2012).

Deposition into the Fimiston II TSF commenced in 1991 and the facility is currently operated as three separate cells A/B, C and D. Seepage is monitored and managed via a network of groundwater bores around Fimiston II TSF (refer to Section 7.5.3).

Rehabilitation up to the 20 m height of the embankments of paddocks was completed in 2002/2003. Rehabilitation of the remaining higher embankment walls will be undertaken once future lifts are completed. Embankments were primarily rehabilitated with 1 m of rock cover and 0.2 m of surface topsoil as the initial growth medium for native vegetation.

6.4.3 Kaltails TSF

The Kalgoorlie Tailings Retreatment Project (Kaltails) was a joint venture project undertaken during the period 1988 to 1999, between Normandy of Australia Ltd and the Western Australian Mint. Kaltails reprocessed historical tailings material from storage facilities that were constructed along the Golden Mile during the early part of the century.

The Kaltails TSF is located approximately 5.4 km east south east of the Fimiston Mill, and covers an area of 250 ha. The facility and the associated infrastructure were located on two General Purpose Leases (G 1 SA and G 2 SA) managed by the DoIR. Both leases were linked to Special Licence 1SA granted pursuant to the *Tailings Treatment (Kalgoorlie) Agreement Act 1988*. The TSF is located on G1 SA and tenement G2 SA and is largely rehabilitated but contains a process water pond that is used for the storage and transfer of water to the Fimiston Mill from the TSF dewatering system.

The existing facility comprises of six cells. The perimeter embankments vary in height due to the difference in the natural ground slope across the extent of the TSF. Kaltails TSF is 26 m above ground level at its highest embankment (Cells 1 and 2) and 23 m above ground level at Cell 6. Embankments of the TSF were initially constructed using local clay material. Subsequent lifts of these embankments were constructed "upstream" using tailings excavated from the TSF.

Decommissioning and rehabilitation of the Kaltails processing plant area commenced in 2000 in accordance with the Mine Closure Plan for the Kaltails operation that was approved by the DoIR in September 2000. Decommissioning incorporated the removal of the plant and infrastructure and seeding with native flora species. Rehabilitation was also undertaken on the TSF embankments which currently comprise a large proportion of established native species.

A network of groundwater abstraction and monitoring bores, as illustrated on Figure 9, was commissioned in 1992 to facilitate the management of the TSF seepage. Dewatering from abstraction bores continues (although at a reduced rate) and groundwater is pumped to the process water pond located adjacent to the facility. This water is used by KCGM. Refer to Section 7.5.4 for further information on groundwater at the Kaltails TSF.

6.5 FIMISTON ORE PROCESSING

The Fimiston Mill comprises two separate ore processing circuits one for processing refractory sulphide ore from the Fimiston Open Pit and the other circuit for processing refractory sulphide ore from the Mt Charlotte Underground Mine and the Fimiston Open Pit.

The ore generated from Fimiston Open Pit is treated through the following processing circuit:

- Primary crushing plant;
- A semi-autogenous grinding mill with pebble crushing circuit:
- Two ball mills; and
- Flotation and two carbon-in-leach circuits.

In the flotation circuit, the gold bearing refractory sulphide is separated and referred to as concentrate. The concentrate is de-slimed (removal of the very fine fraction), with the slimes then leached at the Fimiston Mill. The coarse fraction is then separated into two streams. One stream is washed, filtered and transferred to the Gidji Roaster for roasting. The other stream takes excess material that the Roaster cannot process, and grinds it in an Ultra-Fine Grinding Mill. This mill reduces the particle size of the concentrate to expose enough gold surfaces to facilitate cyanide leach recoveries. After grinding, it joins the slimes to be leached at the Fimiston Mill in the two cyanide carbon-in-leach adsorption circuits where the gold is extracted.

The Fimiston Mill also comprises elution, electrowinning circuits and facilities for smelting, pouring and the production of gold bullion. Final tailings are pumped to the Fimiston TSFs.

6.6 EXISTING LAND TENURE AND ZONING

The land proposed for the location of the Golden Pike Cutback and Northern Waste Rock Dumps (NWRD) is Crown Land (designated as Vacant Crown Land), owned by the State of Western Australia. The Joint Venture Owners, Barrick Gold of Australia and Newmont Australia Ltd hold mining tenure over all of the project areas. There is no other land use on these areas other than mining related activities. The Golden Pike Cutback will be entirely contained within a perimeter fence that was constructed by KCGM at the completion of the Bypass Road re-alignment in 2003. The Cutback will not require any additional public infrastructure relocation.

Tenure over the Kaltails TSF was granted via the *Tailings Treatment (Kalgoorlie) Agreement Act 1988* which provided for the establishment of two General Purpose Leases, G 1 SA and G 2 SA. These leases are held in Joint Venture by Newmont Kaltails Pty Ltd (90%) and the Western Australian Mint (10%). The DoIR has advised that the Tailings Treatment Agreement would need to be determined prior to DoIR allowing the leases (G 1 SA and G 2 SA) to be transferred.

The relevant tenements over the Project area are detailed in Table 9.

Table 9: Tenements over the Project Area

PROJECT AREA	TENEMENTS
Golden Pike Cutback	M26/316 M26/359 M26/388 M26/405
Northern Waste Rock Dumps	M26/46 M26/54 M26/131 M26/359 M26/383
Fimiston I TSF	M26/383
Fimiston II TSF	M26/308 M26/451 G26/44 to 68 G26/70 to 71 G26/73 to 78 G26/82 to 86
Kaltails TSF	G 1 SA G 2 SA

6.6.1 Town Planning Scheme

During 1991, the Golden Mile Mining Development Planning Committee developed the concept of a Safety Exclusion Zone (SEZ) to be maintained between open pit activities at KCGM and residential properties. In 1992, KCGM was advised by the Department of Minerals and Energy (now DoIR) that they had determined that a 400 m wide SEZ should apply which was primarily based on the risk of flyrock from blasting. It also took into account long term pit wall stability although a lesser distance would have been adequate to provide protection from possible subsidence.

The SEZ restricts the development of residential properties in close proximity to the open pit operation. DoIR indicated that the SEZ was to be applied from the outermost row of primary blast holes at any section of the Fimiston Open Pit and therefore the location of the 400 m zone is variable (effectively extending or contracting in accordance with where primarily blasting occurs). However, to enable the SEZ to be incorporated into the Town Planning Scheme (TPS), a standard 400 m SEZ was defined from the projected maximum extent of the pit based on the orebody and pit plan knowledge at the time, as shown on Figure 12.

The SEZ was gazetted in April 1997 in the City of Kalgoorlie-Boulder Town Planning Scheme No 1 - Section 3.16. The TPS outlines objectives and the purpose of the SEZ. The objectives of the SEZ are to:

- Provide a buffer between the Fimiston Open Pit and the urban area to maintain the safety, health and welfare of surrounding residents and the population in general;
- Minimise the impact upon the amenity of adjoining urban and residential areas; and
- Allow for the continuing development and operation of the Fimiston Operations.

In essence, the effect of the SEZ in the TPS is to control development within the identified area. Residential development is prohibited and as such the City of Kalgoorlie-Boulder supports and encourages KCGM to acquire land upon which residential development is situated. Since 1992, KCGM has undertaken a programme of passive property acquisition and now owns all residential properties within 400 m of the proposed Golden Pike development.

Some commercial properties not owned by KCGM exist within 400 m from the Golden Pike pit outline. However through an amendment passed in August 2002, other commercial activity within the SEZ is permitted subject to the endorsement of KCGM and the City of Kalgoorlie-Boulder.

Based on discussions with KCGM, the DoIR and the EPA and the review of available Project information, the City of Kalgoorlie-Boulder is of the view that a potential expansion of the SEZ is not considered necessary. The Council is supportive of an independent consultant to undertake a review of the technical studies undertaken by KCGM with the results provided to DoIR, as it considers that the State Government bears primary protection for public safety in this instance. The City of Kalgoorlie Boulder will also be reviewing this documentation in association with the PER.

Figure 10
Fimiston Open Pit Outline 2012

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: FT	Date: Jan-06

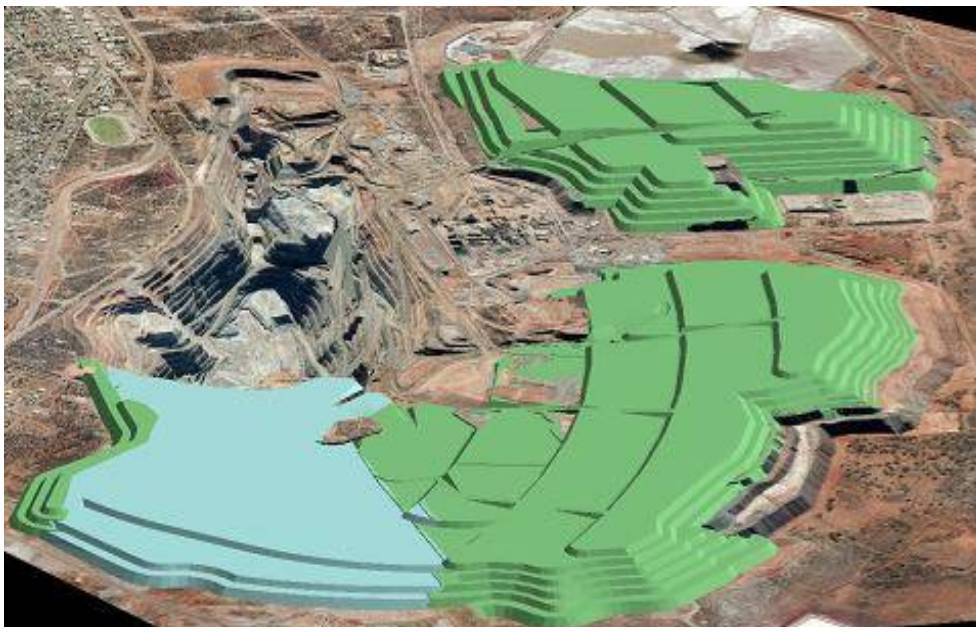

Figure 11
Approved Waste Rock Dumps

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: FT	Date: Jan-06

Source: *City of Kalgoorlie_Boulder Town Planning Scheme No 1 1997 (as amended*)

Figure 12
Town Planning Scheme- Fimiston Open Pit Safety Exclusion Zone

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: FT	Date: Jan-06

7. EXISTING ENVIRONMENT

7.1 REGIONAL SETTING

The KCGM operation is located immediately east of the City of Kalgoorlie-Boulder in the Goldfields Region of Western Australia, approximately 600 km east of Perth.

The area known as the "Golden Mile" has a long association with gold mining since the first discoveries during the late 1800's. Mining continues to be a key land use of the region. Kalgoorlie-Boulder, with an approximate population of 30,000, is the major regional centre in the Goldfields Region. Many people in Kalgoorlie-Boulder are either directly or indirectly dependent on the mining industry for their income.

The principle agricultural activity in the region is sheep grazing but this is located away from the city.

7.2 CLIMATE

The Kalgoorlie area has a semi-arid climate where the annual rainfall varies between 100 – 500 mm and the average is 268 mm (Bureau of Meteorology website www.bom.gov.au). Generally, more rain falls during the winter months; however, summer storm events occur regularly and often result in high intensity, short duration rainfall. These events are brought about by tropical depressions and comprise a significant proportion of the total annual rainfall, but are offset by the high annual evaporation rate (2,500 mm/yr). Potential evaporation exceeds expected rainfall for all months of the year.

The majority of the annual evaporation occurs from November to February. The average evaporation rate in January is 12.6 mm per day, although on a hot, windy day the evaporation can be over 20.0 mm. During the winter the average daily evaporation decreases to 2.6 mm. The relative humidity averages less than 30% at 3pm during summer while the 9am winter figures are typically around 70%.

Temperatures in the Goldfields can range from a summer maximum of 46ºC to a winter minimum of –3ºC with occasional frosts experienced during the winter months. Winds are strongest during winter, though not usually exceeding 30 km/h and are mainly from the northeast or west. At other times of the year winds are from the southeast.

Meteorological data collected by the Bureau of Meteorology at the Kalgoorlie Airport is summarised in Table 10.

Table 10: Climate Averages at the Kalgoorlie Airport (1939- 2004)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann. Total
Temp (°C)	33.6	32.0	29.5	25.1	20.5	17.5	16.7	18.4	22.2	25.6	28.9	31.9	-
Rainfall (mm)	22.8	31.5	23.6	22.1	27.8	29.6	25.4	21.7	14.5	15.1	18.2	16.1	268.4
Mean No. Rain Days	3.7	4.1	4.3	5.4	7.1	8.2	8.4	7.1	5.5	4.3	3.9	3.6	65.6
Mean Daily Evaporation (mm)	12.6	11.0	8.7	5.7	3.6	2.6	2.8	3.7	5.7	8.3	10.2	12.1	7.2
Mean 3pm Wind Speed (km/hr)	15.0	15.0	14.2	13.7	14.2	15.9	16.9	17.3	17.8	17.6	17.3	15.9	15.9
Maximum Wind Gust (km/hr)	140.8	118.4	118.4	103.7	122.4	101.9	96.5	107.6	109.4	116.6	139.0	122.4	140.8

Source: Bureau of Meteorology (www.bom.gov.au)

7.3 TOPOGRAPHY AND SURFACE DRAINAGE

The Fimiston Operations is located in a catchment of Hannan's Lake, which is a saline playa lake located about 10 km south of Kalgoorlie. This catchment is about 18 km long and between 8 km and 13 km wide. Surface gradients range between 3 m/km parallel to the central floodway and greater than 10 m/km across the catchment.

A gently undulating topography is broken up with occasional ranges of low hills. Sand plains are more prominent in the western part with some large playa lakes (Jim's Seeds Weeds and Trees, 2006). Low relief and low annual rainfall has resulted in poorly-defined surface drainage within the area of the Fimiston operations. Drainage in the area to the east of the Fimiston Open Pit flows easterly and then to the south after joining an ephemeral creek. This eastern creekline drains directly to Hannan's Lake. This creekline also acts as a natural constraint for the eastern extension of the Fimiston waste rock dumps (KCGM, 1990). The major part of the catchment of this creek is located upstream of the Trans Australian Railway line, thus peak stream flows are largely restricted by the volume of water able to pass through the railway embankment culverts (KCGM, 1990).

Streamflow events only occur after intense rainfall events. Runoff coefficients are low for typical peak rainfall events, but very high for the longer average return intervals (0.18 for 2 years Average Recurrence Interval (ARI) versus 0.95 for 20 years ARI) (Pilgrim, 1987). Heavy rains associated with tropical depressions in 1992, 1995, and 1999 caused extensive flooding in the Kalgoorlie area (Golder Associates, 2005).

7.3.1 Kaltails TSF

Kaltails is also located in the catchment of Hannan's Lake. Natural surface and groundwater flow is south west of the facility towards Hannan's Lake. Surface gradients range between 3 m/km parallel to the central floodway and over 10 m/km across the catchment. The TSF area is crossed by a braided drainage system, which drains a catchment of approximately 10 km upstream to the northeast from the Trans-Australia Railway line, (which is approximately 300 m from the northeast corner of the TSF). The presence of the railway embankment to the east, has concentrated sheet flow runoff into discrete channels which are diverted around the TSF.

7.4 GEOLOGY AND SOILS

7.4.1 Geology

The Kalgoorlie stratigraphy in the vicinity of the Fimiston deposit consists of a basal ultramafic unit called the Hannan's Lake Serpentinite, overlain successively by the Devons Consol Basalt, Kapai Slate, Paringa Basalt and Black Flag Beds. Mafic to ultramafic sills have then intruded the sequence. One of these sills, the Golden Mile Dolerite, is the host for most of the gold mineralisation in the Golden Mile deposit.

The structure of the Fimiston area is dominated by the large Kalgoorlie Anticline and Kalgoorlie Syncline, the major Golden Mile Fault which strikes sub-parallel to formation boundaries, and numerous cross-cutting faults (e.g. Golden Pike). It was recognised that three major deformation events were responsible for these structures, occurring over a period of 60 million years beginning 2,670 million years ago.

The rock mass in the pit region consists of Paringa Basalt, Golden Mile Dolerite, shales and porphyry dykes. Except shales, each of these units has a high intact rock strength, with an average Uniaxial Compressive Strength of greater than 85 MPa. The Paringa Basalt and the Golden Mile Dolerite are considered as the two main rock masses forming the final pit walls. The weathering profile along the western flank consists of a laterite caprock (comprising oxidised and cemented material) with a variable thickness of 5 m to 15 m which overlies the oxide profile. The oxidation depth varies from 0 m to 70 m and averages 40 m.

Acid Generation Potential

The Fimiston Open Pit extension will be predominantly hosted by Golden Mile Dolerite with a small percentage to the west hosted by Williamstown Dolerite and the Black Flag Beds sedimentary sequence. The Black Flag Beds contain bands of pyritic shale which have an acid generation potential. Any exposed mineralisation within the dolerite will contain sulphide minerals in conjunction with carbonates, the presence of both these minerals results in a neutralising effect with no proven acid generation potential. Non-mineralised material will not contain significant amounts of sulphide minerals and therefore has little to no acid generation potential (Appendix F3).

Presence of Tellurides

At Kalgoorlie, mercury occurs naturally in the mineral coloradoite (HgTe). This mineral is one of 17 telluride minerals identified within the Kalgoorlie Lodes and is considered to be the most common of the telluride minerals within the deposit. Approximately 70% of the historic high grade telluride zones are above 200 m although they also occur down to 1,000 m (Appendix F1). These high grade zones are found in all units of the Golden Mile Dolerite as well as in the Paringa Basalt and the Black Flag Beds. Work by Shackleton *et al* (2002) strongly suggests that there is no lateral or vertical variation in the distribution of any tellurides. There also appears to be a relatively poor correlation between mercury and gold which is expected given the variety in gold paragenesis (the sequence in which minerals are formed) and it is likely that there is a multiple population with only part of the gold related to telluride.

7.4.2 Soils

Soils of the region are typically neutral red earths in the plain areas, calcareous loams and brown calcareous earths in the more hilly portions, with saline/sodic soils dominating in and around the salt lakes. Soils within the Project area are degraded as a result of historical mining operations and land clearing, however many areas have been revegetated as part of KCGM's progressive rehabilitation programme.

Fimiston I and Fimiston II TSFs

The typical soil profile for the Fimiston I and Fimiston II TSFs is generally characteristic of the surrounding areas and may be described as follows (Golder Associates, 2003):

1. Topsoil horizon comprising red brown sandy or gravely silt up to 2 m thick, overlying;
2. Hard, red brown gravely clay and clayey gravel up to 12 m thick, overlying;
3. Hard pale grey-green clay with red-brown clay laminations and mottles.

Superficial materials are generally loose and shallow to around 300 mm depth, becoming dense to very dense or very stiff to hard. Calcrete typically occurs in the topsoil unit with well developed ferricrete horizons occurring in the underlying clay.

Underlying bedrock horizons consist typically of banded meta-sedimentary rock or massive igneous rock, extensively weathered to depth and lateritised.

Kaltails TSF

The surface soils of the TSF areas consist of red brown loams and sandy clay loams. At 200 mm to 300 mm depth there is a gradual increase in gravel and clay components giving rise to gravely light clays commonly containing calcareous nodules. These are underlain at 1 m to 1.5 m by sporadically mottled, dry red brown sandy clays and stiff brown clays. Soils become increasingly saline as they approach Hannan's salt lake.

7.5 HYDROGEOLOGY

7.5.1 Regional Setting

The Greenstones along the Golden Mile deposit are overlain by Tertiary and younger sedimentary deposits to the west, south and east (Kern, 1995, 1996). Groundwater often occurs in these deposits at shallow depths. Some exchange of groundwater occurs between Tertiary sedimentary deposits and the older Greenstones which form the Golden Mile deposit and other bedrock formations in the Kalgoorlie area. This generally arises as a consequence of discharge from the more elevated bedrock areas into the low-lying sedimentary systems.

The main rock units in the Golden Mile deposit are the Golden Mile Dolerite and the Paringa Basalt. These formations have very low primary permeability and will not store or transmit large quantities of groundwater except through major secondary structures.

7.5.2 Fimiston Open Pit

The historical underground workings below the Fimiston Open Pit have provided a conduit for groundwater and surface run-off. Dewatering from the 25 level in Chaffers Shaft (810 m below surface) has been ongoing since 1989 and this has maintained groundwater levels well below current mining operations within the bedrock aquifer. With the recent removal of the Chaffers head frame as part of the Chaffers Cutback, dewatering is now undertaken by a dewatering bore located 700 m below surface on the south-eastern edge of the Fimiston Open Pit.

7.5.3 Fimiston I and Fimiston II TSFs

The area around the Fimiston I and Fimiston II TSFs is underlain by sedimentary deposits and variably weathered bedrock. The sedimentary deposits are widespread and correlate with similar deposits around Hannan's Lake and elsewhere in the Eastern Goldfields. Near the TSFs the sedimentary deposits have a maximum thickness of 30 m and pinch out to the east and west towards bedrock ridges along the flanks of the catchment. These units typically consist of red-brown clays and gravels, and blue-grey clays and clayey gravels. The weathered bedrock mainly consists of pallid clay in the central floodway.

The most transmissive parts of the shallow stratigraphic sequence near the Fimiston I and II TSFs are gravels between about 5 m and 15 m below the surface, and ferricrete horizons within blue-grey clays between about 10 m and 20 m beneath the surface. The underlying weathered bedrock generally has a very low transmissivity.

The groundwater system is recharged naturally after significant rainfall events that cause surface water to accumulate and flow down the floodway. Seepage from the Fimiston I and Fimiston II TSFs has created a water mound under the facilities and this is being managed by KCGM's Seepage and Groundwater Management Plan (SGMP).

Natural groundwater in the catchment is saline, with total dissolved salts concentrations in the range of 20,000 mg/L to 200,000 mg/L (seawater has about 35,000 mg/L to 40,000 mg/L of total dissolved solids). This groundwater is naturally acidic, with pH generally between 2 and 4 (Kern, 1995 and 1996).

KCGM maintains groundwater monitoring bores near the Fimiston I and II TSFs (Figure 13). KCGM manages the operation of the Fimiston I and II TSFs in accordance with the SGMP (September 2005) that establishes performance targets for factors including groundwater quality, and water table level, vegetation health.

Fimiston I TSF

Tailings disposal at the Fimiston I TSF has resulted in the development of a groundwater mound under the facility due to seepage. KCGM has installed groundwater production bores near the eastern wall of the TSF as part of its SGMP (Figure 13) and a trench along the northern side of the TSF.

During 2004 groundwater production bores from around the Fimiston I TSF produces 500 kL/d, decreasing to 460 kL/d in 2005. Water recovered from the interception trench was 20 kL in 2003/2004 and zero kL in 2005.

Fimiston II TSF

The aquifer system underlying the Fimiston II TSF consists of the clayey sand and gravel and the underlying ferricrete horizons, all of which can be expected to be extremely variable in their hydraulic properties. In some areas, for example within the central area to the north of the TSF, the transmissivity is in the order of 50 to 100 m^2/day, while in other areas, such as the central area of paddock A/B, the transmissivity is lower, of the order of 5 m^2/day.

Seepage collection drains have been constructed around the perimeter of the TSF to intercept near-surface seepage from the Fimiston II TSF. Water in the drains flows to collection ponds from where it is transferred by pumping to the main decant recovery pond.

In addition to the drains, there are more than a hundred seepage extraction bores installed around the Fimiston II TSF to manage seepage emanating from the facility and prevent a rising saline water table. The water abstracted from these bores, which has demonstrated more than 90% availability, is transferred to the Fimiston Mill for re-use within the process circuit.

Refer to Appendix D5 for further information on groundwater in the vicinity of Fimiston I and II TSFs.

7.5.4 Kaltails TSF

The area has a deeply weathered profile extending up to 40 m over Archaean basement rocks. A thin veneer of superficial alluvial sands, gravely sands and clays overlie the weathered profile. Palaeochannel sands underlie the Kaltails TSF at depths of around 20 m. A shallow, discontinuous ferricrete aquifer overlies the impermeable clay layer above these palaeochannel sands and covers much of the TSF and former plant area. The ferricrete aquifer has been a conduit for seepage water from the TSF. Seepage management works have controlled early water table rises. The underlying aquifer in the palaeochannel sands is regionally extensive and is regarded as largely independent of the overlying shallow ferricrete aquifer (Appendix D4).

Local infiltration of runoff generates some subsurface flow within alluvium that underlies the site to a depth of 1 m to 2 m, however deeper percolation through the underlying clayey sediments is minimal. It has been noted historically that water in the immediate (Kaltails) project area is saline to hypersaline with salinities ranging from 40,000 mg/L to 100,000 mg/L within quaternary alluvium and basement material. The pH values in sections of the aquifer system may commonly be as low as 2-3, although in the broader region most of the groundwater is marginally acidic, with pH in the range of 5-7 (Kern, 1995 and 1996).

There is a system of seepage extraction wells around the Kaltails TSF to manage seepage and to prevent a rising saline water table. Since the facility was last used in 1999, the system has been operated with the additional aim of progressively lowering the groundwater levels to background levels. Initial pumping volumes from the Kaltails seepage management system were at a rate of about 4 ML/day however this has reduced following the closure of the operation. Groundwater is abstracted from around the Kaltails TSF and transferred to a process water pond, where water is pumped to the Fimiston operations. Groundwater quality monitoring of select bores is completed on a quarterly basis, whilst standing water levels in bores and piezometers is measured monthly.

Refer to Appendix D4 for further information on groundwater in the vicinity of the Kaltails TSF.

7.6 VEGETATION AND FLORA

KCGM is located within the Coolgardie Botanical District's Coolgardie Vegetation System, in the southwest interzone (Beard, 1990). This botanical district is predominantly eucalypt woodland becoming open towards the more calcareous soils, where a cover of saltbush-bluebush understorey is evident. Extensive timber cutting occurred in the Kalgoorlie region at the turn of the century for mineshaft supports and for firewood, therefore much of the woodland has been historically cleared (Muir Environmental, 1994).

7.6.1 Golden Pike Cutback and Northern Waste Rock Dumps

The proposed areas of the Golden Pike Cutback and the NWRD have been historically cleared and degraded by mining activities along the Golden Mile. These areas however were rehabilitated between 1990 and 1999, as part of KCGM's "Greening the Golden Mile" revegetation programme.

A flora and vegetation survey of the Golden Pike Cutback and the NWRD areas was completed in January 2006 by Jim's Seeds, Weeds & Trees Pty Ltd in accordance with the EPA Position Statement No. 3 and EPA Guidance Statement No. 51 (Appendix C1). One vegetation group was encountered within the surveyed areas and classified as cleared/modified native vegetation. There were no single dominant taxa, but species present included a mix of Eucalyptus species with a dense Chenopod understorey.

The condition of the vegetation was classified as "good" according to the definitions developed by Keighery (1994). This classification reflects the fact that whilst the vegetation has been significantly modified, it has the ability to regenerate.

No Declared Rare Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950* and as listed in the DEC [CALM] *Declared Rare and Priority Flora List for Western Australia* (2005), were found in the area surveyed.

Two Priority Species defined in the DEC *Declared Rare and Priority Flora List for Western Australia* (2005) were located during the survey in Area 3, location of the Golden Pike Cutback. These were *Eucalyptus formanii* (Priority 4) and *Eucalyptus brockwayi* (Priority 3). Approximately 20 individual trees were present of each species. These species were intentionally included into the rehabilitation programme for this area and planted as seedlings as part of the "Greening the Golden Mile". DEC has been consulted regarding the presence and significance of these species in this area and these are not considered to be significant due to their cultivation.

There are numerous exotic weed species in the Goldfields area. These are likely to have been introduced and colonised areas degraded by historical mining, pastoral and urbanisation activities. Fourteen introduced species were recorded in the Golden Pike Cutback and NWRD survey areas. Of these introduced species, *Emex australis* (P1, 3, 4, 5[1]), *Tamarix aphylla* (prohibited) and *Carthamus lanatus* (P1, 3, 4) are considered to be declared weeds. Currently KCGM has weed control management strategies in place which are aimed at controlling these invasive weeds.

The progressive establishment of native vegetation in many historically disturbed areas is assisting to control the spread and reduce proliferation of weeds.

7.6.2 TSF Surrounds

Two broad vegetation communities are present in the area of KCGM's vegetation monitoring transects for the Fimiston I and Fimiston II TSFs. To the north, south and far west of the Fimiston II TSF Eucalypt/Chenopod open woodlands predominate. To the immediate west of the Fimiston II TSF, open Acacia shrubland exists in association with the floodway.

Vegetation adjacent to the Kaltails TSF ranges from eucalypt woodland with a saltbush or broombush understorey at the higher elevations, to saltbush and samphire steppe close Hannan's Lake. A baseline survey conducted in 1987 (McArthur, 1987 in AGC, 1988) found no rare or endangered flora known to be located within the Kaltails area.

7.7 FAUNA

A fauna survey was undertaken in 1994 by Muir Environmental for Gazetted Rare Fauna at the Fimiston Operations. The following species are currently protected under Schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2005* and may occur in the Kalgoorlie region and the Project area. None of these species are listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999.*

[1] Weed control category:

- P1 - Prevention: Plants, which cannot be introduced or spread. Most declared plants are under this category.
- P2 - Eradication: Includes potentially serious weeds that are not yet widely spread
- P3 - Control: reduce plant numbers and/or distribution, as eradication is not realistic
- P4 - Containment: Plants should be prevented from further spread.
- P5 - Plants will be controlled on public lands

- Peregrine Falcon (*Falco peregrinus*);
- Pink (or Major Mitchell's) Cockatoo (*Cacatua leadbeateri*);
- Naretha Blue Bonnet (Parrot) (*Northiella haemotogaster narethae*);
- Woma (or Ramsays Python) (*Aspidites ramsayi*); and the
- Carpet Python (*Morelia spilota imbicata*).

A baseline survey conducted in 1987 found no rare or endangered fauna known to be located within the Kaltails area (McArthur, 1987 in AGC, 1988). A desktop search on matters of environmental significance in December 2005 indicated the likely presence of one vulnerable bird species, *Acanthiza iredalei iredalei* (Slender-billed Thornbill – western) or its habitat in the area. The area is also known to be an overfly area for four Listed Marine (Bird) Species protected under the EPBC Act. These are:

- Fork-tailed Swift (*Apus pacificus*);
- Great Egret (or White Egret) (*Ardea alba*);
- Cattle Egret *(Ardea ibis*); and
- Rainbow Bee-eater *(Merops ornatus*).

Fauna habitats provided by the project area are widespread and occur extensively around Kalgoorlie and throughout the Coolgardie Botanical District. Rare species in the broader Kalgoorlie region tend to be associated with healthy vegetation, rock outcrops, sand dunes and fresh-water wetlands.

The area under the control of and surrounding the KCGM operations has been degraded by historical mining, pastoral and urbanisation activities. The degradation has included disturbance and alteration of the ground surface, erosion by water and wind, revegetation programmes and recreational activities. These activities have resulted in the disruption or removal of fauna habitats from KCGM operations and the City of Kalgoorlie-Boulder.

Records of the Western Australian Museum indicate that most mammals occurring in the vicinity of the KCGM operations are both common and widespread. In addition, there have not been any reports of collections or sightings of rare species in or around Kalgoorlie for many decades.

7.8 CONSERVATION RESERVES

The Lakeside Miscellaneous Conservation Reserve (No. 19214) is located approximately 800 m to the south-southeast of the Kaltails TSF as shown on Figure 14. This reserve was declared in 1957 and is managed by DEC (CALM) for the preservation of sandalwood (*Santalum spicatum*). The reserve is classified under the International Union for the Conservation of Nature and Natural Resources (IUCN) as protected category VI. Table 11 outlines the definitions of each of the IUCN protected area categories.

Table 11: IUCN Protected Area Category Definitions

IUCN CATEGORY	DEFINITION
IA	Strict Nature Reserve: protected area managed mainly for science
IB	Wilderness Area: protected area managed mainly for wilderness protection
II	National Park: protected area managed mainly for wilderness protection
III	Natural Monument: protected area managed mainly for conservation specific natural features.
IV	Habitat/ Species Management Area: protected area managed mainly for landscape/ seascape conservation and recreation.
V	Protected Landscape/ Seascape: protected area managed mainly for landscape/ seascape conservation and recreation.
VI	Managed Resource Protected Area: protection area managed mainly for the sustainable use of natural ecosystems.
VOID	Denotes an area in the spatial data which is not a “protected area”, but is maintained in the spatial data to ensure the area boundary integrity.

During the operation of the Kaltails TSF, seepage from the facility caused the hypersaline water table to rise, impacting on vegetation in the Lakeside Conservation Reserve south of the TSF. Initial measures to reduce the impacts from seepage were implemented and included the construction of interception trenches along the base of the TSF embankments. In 1992, the construction and operation of dewatering bores successfully controlled the seepage and the level of the groundwater water table. In 1995, the affected section vegetation was formally excised from the Lakeside Conservation Reserve.

FIGURE 13

Groundwater Monitoring Bores (near FIM I and FIM II)

0 75 150 300 450 600 Metres

Client : KCGM	ENVIRON	
Project : 30-0146	Drawn : GS	Date : Jan-06

PER_Fig13.pdf

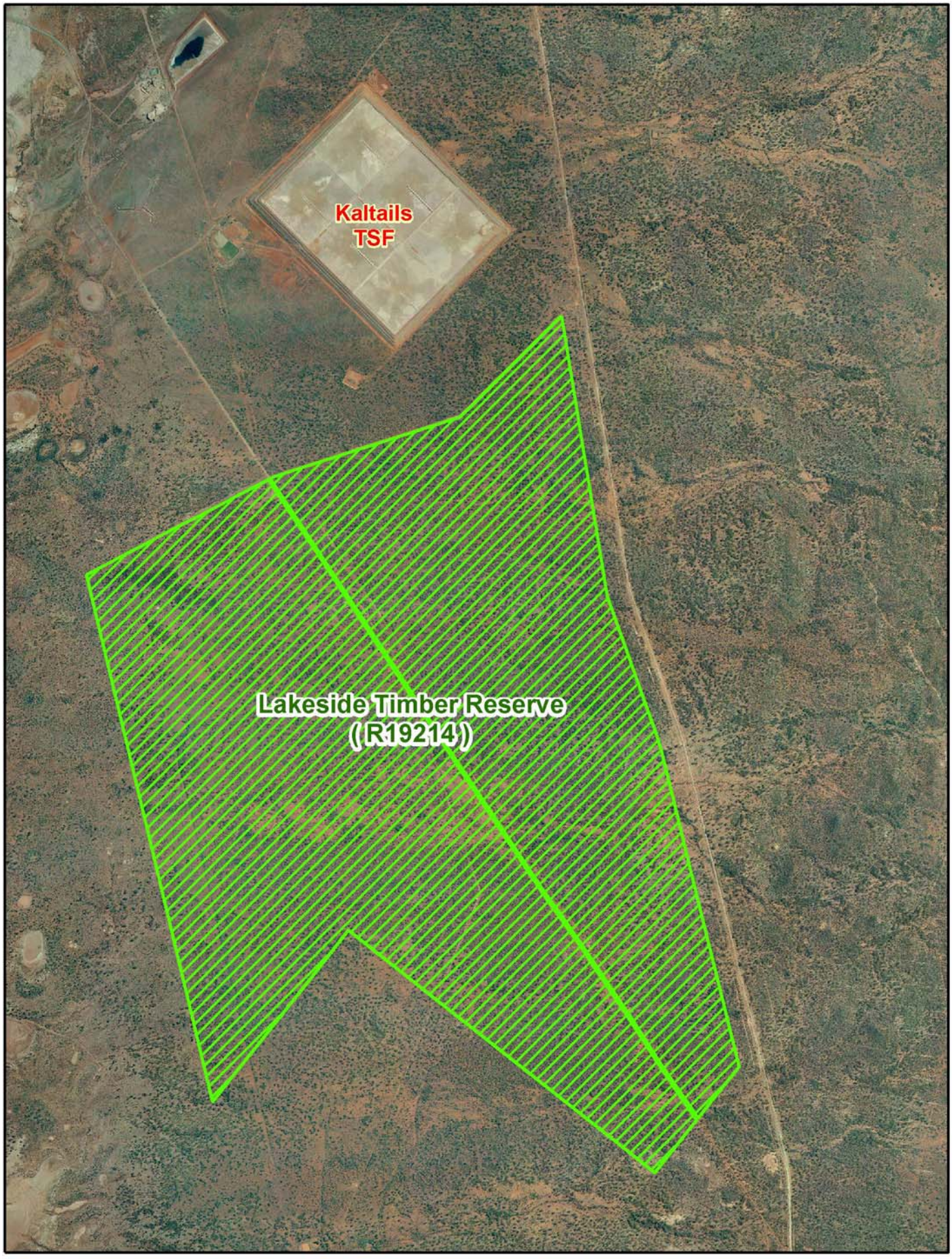

FIGURE 14

Lakeside Timber Reserve

0 125250 500 750 1,000
Metres

Client : KCGM	ENVIRON	
Project : 30-0146	Drawn : GS	Date : Jan-06

PER_Fig14.jpg

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8. EXISTING SOCIAL ENVIRONMENT

The City of Kalgoorlie-Boulder has primarily developed around the mining activities along the Golden Mile since gold was discovered in the late 1800's being the primary support for the mining workforce and their families. Currently the population of the City of Kalgoorlie-Boulder is approximately 30,000.

8.1 DEMOGRAPHICS

In May 2004, Q & A Communications completed a Social Impact Assessment for KCGM of the local Kalgoorlie-Boulder and indigenous stakeholders. The information outlined in this section is derived from this assessment document. The complete report is available on the KCGM website (www.superpit.com.au under 'About KCGM', 'Publications').

According to the Australian Bureau of Statistics most recent census, the City of Kalgoorlie-Boulder comprises of around 28,818 people, of which 6.45% are Indigenous (Department of Industry and Resources, 2003).

The demographic profile of Kalgoorlie-Boulder points to a relatively stable, family orientated community. The gender mix is fairly balanced at a ratio of 1:1.2 females to males. Sixty percent of those over 15 years have been married, with 75% still married. The family structure of the City reflects young families with 41% having children under the age of 15 years. There is a slight over-representation of young people in the region (around 25% are under the age of 15 years and the towns medium age is 30 compared to the State median of 34). This is likely to be a reflection of the positive education and employment opportunities. Community development or employment opportunities for young people are likely to assist in maintaining community cohesion.

The residents of the City of Kalgoorlie-Boulder are predominately of Australian and English ancestry with the majority speaking English only. However, the City of Kalgoorlie-Boulder has higher ethnic diversity than other regions within rural Western Australia.

There are 11,400 dwellings in the City of Kalgoorlie-Boulder. The City accommodates more people in semi-detached town houses or flats when compared to Western Australia as a whole (16% vs. 11%) and has a slightly higher use of other temporary dwellings such as caravans (4% vs. 2%).

There are 54 accommodation providers in the City of Kalgoorlie-Boulder including hotels, motels, B&B's, caravan parks, lodges etc. In 2002, there were 12 establishments with 15 or more rooms in the City. The total number of beds covered by these larger establishments is 1,872. Thirty eight percent of all domestic visitors stayed in commercial accommodation such as local hotels, resorts or motor inn type accommodation, 59% stayed in non commercial accommodation such as a friend's or relative's property.

Kalgoorlie has a well developed regional airport, rail and bus services connecting to Perth. There are a total of 10 primarily schools, six secondary schools and a university campus in addition to a large number of child care and pre-primary schools.

8.2 ABORIGINAL HERITAGE

8.2.1 Ethnographic

An ethnographic survey was undertaken in 1989 in conjunction with the Aboriginal Site Survey undertaken by O'Connor and Quartermaine (1989) for the original CER for the KCGM operation. The survey area covered by this study encompasses the extension area proposed by this Project. Additional surveys have been conducted by O'Connor and Quartermaine in 2000, 2001 and 2004.

Aboriginal people from Coolgardie, Kalgoorlie, and Coonana, who have long term associations with the region, have been consulted on a number of occasions regarding the Fimiston Operations, and local elders who have detailed knowledge of the region's totemic geography have visited the area. Eight sites of ethnographic significance have been identified in close proximity to KCGM's operations. One site is close to the project area however this will not be disturbed by the project. The coordinates of these sites are mapped and the information is utilised during planning and development for new and existing projects.

A review of literature and knowledge of the ethnographic conditions conducted indicated that the potential for sites in the Kaltails area is low particularly as there is no permanent fresh water at the site (AGC, 1988).

8.2.2 Archaeological

An Archaeological survey was undertaken by O'Connor and Quartermaine (1989) to locate and record archaeological sites within the survey area and to research historically recorded Aboriginal sites.

No Archaeological sites were located within the survey area; however three isolated finds were recorded. The paucity of archaeological materials is considered to be attributed to the small size of the survey area and the apparent lack of water sources, as well as the disturbance from mining activity dating back to the turn of the century (O'Connor & Quartermaine, 1989).

A survey conducted prior to the commencement of the Kaltails Project found no registered Aboriginal sites or evidence of Aboriginal activity (AGC, 1988).

8.2.3 Native Title

The Commonwealth *Native Title Act 1993* provides for the protection of Aboriginal interests on land other than Aboriginal Freehold land (e.g. Pastoral Leases, Crown Land). The Act covers past and future acts that may affect Native Title and determines whether Native Title exists. The *Native Title Act* also provides a mechanism by which traditional owners can negotiate compensation for acts affecting Native Title interests.

There are four Native Title Claims that incorporate the KCGM leases and the Special Purpose Kaltails leases. Claimant groups include the Maduwongga people (WC99/9), Central East and Central West Goldfields People (WC/99/29, WC99/30), Widji People (WC98/27), and the Gubrun (WC95/27). Three of these claims are currently in mediation.

Native Title cannot be granted over any of the KCGM mining leases as mining operations on the site predate Native Title (Q & A Communication Group, 2004).

8.3 NON-INDIGENOUS HERITAGE

There are many non-indigenous sites in the City of Kalgoorlie-Boulder recognised for their heritage value. The Kalgoorlie Post Office is the only site listed on the Commonwealth Heritage List under the *Environmental Protection and Biodiversity Conservation Act 1999*. There are 122 sites listed on the Register of the National Heritage Estate and 45 sites registered on the Kalgoorlie-Boulder Municipal Inventory under the *Heritage of Western Australia Act 1990*.

There are no non-indigenous heritage sites located within the Project Area, or likely to be affected by the Project.

8.4 REGIONAL PLANNING

The Western Australian Planning Commission (WAPC) has developed a Goldfields-Esperance Regional Planning Strategy that provides a broad strategic approach to planning in the Goldfields-Esperance region (WAPC, 2000). The aim of the strategy is to provide a strategic framework for an integrated approach to planning in the region for the next 30 years. The strategy incorporates structure plans for the City of Kalgoorlie-Boulder and the Town of Esperance to guide future urban expansion and community and infrastructure coordination.

The overall vision statement and broad principles provide the foundation of the strategy. The vision statement for the strategy is:

> *"The region will be based upon a diverse and vibrant economy, offering an attractive lifestyle with a range of services and recreational opportunities, while embracing environmental principles".*

The strategy sets out the objectives, principle issues, strategy, guidelines and recommendations for the following areas:

- Settlements and community services;
- Heritage and culture;
- Environmental protection and the coast;
- Resource and industrial development; and
- Regional infrastructure requirements.

The Strategy recognises the Goldfields-Esperance Region as being predominantly mineral resource based and that further economic and population growth will depend on the efficient winning of minerals. The WAPC acknowledges that there are great opportunities to further develop the economics of the Region. In the short term, downstream processing of minerals will increase, as will the export of goods and services related to the mining industry (WAPC, 2000).

In January 2004, the DIA, the City of Kalgoorlie-Boulder and the Mulga Mallee Regional Council signed a framework agreement that demonstrated their commitment to work jointly together to address the needs of Aboriginal people in Kalgoorlie-Boulder. The partnership aims to create an equitable and inclusive community where indigenous and non-indigenous can work together with dignity, respect and fulfilment.

In 2004 KCGM co-signed the 'Dignity, Respect and Fulfilment Agreement' with community leaders at Ninga Mia. As our closest indigenous neighbours, KCGM has been working with Ninga Mia on various small projects around their community, largely thanks to Jim's Seeds, Weeds and Trees contractors who have provided earthworks and clean-up equipment and labour.

9. OVERARCHING ENVIRONMENTAL MANAGEMENT

9.1 SUSTAINABILITY

The definition of sustainability that has been widely adopted is outlined in the World Commission on Environment and Development's Brundtland Report (World Commission on Environment and Development, 1987) as:

> *"Development which meets the needs of the present without compromising the ability of future generations to meet their own needs."*

There are at least three aspects to sustainability which are interrelated; social sustainability, economic sustainability and environmental sustainability. It has been said that a sustainable society depends upon a stable economy which in turn depends on the global ecosystem, whose health is vital to all (World Commission on Environment and Development, 1987).

Australia has a National Strategy for Ecologically Sustainable Development (NSESD) that through its core objectives provides broad strategic directions and framework for governments to direct policy and decision making.

The Core Objectives of the NSESD are:

- To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- To provide for equity within and between generations; and
- To protect biological diversity and maintain essential ecological processes and life-support systems.

In 2003, the Western Australian Government also released a State Sustainability Strategy "Hope for the Future" which outlines six broad goals for sustainability that envisage how sustainability can be applied across the whole of government. These goals include:

- Ensure that the way we govern is driving the transition to a sustainable future;
- Play our part in solving the global challenges of sustainability;
- Value and protect our environment and ensure the sustainable management and use of natural resources;
- Plan and provide settlements that reduce the ecological footprint and enhance our quality of life;
- Support communities to fully participate in achieving a sustainable future; and
- Assist business to benefit from and contribute to sustainability.

9.1.1 Sustainability Assessment

KCGM has undertaken an assessment of the Project in accordance with the EPA's Position Statement No. 6 Towards Sustainability, August 2004. The checklist provided in Table 12 outlines KCGM response to the sustainability questions put forward for the Project.

Table 12: Sustainability Checklist for the Fimiston Operations Extension Project

QUESTION	RESPONSE
Does the proposal deplete non-renewable resources significantly?	No - Significant gold resources remain at depth below the Fimiston Open Pit and in many other locations throughout WA.
Does the proposal deplete assimilative capacity significantly?	No - Discharges to the environment are minimised. Groundwater will be managed in accordance with the Seepage and Groundwater Management Plan (SGMP).
Does the proposal use natural resources responsibly?	Yes - the Project will minimise the use of natural resources by recycling waste throughout the operation and implementing Continuous Improvement and Strategic Energy Management programme.
Does the proposal satisfactorily restore any disturbed land?	All disturbed areas except the areas of the pit that can not be backfilled, will be progressively rehabilitated. Rehabilitation will meet agreed completion criteria.
Does the proposal follow the waste hierarchy and manage satisfactorily any waste produced?	Yes - Waste will be avoided, reduced, reused and recycled wherever possible.
Does the proposal incorporate best practice in water and energy?	Yes - KCGM identifies continuous improvement opportunities for energy and water use efficiency.
Does the proposal make good use of best practice to prevent pollution?	Yes - Prevention of pollution will be aimed at industry best practice. Continuous improvement programmes at KCGM will ensure this is maintained.
Does the proposal increase use of non-renewable transport fuels?	Yes - Only until approximately 2011 when diesel consumption for heavy mining vehicles will decrease.
Does the proposal increase use of energy efficient technologies?	Yes - Diesel is used for the mining fleet. Investigations continue into the use of alternative fuels and other opportunities throughout the operation.
Does the proposal result in net improvements in biodiversity?	No - There is no net change in biodiversity. The NWRDs will be rehabilitated post construction and 57ha of the Fimiston Open Pit will be rehabilitated to offset the clearing for the Golden Pike Cutback (46ha). Areas will be rehabilitated to agreed standards and completion criteria.

QUESTION	RESPONSE
Does the proposal increase greenhouse gas emissions?	Yes - Only until approximately 2010. A decrease in the annual emissions is evident from 2011 - 2017.
Does the proposal involve acceptable levels of risk?	Yes - Detailed investigations have confirmed that the proposal involves acceptable levels of risk for the environmental; social and economic aspects of the Project.
Does the proposal have a secure foundation of scientific understanding of its impacts?	Yes - Detailed scientific investigations have been undertaken in relation to flora and fauna noise, dust, blasting and vibration, groundwater, Aboriginal heritage and public safety issues.
Does the proposal minimise the ecological footprint?	Yes - The Project aims to reduce the ecological footprint of the operation wherever possible.
Does the proposal avoid or minimise adverse impacts and promote beneficial impacts on the surrounding community?	Yes - the proposal aims to minimise adverse impacts on the community. KCGM will continue to be a major financial support to the City of Kalgoorlie-Boulder.
Does the proposal produce sustainable net economic benefits?	Yes - KCGM is developing long-term sustainable tourism incentives through its conceptual mine closure strategy.
Does the proposal produce net social benefits?	Yes – KCGM will continue to contribute to the community through support of local businesses, local employment, sponsorships, volunteer work and other community programmes.
Does the proposal add to heritage protection and provide a sense of place?	Yes - KCGM is assisting in the restoration of the Historical Loopline Tourist Railway as part of Stage 1 of the broader Project. Ongoing management of Aboriginal and ethnographic heritage is being undertaken with local Aboriginal people.
Does the proposal produce net environmental benefits?	In addition to rehabilitation of disturbance by current operations, KCGM has an ongoing rehabilitation programme to revegetate historically disturbed areas. This has reduced dust emissions and improved biodiversity and visual amenity in the Kalgoorlie area. This programme will be continued as part of the Project.
Does the proposal contribute to a more equitable and just society?	Yes - KCGM provides significant direct and indirect financial support to the City of Kalgoorlie-Boulder.
Does the proposal interact positively with other likely developments?	Yes - KCGM is completing the relocated Environmental Noise Bund (Stage 1) such that the Historical Loopline Tourist Railway can be constructed on the surface to design specifications. Future toll treating may also prolong the life of the Project.

QUESTION	RESPONSE
Does the proposal provide new opportunities (social, economic or environmental)?	Yes - the Project provides for opportunities for an extended five year mine life to 2017. New research and an increase in scientific knowledge will be gained during this time.

9.2 PRINCIPLES OF ENVIRONMENTAL PROTECTION

The principles of environmental protection are established in the *Environmental Protection Act 1986* and form the core principles that guide the EPA during their assessment and decision making process against Project's formally assessed. The five principles are the:

1. Precautionary principle;
2. Principle of intergeneration equity;
3. Principle of the conservation of biological diversity and ecological integrity;
4. Principles relating to improve valuation, pricing and incentive mechanisms; and
5. Principle of waste minimisation.

The Principles of Environmental Protection are also outlined in the EPA's Position Statement No. 7, released in August 2004. KCGM has considered these principles in the planning and design of the Project and during the environmental impact assessment. Details of this consideration are outlined in Table 13.

Table 13: Principles of Environmental Protection

PRINCIPLE	RELEVANT YES/ NO	IF YES, CONSIDERATION GIVEN	ADDRESSED YES/ NO	SECTION OF PER
1. *The precautionary principle* Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle decisions should be guided by- a. Careful evaluation to avoid, where practicable serious or irreversible damage to the environment; and b. An assessment of the risk- weighted consequences of various options	Yes	Careful evaluation of the Project has been undertaken. Specialist studies and investigations have been carried out within the Project area to assess the potential environmental impacts and to identify management responses for mitigation. These investigations assist KCGM to assess the risk-weighed consequences with options associated with waste rock dump locations, tailings storage and mining of the Golden Pike orebody.	Yes	10
2. *The principle of intergenerational equity* The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.	Yes	KCGM's Joint Venture owners, Newmont and Barrick recognise the importance of sustainability in their operations on a social, environmental and economic context in line with the ICMM International Principles of Sustainable Development and those of the MCA. Corporate environmental, social, health and safety commitments guide the companies' management all aspects of development, operation and closure of their global-scale operations. KCGM is continuing to undertake investigations to ensure that the health, diversity and productivity of the environment are not	Yes	10.11 Appendix B1 (Conceptual Mine Closure Strategy)

PRINCIPLE	RELEVANT YES/ NO	IF YES, CONSIDERATION GIVEN	ADDRESSED YES/ NO	SECTION OF PER
		comprised for future generations. As part of this Project KCGM formalises a Conceptual Mine Closure Strategy that details KCGM's commitment and approach to the closure of its operations.		
3. *The principle of the conservation of biological diversity and ecological integrity* Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Yes	Fauna and Flora surveys have been undertaken to assess the significance of the vegetation and for the presence of declared rare or threatened species. Management of introduced species is undertaken. Backfilling within the existing pit void reduces clearing for waste dumps and the option to use the existing Fimiston I, Fimiston II and Kaltails TSFs for tailings storage will reduce clearing of remnant vegetation. KCGM's Greening the Golden Mile revegetation programme which has improved the biological diversity and ecological integrity of the area around KCGM's operations will continue with the Project.	Yes	10.1 10.2
4. *Principles relating to improved valuation, pricing and incentive mechanisms.* (1) Environmental factors should be included in the valuation of assets and services. (2) The polluter pays principles- those who generate pollution and waste should bear the cost of contaminant, avoidance and abatement. (3) The users of goods and services should pay prices based on the full life cycle costs of use of natural resources and assets and the ultimate disposal of any waste. (4) Environmental goals, having been established should be pursued in the most cost effective way, by establishing	Yes	Environmental factors have played a major part of determining the scope, details and options for the Project. KCGM recognises the polluter pays principle and has designed the Project to ensure that pollution type impacts are minimised. KCGM endeavours to purchase goods where the full life cycle costs have been considered and continue to identify opportunities for improvement. Environmental goals established by KCGM will be pursued in	Yes	10.5 – 10.11

PRINCIPLE	RELEVANT YES/ NO	IF YES, CONSIDERATION GIVEN	ADDRESSED YES/ NO	SECTION OF PER
inventive structure, including market mechanisms, which enable those best placed to maximize benefits and/or minimise costs to develop their own solution and responses to environmental problems.		the most cost effective way. The full life-cycle cost of mining gold, including the use of natural resources and assets, the ultimate disposal of wastes and the decommissioning and closure costs of the operation is estimated.		
5. *The principle of waste minimization* All reasonable and practicable measures should be taken to minimize the generation of waste and its discharge into the environment.	Yes	All reasonable and practicable measures will be undertaken to minimise the generation of waste and its discharge to the environment. The preferred management options are to avoid, reduce, reuse, recycle and recover waste. The assessment of proposed waste rock dump locations has resulted in the opportunity to backfill waste rock within existing voids to the northern end of the Fimiston Open Pit. The Seepage and Groundwater Management Plan outlines performance targets and standards to ensure impacts from the TSFs are controlled and managed effectively.	Yes	10.10 10.5

9.3 CORPORATE COMMITTMENT

9.3.1 Sustainability

Barrick and Newmont are signatories to *Enduring Value - Australian Minerals Industry Framework for Sustainable Development*. *Enduring Value* is the centrepiece of the industry's commitment to achieving continual improvement in its environmental, social and economic performance, accountability and ensuring that it operates in manner that is attuned to community expectations. The ten principles of the framework that Barrick and Newmont are committed to are:

1. Implement and maintain ethical business practices and sound systems of corporate governance;
2. Integrate sustainable development considerations within the corporate decision-making process;
3. Uphold fundamental human rights and respect culture, customs and values in dealing with employees and other who are affected by our activities;
4. Implement risk management strategies based on valid data and sound science;
5. Seek continual improvement of our health and safety performance;
6. Seek continual improvement of our environmental performance;
7. Contribute to conservation of biodiversity and integrated approaches to land use planning;
8. Facilitate and encourage responsible product design, use, re-use, recycling and disposal of our products;
9. Contribute to the social, economic and institutional development of the communities in which we operate; and
10. Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.

9.3.2 Corporate Policies

Demonstrated by a Statement of Commitment (Figure 15), KCGM reflects support of the policies and standards of its JV Owners Newmont and Barrick. Barrick and Newmont policies include those for Environment, Occupational Health and Safety and Indigenous Relations. The Environmental Policy Statement's of the JV owners (provided on Figure 16 and Figure 17) outline the corporate principles in relation to environmental performance, management and community consultation.

In summary, KCGM manages its operation in accordance with the corporate policies which aim to:

- co-operate with government and communities of interest;
- comply with all laws and commitments;
- have an environmental management programme to control risks;
- provide training, resources and responsibility to manage environmental impacts;
- consider the environment in all stages of site activities;
- identify opportunities for improvement; and
- undertake regular reviews and audits.

9.3.3 Environmental Management

KCGM has an established system for the management of environmental, safety and community relation aspects of the operation. The core of the management system is KCGM's Safety, Environment and Community Relations Information System (SECRIS). SECRIS provides a framework to:

- Present the main elements required in the organisation to ensure that the safety, environmental and community relations policies, standards and internal requirements of the JV owners and those of the regulatory and broader community can be met; and to
- Outline performance elements which focus on managing specific activities that have been identified as critical to good safety, environmental and community relations management at KCGM.

The system is a collaborative and interactive tool that is an effective resource base for procedures, standards and guidelines, training modules and registers, reports, performance statistics and links to other management systems such as KCGM's Accident Incident Reporting System (AIRS).

AIRS provides a mechanism for environmental reporting of incidents, hazards and near misses throughout the operations. The simplistic reporting system encourages employees at all levels of the organisation to report and thereby improve the awareness and identification of hazards before they become minor or significant incidents.

KCGM has also developed the Continuous Improvement (CI) programme for its operations. By utilising the JV owner principals KCGM uses a systematic approach to CI to work towards:

- Providing a more disciplined approach to CI projects and initiatives;
- Allowing for greater consistency across departments and other JV sites with standard methodology and tools;
- Allowing for a quicker response to CI opportunities by facilitating the organisation of teams and the development of both teams and individuals;
- Helping all employees understand the importance of, and the ways to improve processes and organisational relationships;
- Helping to capitalise on global best practices and share knowledge across sites.

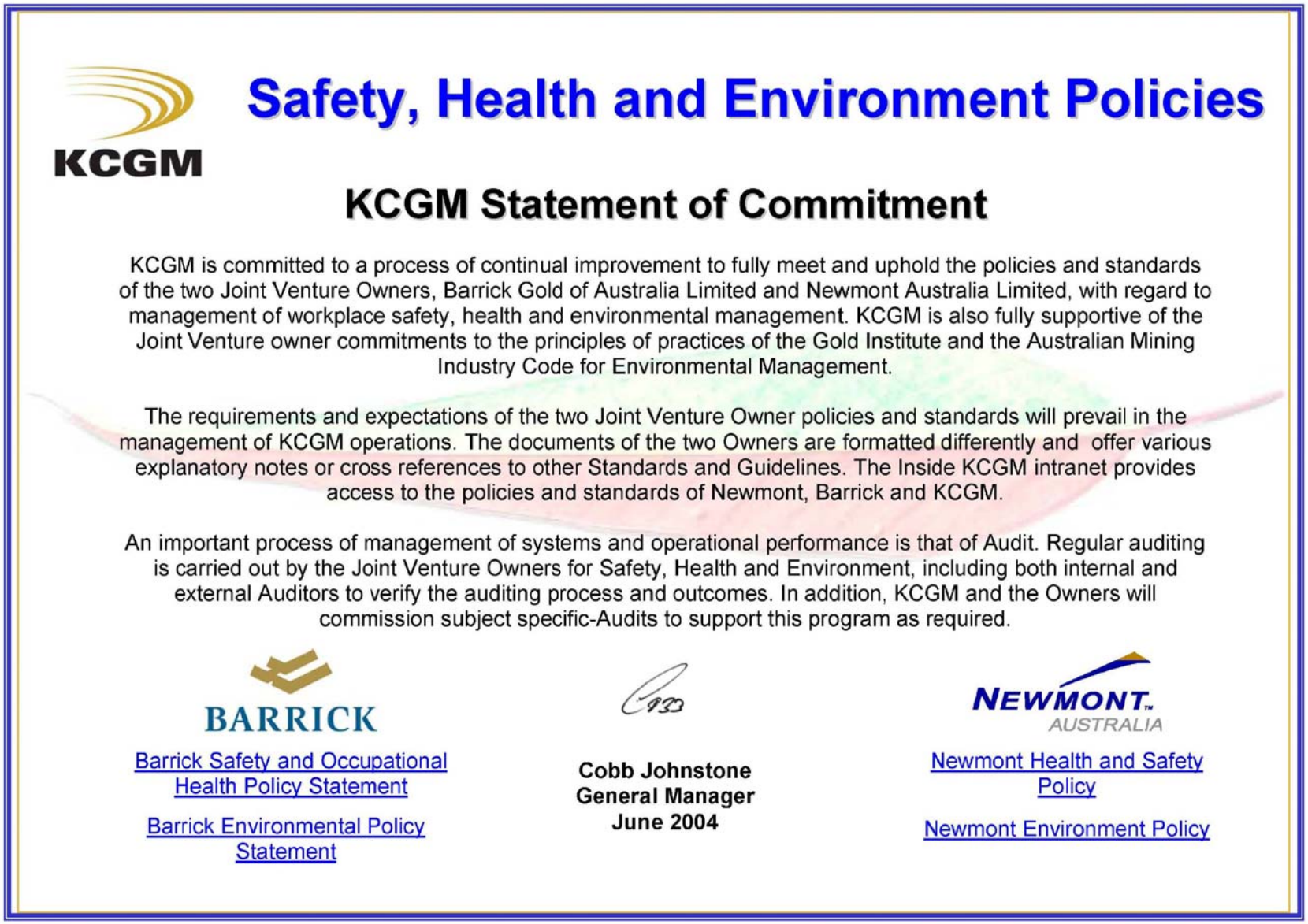
To capture the ideas from all employees a formal Ideas Management System (IMS) has been developed and implemented. Formalising the management of employee ideas was considered to be a critical step in building a culture.

The development and implementation of the IMS has and will continue to result in:

- The opportunity to realise the improvement potential of our front-line employees and supervisors;
- The balancing of 'bottom-up' and 'top-down' approaches to improvement;
- Making accountability and performance transparent to aid in decision-making;
- A way to involve the front-line in work planning and continuous improvement reviews as well as just 'doing';
- A development opportunity for all staff; and
- A way to earn recognition individually, at team level and as an entire site.

KCGM's Core Values for Continuous improvement are:

- Lead in Safety, the Environment & Social Responsibility;
- Behave Like an Owner;
- Act with a Sense of Urgency;
- Be a Team Player;
- Continually Improve; and
- Deliver Results.



Safety, Health and Environment Policies

KCGM Statement of Commitment

KCGM is committed to a process of continual improvement to fully meet and uphold the policies and standards of the two Joint Venture Owners, Barrick Gold of Australia Limited and Newmont Australia Limited, with regard to management of workplace safety, health and environmental management. KCGM is also fully supportive of the Joint Venture owner commitments to the principles of practices of the Gold Institute and the Australian Mining Industry Code for Environmental Management.

The requirements and expectations of the two Joint Venture Owner policies and standards will prevail in the management of KCGM operations. The documents of the two Owners are formatted differently and offer various explanatory notes or cross references to other Standards and Guidelines. The Inside KCGM intranet provides access to the policies and standards of Newmont, Barrick and KCGM.

An important process of management of systems and operational performance is that of Audit. Regular auditing is carried out by the Joint Venture Owners for Safety, Health and Environment, including both internal and external Auditors to verify the auditing process and outcomes. In addition, KCGM and the Owners will commission subject specific-Audits to support this program as required.

BARRICK

Barrick Safety and Occupational Health Policy Statement

Barrick Environmental Policy Statement

Cobb Johnstone
General Manager
June 2004

NEWMONT AUSTRALIA

Newmont Health and Safety Policy

Newmont Environment Policy

Figure 15
KCGM Statement of Commitment

Client: KCGM	ENVIRON
Project: 30-0146	Drawn: KP
	Date: Jan -06

ENVIRONMENTAL POLICY STATEMENT

Barrick Gold Corporation believes that wise environmental stewardship is founded in the diligent application of proven natural resource management controls and practices for the protection, reclamation and enhancement of the environment.

As a leader within the mining industry, Barrick is in the forefront of implementing operational improvements that offer superior environmental protection. Barrick's management practices will continue to fully integrate environmental evaluation, planning and design into its business development strategies.

Therefore, in the best interests of its business, its employees, its shareholders, and the communities in which it operates, Barrick Gold Corporation will:

Comply with all environmental laws and regulations.

Establish and maintain a clearly defined environmental management program to guide its operations.

Ensure that its directors, officers, managers and employees understand and adhere to its environmental management program.

Provide its managers and supervisors at each operation with the authority and resources necessary to carry out its environmental management program, including the administration of site-specific environmental practices.

Conduct periodic reviews of its operations to monitor environmental performance and to guide its environmental management program.

Require those who provide it with services and products to practice good environmental stewardship.

Sponsor research directed at expanding scientific knowledge and achieving cost-effective solutions to environmental issues.

Promote environmental awareness among its employees, their families, and the communities in which it operates.

Work with governmental and civic leaders, environmental groups and other concerned parties to develop a mutual understanding of environmental issues.

Mitigate its environmental impacts and support environmental enhancement programs of common benefit.

BARRICK

John Shipp
Regional Vice President
Australia-Africa

Figure 16
Barrick Environmental Policy Statement

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: -	Date: Jan -06

NEWMONT
AUSTRALIA

ENVIRONMENT POLICY

Newmont Australia Limited ("Newmont") is an international mining company, with a principal focus on gold. The company operates in Australia, New Zealand, Europe, Africa, North and South America and Asia.

Newmont believes that responsible environmental management and superior environmental performance is integral to an efficient and successful company. This will be achieved through leadership and the use of reliable systems that provide timely and accurate information, in a transparent manner, to support effective decision making.

To enable environmental objectives to be achieved, each Newmont operation will:

- **Identify** opportunities for improvement and set challenging standards that are congruent with community values and expectations.
- **Implement** and maintain an environmental management system that identifies, assesses and effectively controls environmental risks to the business and community. Such a system must be characterised by rigor, simplicity and action.
- **Integrate** environmental considerations into all aspects of the company's activities including exploration, project development, mine expansion, acquisitions, divestments and closures.
- **Design**, operate and decommission all facilities and associated infrastructure to avoid or mitigate adverse environmental impact, minimise associated long term financial liability and enhance social benefit.
- **Select** people with appropriate qualifications and capabilities, and provide necessary training to enable employees, contractors and suppliers to recognise the potential and actual impact of their activities to ensure they are able to manage their activities in accordance with this policy.
- **Initiate** regular audit and assessment programs and embrace recommendations for improvement by prompt follow-up action.
- **Consult** the community on its concerns, aspirations and values regarding the development, operational and closure aspects of mineral projects, recognising that there are links between economic, social and cultural issues.
- **Communicate** openly about environmental risks, incidents or emergency situations, or ideas for improvement, to enable effective decision making and action.
- **Demonstrate** commitment to public reporting of environmental performance and other requirements of the Australian Minerals Industry Code for Environmental Management.
- **Comply** with all applicable legal and regulatory requirements as a minimum standard.

John A.S. Dow
Managing Director

June 2002

Figure 17
Newmont Environment Policy

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: -	Date: Jan -06

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10. ENVIRONMENTAL IMPACTS AND MANAGEMENT

The following environmental factors have been addressed in the environmental and social impact assessment for the Fimiston Operations Extension and Mine Closure Planning Project:

- Terrestrial Native Flora and Vegetation
- Terrestrial Native Fauna
- Water Resources – Supply
- Surface Drainage
- Groundwater
- Environmental Noise
- Air Quality
- Blasting Noise and Vibration
- Greenhouse Gas Emissions
- Waste Management
- Rehabilitation and Decommissioning
- Aboriginal Heritage
- Non-Indigenous Heritage
- Seismicity
- Public Safety
- Amenity

An outline of the issues associated with each environmental factor and the management measures proposed in recognition of the EPA Objective is included in the following Sections.

10.1 TERRESTRIAL NATIVE FLORA AND VEGETATION

The EPA's objective with regards to:

Terrestrial flora and vegetation is:

- to maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

Conservation reserves is:

- to protect the environmental values of areas identified as having significant environmental attributes.

Applicable Guidelines and Standards are:

- EPA Position Statement No. 2, Environmental Protection of Native Vegetation in Western Australia (EPA, 2000);
- EPA Position Statement No. 5, Environmental Protection and Ecological Sustainability of the Rangelands in Western Australia (EPA, 2004);
- EPA Position Statement No.7, Principles of Environmental Protection (EPA, 2004b); and
- EPA Position Statement No. 8, Environmental Protection in Natural Resource Management (EPA, 2004c).

Issues

Potential impacts on flora and vegetation primarily relate to clearing vegetation in the area of the Golden Pike Cutback and the NWRDs. There is also the risk of impacts to vegetation health from a potential rise in groundwater levels associated with the operation of the TSFs. The Kaltails TSF is also located near the Lakeside Conservation Reserve which is classified under the International Union for the Conservation of Nature and Natural Resources (IUCN).

Vegetation Clearing
The Project will require the clearing of approximately 46 ha of vegetation for the Golden Pike Cutback and 115 ha for the NWRDs. The flora and vegetation in the area of the Golden Pike Cutback has been historically disturbed by mining activities on the Golden Mile since the early 1900's. The area is currently transected by numerous access tracks and disturbance caused by exploration drilling activities. The proposed location of the NWRDs is on previously disturbed land close to KCGM's current operations.

The areas proposed for the location of the NWRDs and the Golden Pike Cutback were rehabilitated by KCGM as part of the "Greening the Golden Mile" Programme between 1990 and 1999. The vegetation was classified as cleared/modified native vegetation in 'good' condition during the survey undertaken by Jim's Seeds Weeds and Trees in January 2006 (Appendix C1).

Two priority species were recorded in the Golden Pike Cutback area proposed to be disturbed. These species *Eucalyptus formanii* and *Eucalyptus brockwayi* are Priority 4 and Priority 3 listed species respectively. These species were intentionally cultivated and planted during rehabilitation activities and are therefore not considered to be significant populations.

No Declared Rare Flora species listed under the *Wildlife Conservation Act 1950* or listed in the DEC *Declared Rare and Priority Flora List for Western Australia* (2005) were recorded within the area proposed to be disturbed.

KCGM considers that the potential impacts to vegetation from the Project will not result in an unacceptable loss of biodiversity consistent with the EPA's objectives in Position Statement No. 2 Environmental Protection of Native Vegetation in Western Australia (EPA, 2000).

The preferred tailings storage options of utilising existing facilities, Fimiston I, II and the Kaltails TSF eliminates the need to construct a new TSF and clear approximately 150 ha of native vegetation.

Groundwater

The Kaltails TSF is located near the Lakeside Miscellaneous Conservation Reserve (No. 19214). This reserve declared in 1957, is managed by DEC for the preservation of sandalwood (*Santalum spicatum*). The reserve is located approximately 800 m to the south-southeast of the Kaltails TSF. A rise in the saline groundwater table early in the Kaltails TSF operation caused detrimental impacts to the vegetation to the south of the TSF. A loss of vegetation was evident peripheral to the TSF and from the timber reserve further to the south. As a result the affected area was excised from the conservation reserve in 1995 and the reserve now covers an area of 2,391 ha.

Subsequent seepage management activities implemented at the Kaltails TSF in 1992 controlled the rising water table and have included close monitoring of groundwater levels. Should the Kaltails option for tailings storage be selected for the Project, the potential impacts on surrounding areas including the conservation reserve, is considered manageable provided that the Seepage and Groundwater Management Plan (SGMP) is revised and implemented for the Kaltails TSF.

KCGM has undertaken vegetation monitoring at the Fimiston I and Fimiston II TSFs in accordance with DEC requirements since 1999. This monitoring is incorporated into the SGMP and is used to confirm that the groundwater management plan is protecting the environmental values of the area.

Management

Vegetation Clearing

The clearing of waste rock dump areas will be undertaken progressively as the need for additional storage area as required. This will ensure that vegetation clearing will be kept to a practicable minimum throughout the life of the mining operation. Cleared vegetation and topsoil will be stockpiled for later use in rehabilitation. Waste rock dump slopes and other disturbed areas will be rehabilitated as soon as practicable to promote the re-establishment of vegetation. Rehabilitation will be undertaken in accordance with KCGM's Rehabilitation Management Plan (Refer to Section 10.11). No additional clearing will be required for the TSFs or associated pipeline corridors.

Dust

KCGM will employ management actions outlined in the *Revised Dust Monitoring and Management Programme June 2004* to minimise dust generation and the potential for impacts on vegetation outside the clearing footprint. Refer to Section 10.8.2 for additional information regarding dust impacts and management.

Weeds

Weed management will be undertaken by KCGM to manage the risk of spreading weeds. This will include but not be limited to progressive rehabilitation to reduce the establishment of weed species and monitoring of disturbed areas. KCGM will avoid the introduction of new environmental weeds into rehabilitated areas, and identify and appropriately manage any exotic or non-local weed species on KCGM's operations. These strategies will be documented in the Rehabilitation Management Plan (Section 4.5).

Groundwater

Potential impacts from the TSFs on vegetation will be managed through the implementation of KCGM's SGMP, currently in place for the Fimiston I and Fimiston II TSFs. The SGMP establishes performance targets for the long-term management of TSF seepage. The vegetation monitoring programme has recently been revised and updated to include Landscape Function Analysis (LFA). LFA is a monitoring procedure that assesses the functional performance of a developing ecosystem, including the assessment of factors such as nutrient cycling, water management and species composition and diversity. KCGM will undertake a baseline vegetation survey and incorporate vegetation monitoring as part of the SGMP for the Kaltails TSF should the option to use the Kaltails TSF proceed.

Further assessment of the potential impacts to flora and vegetation associated with operation of the TSFs are discussed in Section 10.5.

Predicted Outcome

The Project will meet the EPA's objective in regards to flora and vegetation.

10.2 NATIVE TERRESTRIAL FAUNA

The EPA's objective with regards to fauna is:

- to maintain the abundance, diversity and geographic distribution of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

Applicable Guidelines and Standards are:

- EPA Position Statement No. 3, Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA, 2002); and
- EPA Position Statement No. 5, Environmental Protection and Ecological Sustainability of the Rangelands in Western Australia (EPA, 2004).

Issues

Habitat Disturbance
Clearing of vegetation for the Golden Pike Cutback and NWRDs has a very low potential to impact on localised fauna habitats due to the historical disturbance and clearing that has occurred within these areas. These areas have been previously rehabilitation by KCGM as part of the "Greening the Golden Mile" Programme between 1990 and 1999.

Potential impacts to vegetation adjacent to the TSFs and specifically vegetation of the Lakeside Conservation Reserve, from a rise in groundwater levels also have the potential to impact on fauna habitat. However, effective groundwater management and vegetation monitoring will significantly reduce the risk of this occurring. Potential impacts and management from a rise in the groundwater table are discussed in Section 10.5.

Direct Impacts
There is also the potential for impacts to fauna from the TSFs as avian or other fauna can be attracted to the water ponding on the surface of the TSF. There is the potential that fauna may be affected by the water quality of the ponded water or become trapped in the tailings mud. KCGM currently has a very low incidence of fauna fatalities (two incidents each involving one animal, in 10 years) on the Fimiston TSFs.

Management

The Project will not impact any known significant fauna habitats. Should any threatened fauna habitats be found in the Project area, management measures will be implemented to ensure that the Project does not adversely impact the conservation status of threatened species. Fauna habitats will be re-established during rehabilitation of disturbed areas as part of KCGM's Rehabilitation Management Plan (refer to Section 10.11).

Potential impacts of seepage on vegetation, from the TSFs and therefore associated fauna habitats will be managed through the implementation of KCGM's SGMP as outlined in Section 10.5.

Fauna management on KCGM's current TSFs is managed in accordance with licence conditions and the International Cyanide Management Institute's (ICMI) Cyanide Management Code. The monitoring of facilities is undertaken on 6 hourly intervals and the supernatant pond on the surface of the facility is maintained as low as practicable. Fencing of the TSFs also aims to prevent fauna access.

Predicted Outcome

The Project will meet the EPA's objective in regards to terrestrial fauna.

10.3 WATER RESOURCES

The EPA's objective in regards to water resources is:

- to maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected.

Applicable Guidelines and Standards are:

- EPA Position Statement No. 5, Environmental Protection and Ecological Sustainability of the Rangelands in Western Australia (EPA, 2004).

Issues

KCGM uses on average 12,175 megalitres (ML) of water each year of which 88% is saline, sourced from groundwater bores and recovered and recycled from various aspects of the operation. The remaining 12% is potable water sourced from the Kalgoorlie water supply system. Water is primarily used for ore processing within the Fimiston Mill.

The Project will not significantly increase the current ore processing rate of the mill and therefore the water requirement for treatment purposes will remain relatively unchanged. The extension of mine life for an additional five years will however increase the period over which KCGM abstracts and uses water from potable and saline sources.

KCGM is the largest user of hypersaline groundwater in the local area. The DEC has established the environmental and beneficial use values for Goldfields water in the Goldfields Groundwater Management Plan (Water Authority, 1994). Based on this plan, the DEC recognises that the primary beneficial use of the groundwater continues to be for the purpose of mining and mineral processing. The additional five years of operation is not expected to impact on water resources within the region.

Management

KCGM will continue to focus on strategies to improve water efficiency throughout the operation to reduce the reliance on groundwater abstraction and the use of potable water from the Kalgoorlie water supply scheme. Significant advantages are currently being seen from the increased blending of mine water (from the underground operation) and water recycled from the TSFs decants and seepage recovery bores in preference to using water pumped from distant saline groundwater resources. These advantages include a reduction in:

- the relative consumption of water from distant borefields compared with blended TSF decant and groundwaters;
- the specific rate of lime consumption and in the specific rate of greenhouse gas emissions related to lime manufacture;
- energy use, by pumping water from shorter distances; and
- the risk of saline water spills along pipeline easements from the distant borefields to the Fimiston Mill.

Groundwater abstracted from the Kaltails TSF will be returned to the Fimiston Mill for use within the processing circuit as is currently done.

Predicted Outcome

The Project will meet the EPA's objective in regards to water resources.

10.4 SURFACE DRAINAGE

The EPA's objective with regards to surface drainage:

- to maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected.

Applicable Guidelines and Standards are:

- EPA Position Statement No. 5, Environmental Protection and Ecological Sustainability of the Rangelands in Western Australia (EPA, 2004).

Issues

Low relief and low annual rainfall has resulted in poorly-defined surface drainage within the area of the Fimiston Operations. There is one significant ephemeral creekline located between the Fimiston Mill, open pit and waste rock dumps to the west and the Fimiston II TSF to the east. This creekline drains directly to Hannan's Lake, and only flows after significant rainfall events, generally associated with northern tropical depressions.

The identified options for the location of the NWRDs were in part selected because of the inability to extend and/or increase the height of the existing waste rock dump areas. The heights of the waste rock dumps encompassing the southern and eastern extents of the Fimiston Open Pit are restricted by airport regulations. Geographic constraints of the eastern and southern drainage lines associated with Hannan's Lake also restrict any lateral extension. The location of the proposed NWRDs is not associated with any major surface drainage features.

Management

Surface drainage management during the construction, operation and closure of the waste rock dumps and the Golden Pike Cutback will ensure that water ponding does not occur and impact on the health of native vegetation. Earthworks will be undertaken as part of this surface drainage management where necessary so as not to starve native vegetation of surface water or create prolonged saturated areas. Any surface diversions will direct stormwater towards existing and natural drainage paths.

The design performance of the waste rock dumps will be routinely inspected especially following periods of heavy precipitation to identify any areas of ponding or erosion. Impacts of altered surface drainage and/or ponding on native vegetation will be monitored annually as defined in KCGM's Rehabilitation Management Plan.

Predicted Outcome

The Project will meet the EPA's objective in regards to surface drainage.

10.5 GROUNDWATER

The EPA's objectives with regards to groundwater are:

- to ensure that groundwater emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses, by meeting statutory requirements and acceptable standards; and
- to maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected.

Applicable Guidelines and Standards are:

- EPA Position Statement No. 5, Environmental Protection and Ecological Sustainability of the Rangelands in Western Australia (EPA, 2004); and
- DEC Water Quality Protection Guidelines No. 2, Mining and Mineral Processing; Tailings Facilities (WRC, DME and DEP, 2000).

Issues

Potential groundwater issues associated with the Project relate to the elevation of the local saline water table as a consequence of seepage from the Fimiston I and Fimiston II TSFs and/or the Kaltails TSF.

Natural groundwater in the vicinity of the Fimiston I, Fimiston II and Kaltails TSFs is saline with total dissolved solids concentrations ranging from >20,000 mg/L to 200,000 mg/L with a pH as low as 2 to 3. The quality of this groundwater is not suitable for potable or agricultural use (stockwater and irrigation). The "beneficial use" of the groundwater in the Goldfields region is recognised by the DEC for the purpose of mining and mineral processing as defined in the Goldfields Groundwater Area Management Plan (Water Authority, 1994).

A network of monitoring and dewatering bores currently exists around the perimeter of the Fimiston I, II and Kaltails TSFs. Based on the recognised beneficial use of the groundwater in the area, potential impacts from use of the Fimiston and Kaltails TSFs are not considered to be significant, providing they can continue to be effectively managed via KCGM's Seepage and Groundwater Management Plan (SGMP).

Fimiston TSFs

Seepage issues were addressed in Golder Associates' studies associated with addenda to the Notices of Intent (NOIs) for the Fimiston I and Fimiston II (Stage 2) TSFs. In both of these studies, assessments were made of the potential for increased seepage with increased thickness of the tailings deposits (Golder, 2003 and 2005) (Appendices D2, D3).

Golder (2003) concluded that the seepage rate from the Fimiston I TSF would not change substantially, provided that the area of the decant pond did not increase.

Golder (2005) undertook seepage modelling to provide a more rigorous and quantitative assessment of the potential for increased seepage with a higher tailings storage facility. Figure 18 (from Golder, 2005) shows the conceptual model adopted for the modelling, with particular characteristics of note:

- strong differences in hydraulic conductivity when measured in different planes, with the vertical (kv) conductivity lower than the horizontal (kh) conductivity, reflecting the episodic nature of the tailings deposition;
- reducing hydraulic conductivity with depth, reflecting increased compaction with increased normal stress as more tailings are deposited with time; and
- lower hydraulic conductivity near the centre of the deposit, reflecting segregation of coarser particles near the points of slurry discharge at the TSF walls.

From the seepage modelling of a 50% increase in TSF height, it was concluded that, provided the groundwater management activities are continued according the SGMP, raising the Fimiston TSFs to a height of up to 60 m, should cause no adverse effects.

Further information on historic and current groundwater levels around the Fimiston TSFs is also provided in Appendix D5. These data indicate that groundwater levels around the Fimiston I and II TSFs have reduced as a result of the groundwater monitoring and seepage recovery programme and are approaching historic 'natural' groundwater levels. This demonstrates that the SGMP has been effective in reducing and maintaining groundwater levels in the vicinity of the Fimiston TSFs. Continued monitoring of the groundwater levels through the SGMP as part of the Fimiston Gold Mine Operations Extension will identify any changes in seepage flows beneath the TSFs. Additional seepage management infrastructure will be installed in accordance with the SGMP if required.

Kaltails TSF

The Kaltails TSF has not been operated since 1999, although its seepage recovery system remains operational (at a reduced recovery rate). A considerable amount of hydrogeological and related data was collected over the ten years of operation of the Kaltails project. Since closure, continued groundwater abstraction has been undertaken to reduce groundwater levels to agreed pre-Kaltails levels. This has been supported by ongoing groundwater monitoring, modelling and geotechnical studies.

KCGM commissioned ERM to undertake an historical review of the Kaltails TSF and assess the implications of raising the height of the TSF on groundwater levels. The potential impact to the vegetation on the Lakeside Timber Reserve to the east-southeast of the TSF was also considered (Appendix D4).

The proposed use of the existing Kaltails TSF is to raise the embankment height by a maximum of 1.4 m pa over the period 2008 to 2017 to increase capacity by a maximum of about 65 Mt. This equates to an average annual disposal of 5.9 Mt. This disposal would be undertaken concurrently with disposal to Fimiston I and II TSFs and at Kaltails would be non-continuous, occupying a period of five and a half months each year. This compares with the average continuous disposal of approximately 7 Mtpa during the previous Kaltails operation whereby the annual continuous raising of the TSF averaged about 2.3 mpa.

The groundwater levels on the southern-south western margins of the TSF were historically near surface, as shallow as 1.4 m below ground level and have been restored to historical pre-Kaltails level. Review of historical data including air photographs indicates that groundwater levels in this area of shallow water table rose close to the surface and impacted vegetation, particularly on the south western margin of the TSF during operation of the Kaltails facility. An area of vegetation within the Lakeside Timber Reserve was affected and subsequently excised from the reserve.

Should the Kaltails TSF be recommissioned to hold tailings from the Fimiston Gold Mine Operations Extension, KCGM considers that seepage from the Kaltails facility can be managed effectively through engineering design and application of the SGMP as outlined below.

Management

Tailings management at KCGM for the existing Fimiston I and Fimiston II TSFs has recently been defined through the Fimiston Operations SGMP, provided as Appendix D1. The SGMP has been developed in consultation with regulatory authorities and the community. Implementation of this plan has recently been included as a licence condition in the operating licence for the Fimiston Mill and Tailings Disposal.

The primary objective of the SGMP is to operate, monitor and develop the groundwater abstraction bores (Eastern Borefield) so that in the long term, groundwater levels are reduced to defined historic levels. KCGM is currently undertaking investigations to determine what these historical groundwater levels were. By working towards achieving historic groundwater levels during operation, KCGM may reduce the need to undertake long term groundwater abstraction after decommissioning of the TSFs.

The SGMP establishes performance targets for the long-term management of TSF seepage including the monitoring of vegetation adjacent to the Fimiston facilities. The performance targets identify either standards to be maintained or tasks to be undertaken and the timeframes over which these will occur. Standards cover items such as licence conditions and specifications for the construction of new monitoring or production facilities. For example, KCGM has established a set of criteria to determine the need for additional groundwater abstraction to reduce groundwater levels, as outlined in Table 14.

Table 14: Criteria for Groundwater Level Management

GROUNDWATER LEVEL AND TREND	ACTION
Groundwater level <4 m BGS* with a shallowing or stable trend	Increase pumping capacity within two quarters
Groundwater level >4 m BGS and <6 m BGS with a shallowing trend	Increase pumping capacity within three quarters
Groundwater level >6 m BGS with a shallowing trend	Extrapolate trend, and increase pumping capacity in sufficient time to maintain groundwater level below 6 m BGS

*BGS = Below Ground Surface

The SGMP consists of a number of components for management or action by KCGM, these are:

- estimate historic groundwater levels;
- minimise the normal operating supernatant pool area on the TSFs;
- maximise the performance of the Eastern Borefield;
- construct additional groundwater monitoring bores as required;
- increase the frequency of monitoring groundwater levels;
- increase the frequency and scope of monitoring groundwater quality; and
- continue vegetation monitoring.

A review of KCGM's performance in terms of the SGMP will be undertaken annually in conjunction with the DEC. Modifications to the targets and requirements under this SGMP will be implemented as required.

Should the option to use the Kaltails TSF be selected, the facility will be recommissioned in a manner which would ensure seepage impacts from the facility are minimised. This would include minimising the area of the decant pond and constructing seepage interception trenches in the near surface ferricrete aquifer as well as groundwater abstraction bores in the deeper semi-confined aquifer. This would be supported by a comprehensive programme of groundwater monitoring, modelling and review and extending the SGMP southwards from Fimiston to incorporate the activities at the Kaltails TSF and surrounds.

DEC (CALM) will be consulted during revision of the SGMP for the Kaltails TSF in relation to monitoring and management of groundwater to ensure protection of the Lakeside Timber Reserve.

Predicted Outcome

Groundwater will be managed in accordance with the SGMP, so that there will be no adverse impacts on environmental values in the area of the TSFs.

Management Action 1

KCGM will manage the Fimiston TSFs and Kaltails TSF (if used) in accordance with the Seepage and Groundwater Management Plan.

10.6 ENVIRONMENTAL NOISE

The EPA's objective with regards to noise is:

- to protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.

Applicable Standards and Guidelines are:

- *Environmental Protection (Noise) Regulations 1997*; and
- EPA Guidance Statement No. 55, Implementing Best Practice in Proposals Submitted to the Environmental Impact Assessment Process (EPA, 2003).

Issues

10.6.1 Golden Pike Cutback

Noise emissions will be generated during mining of the Golden Pike Cutback and the works associated with clearing and waste rock dumping in proposed northern areas. Specifically, noise will be generated by the loading and haulage of ore and waste rock, operating mobile equipment such as drills, excavators and haul trucks. These activities have the potential to impact on the residences in close proximity to the KCGM operation. Potential impacts will be most significant during the initial stages of the Golden Pike Cutback where mining is nearer the ground surface but will be buffered by the 20 m high Environmental Noise Bund between the mining operation and the community.

Noise Modelling
A noise assessment by Herring Storer Acoustics (2005) (Appendix E1) used modelling to predict noise levels at receiver locations in Kalgoorlie-Boulder from mining of the Golden Pike Cutback with a 20 m high noise bund between mining operations and residential areas.

A comparison between noise modelling results and actual monitoring data was possible at two locations, the Boulder Primary School (BPS) and Kalgoorlie Technical School (KTS) as these are KCGM's permanent noise monitoring sites established in 1993. An additional noise logger was placed on York Street between Lane and Hamilton Streets in order to monitor existing noise levels in close proximity to the proposed Golden Pike Cutback.

The resultant predicted noise levels for Golden Pike operations at ground level on the commencement of mining with the Environmental Noise Bund in place and noise levels when mining operations are 20 m below the existing ground level are shown in Table 15 and illustrated by contours presented on Figure 19 and Figure 20.

Table 15: Modelled Noise Levels for Golden Pike Cutback

NOISE LOGGER SITE	CURRENT MEASURED NOISE LEVELS[1]		PREDICTED (MODELLED) NOISE LEVELS GOLDEN PIKE CUTBACK dB(A)[2]		ASSIGNED NOISE LEVELS[3]	
	DAY	NIGHT	EXISTING GROUND LEVEL	20 m BELOW EXISTING GROUND LEVEL	DAY 0700-1900 HRS	NIGHT 2200-0700 HRS
KTS logger site	66	54	37	34	48	38
BPS logger site	62	54	42	37	48	38
Cnr York & Lane Streets	54	52	42	42	51	41

Notes:

1. Current measured noise levels include both mining and non-mining (i.e. traffic) related activities. These are the average L_{10} levels recorded at the KTS and BPS sites from January to December 2005, and the average L_{10} levels recorded from 6-14 April 2005 at the York Street location.

2. Predicted noise levels are from mining activities only and do not account for non-mining (i.e. traffic) influences.

3. Assigned Noise Levels (L_{A10}) are from Table 1 of the *Environmental Protection (Noise) Regulations 1997*.

Noise levels on the surface with a 20 m high Environmental Noise Bund in place were modelled to be between 37 - 42 dB(A) at the three noise logger sites as noted in Table 15 above. Six months after commencement of mining when mining is expected to be 20 m below the ground surface, the levels at the same logger locations are predicted to reduce to a range of 34 - 42 dB(A). The reduction is a result of the additional barrier of the pit itself also assisting to contain noise emitted by mining equipment and associated activities.

The modelled noise level results show that mining of the Golden Pike Cutback both at the ground surface and 20 m below the ground surface comply with the day time Assigned Noise Levels in the *Environmental Protection (Noise) Regulations 1997*. However, the night time Assigned Noise Levels may be exceeded in some cases.

Modelled noise levels were less than or within the current noise levels measured by KCGM. Additional influences of noise measured at these sites are expected to occur from activities within Kalgoorlie-Boulder such as traffic noise and residential activities. Measurements taken in October 2000 between 2200 hours and 0700 hours with all KCGM mining operations stopped, gave results which, for that time period, mostly exceeded the corresponding Assigned Noise Level of each location.

Existing noise levels at Kalgoorlie from KCGM and other sources are already significantly above the night-time assigned noise levels, and noise from mining of the Golden Pike Cutback in isolation is unlikely to be measurable against background noise levels. The calculated noise levels from the Golden Pike Cutback are therefore such that they would not significantly influence the overall noise currently received at noise sensitive premises.

Noise received at noise sensitive premises from the Golden Pike Cutback would not be considered tonal, given the difference between the predicted noise level and the existing background noise levels. Therefore, the adjustment of +5dB(A) for tonality would not be applicable. However, noise received from the entire mining operation could be considered tonal and an adjustment of +5 dB(A) would be added to the overall noise level received at sensitive premises.

KCGM's Kalgoorlie operations commenced prior to the development of the *Environmental Protection (Noise) Regulations 1997* and have been operated in accordance with the Ministerial Conditions for the Project. The *Noise Level Standards for Kalgoorlie Consolidated Gold Mines Pty Ltd* (October 1991) part D1, state that noise levels from KCGM's operations shall not exceed the ambient noise level present at the time by more than 5 dBL_A. There are also other noise level standards for different times of the day and night, but these do not take into consideration ambient noise levels.

KCGM has an ongoing noise abatement programme in an effort to minimise noise emissions from its operations. Measures include:

- installation of environmental noise bunds;
- restriction of some surface activities to day shift only;
- quieter running engines and fans on haul trucks help to reduce tonal (nuisance) noise;
- fitting "smart alarms" to equipment (these alarms vary the noise level of the emitted signal according to the ambient noise level); and
- development and use of portable acoustic screening for exploration drilling near residential areas.

Ongoing noise monitoring and modelling is an important aspect of the noise management programme. On-site measurements are taken of trucks and other equipment to determine the noise performance of individual equipment.

KCGM continues to work on reducing the impact of noise from its operations. Investigations are ongoing and improvements made when identified.

KCGM recognises that the existing Fimiston Open Pit Operations may not comply with the most stringent night time assigned noise levels under the *Environmental Protection (Noise) Regulations 1997* at all times even with the above controls in place. It should be noted however that the ambient noise levels in Kalgoorlie-Boulder with no mining activity occurring are also above the night time assigned noise levels. KCGM is currently working with the Department of Environment Noise Branch to prepare an application to the Minister under Regulation 17, which allows a variation from the assigned noise levels for the mining operations as a whole.

10.6.2 Northern Waste Rock Dumps

Herring Storer Acoustics was also commissioned to undertake a noise level impact assessment of noise emissions from the proposed NWRDs (Appendix E1). Construction of the NWRDs will be undertaken in two stages. The first stage is construction of the outer wall to act as a noise bund, and the second stage will be construction of the remainder of the dump behind the outer wall.

To minimise the impact of constructing the outer wall of the dumps on the neighbouring noise sensitive premises, it is proposed that the outer wall be constructed only during the day period only (i.e. 0700 to 1900 hours Monday to Saturday, excluding Public Holidays). Even so, noise levels received at the selected noise sensitive premises during construction would exceed the criteria stipulated in the *Environmental Protection (Noise) Regulations 1997*. A summary of predicted noise levels compared to the appropriate assigned noise level are listed in Table 16.

Table 16. Predicted Noise Levels for Construction of the Outer Wall of the Northern Waste Rock Dumps

Receiver Location	Modelled Results		Assigned L_{A10}#
	NEWRD	NWWRD	
Baden Street, Williamstown	62	61	56
Hewitt Street, Boulder	60	65	53
Short Street, Boulder	58	64	51

Notes:
NEWRD = North East Waste Rock Dump
NWWRD = North West Waste Rock Dump
# Assigned Noise Levels for Day period 0700hrs to 1900hrs Monday to Saturday (excluding Public Holidays). Noise levels listed include a +5 dB(A) for tonal component.

From the acoustic modelling it is predicted that noise received at Short Street during construction of the outer wall of the NWRD would exceed the assigned day period noise level by up to 13 dB(A). Therefore, a Regulation 17 variation in the assigned noise level would be required for this activity.

However, KCGM will use similar noise control measures proposed for the recently approved Loop Line noise bund, and will implement KCGM's Noise Management Plan (Appendix E3) to minimise noise impacts during construction of the outer wall of the NWRD as far as practicable.

Once the outer wall has been constructed, noise received at all sensitive premises can be managed to be within the criteria stipulated in the *Environmental Protection (Noise) Regulations 1997* provided the operational restrictions as detailed Appendix E1 (Table A) are implemented. In summary these involve dumping only under certain wind conditions when the barrier height of the outer wall is less than 20 m, and split level dumping, restricting the amount of time dumping occurs on the upper level. Predicted noise levels for dumping with a 20 m high outer wall are shown in Table 17. The 3 locations chosen as receiver points, one in Williamstown, and two in Boulder, have been selected as they are nearest to the proposed waste rock dumps.

Table 17. Predicted Noise Levels for Dumping with 20m High Outer Wall

RECEIVER LOCATION	MODELLED RESULTS		ASSIGNED L_{A10}#
	NEWRD	NWWRD	
Baden Street, Williamstown	39 - 45	37 - 40	46
Hewitt Street, Boulder	36 - 39	40 - 41	43
Short Street, Boulder	34 - 38	40	41

Notes:
NEWRD = North East Waste Rock Dump
NWWRD = North West Waste Rock Dump
# Assigned Noise Levels for night period 2200hrs to 0700hrs Monday to Saturday and 2200hrs to 0900 hrs Sundays and Public Holidays. Noise levels listed do not include a +5 dB(A) for tonal component as tonality will not be evident with a 20 m high barrier.

Noise emissions from the dumping of waste rock at both the North East and North West Waste Rock Dumps will, with the proposed management practices, comply with the requirements of the *Environmental Protection (Noise) Regulations 1997*.

Herring Storer Acoustics also investigated the cumulative noise emissions from the existing operations, and the proposed Golden Pike Cutback and operation of the NWRD. The modelling indicates that some residential areas may experience a slight increase in cumulative noise. However, noise received from the dumping of waste rock at the NWRD in isolation would be significantly below the noise received from existing operations (Appendix E1).

Management

KCGM is in a unique situation that was recognised by the Minister for the Environment in 1992 where it was stated, *"mining and ore processing activities have occurred very close to these residential areas for almost one hundred years. Thus the residential and mineral processing land uses impact adversely on each other. This makes it impracticable and unreasonable for KCGM to achieve fully desirable noise levels at all residences as it is not feasible to move either the ore body or all the closer residences. Additionally, some locations in Kalgoorlie-Boulder currently have ambient noise levels, which exceed fully desirable levels in the absence of noise from the proponent's (KCGM's) mining and mineral processing activities".* The Minister issued a statement outlining KCGM's current Ministerial noise levels accordingly. The difficulty still remains to determine and quantify ambient noise levels and the contribution of sources of noise, other than those from KCGM.

KCGM has undertaken measures to ensure that noise emissions from their operations are as low as reasonably practicable such as the construction of an Environmental Noise Bund between the Fimiston Open Pit Operations and the residential community and the development and implementation of a Noise and Vibration Monitoring and Management Programme (Appendix E3).

The Environmental Noise Bund has been a key part of KCGM's noise management programme since it was first established in the early 1990's. The effectiveness of the original Environmental Noise Bund, especially for surface mining operations, was clearly demonstrated through modelling. Since its establishment there have been a number of modifications and extensions to the Environmental Noise Bund. Approval to realign the Environmental Noise Bund to the west of the proposed Golden Pike Cutback has been received, though the *Mining Act 1978* process and under Section 45C of the *Environmental Protection Act 1986*.

KCGM believes that the realigned Environmental Noise Bund together with KCGM's commitment to noise management through the *Revised Noise and Vibration Monitoring and Management Programme, June 2004* (Appendix E3) will be effective in minimising noise impacts on the local community. KCGM's management strategies under this Programme include:

- Ensure the quietest equipment reasonable available is used;
- Endeavour to fit mobile equipment with "smart alarms". Smart alarms adjust the noise level of the alarm depending on the background noise level i.e. the quieter the environment, the lower the noise emission from the alarm;
- Restrict the use of equipment for certain construction activities (e.g. construction of the outer wall of the NWRD) to the hours of 0700 – 1900 hrs Monday to Saturday and not on Sunday or public holidays;

- Ensure that relevant contractors and staff undertake a site-specific induction to raise awareness including the importance of noise control and of less noisy operating techniques;
- Construct waste dumps behind a 20 m high outer wall or restrict operating conditions (see below);
- Ensure noise monitoring is undertaken as and when required;
- Ongoing consultation with stakeholders to determine the success of the noise management practices; and
- Where required, KCGM will undertake modelling to determine predicted noise levels from operational changes.

As construction of the outer wall of the NWRD would not be considered "construction" under the Regulations, work would be restricted to 0700 – 2200 hrs. Once a 20 m high barrier had been constructed dumping of waste rock could continue behind the outer lift unrestricted 24 hours per day. If this barrier height were reduced to less than 20 m, then dumping would be restricted between 2200 – 0700 hrs to southerly, westerly and north-westerly winds. Dumping of the final lift behind the barrier would also be restricted to 0700 – 2200 hrs under westerly winds only. This is explained in further detail in Appendix E1 (see Table A).

Alternatively split level dumping may be undertaken restricting dumping such that the number of trucks dumping on the upper bench is limited to less than 10% of the time and a minimum noise barrier height of 10 m and 20 m is retained, relative to the actual ground for the upper and lower benches respectively.

As part of KCGM's continuous noise monitoring for the operations, a tape recorder tripping mechanism is used to establish the contribution of mining noise. Between 0700 and 1900 hrs, an event is recorded when the noise exceeds a set level for more than two minutes. A maximum of 49 events can be recorded on any night between 1900 and 0700 hrs. Tape recordings are retrieved and the dominant noise identified, to determine the source of the noise level.

With around 91 days each quarter, a maximum of 4,460 noise events could be recorded at each site (or around 17,840 events a year). During 2005, a total of 236 noise triggers were recorded at two sites and of these 58, were attributable to mining. Other triggers included road traffic, rain, wind and dogs.

KCGM publishes a quarterly noise monitoring report in the Kalgoorlie Miner which provides the noise monitoring results and encourages people to contact the Public Inquiry Line (Ph. 9022 1100) (operates 24 hours) if they have any queries or concerns regarding noise from the operation. Any public inquiries are investigated and the source identified and action taken where possible.

KCGM believes the current noise management practices defined in the noise management and monitoring programme are managing noise emissions to acceptable levels. However KCGM continues to work on reducing the impact of noise from its operations. Investigations are ongoing and improvements made when identified.

Predicted Outcome

Noise can be managed in accordance with the revised Noise and Vibration Monitoring and Management Programme (Appendix E3) to meet the EPA's objective of protecting the amenity of nearby residents. KCGM will pursue a Regulation 17 variation for its existing operations and construction of the outer wall of the NWRD to ensure compliance with the *Environmental Protection (Noise) Regulations 1997.*

Management Action 2

KCGM will revise and implement the Noise and Vibration Monitoring and Management Programme for the Fimiston Operations Extension Project.

Management Action 3

KCGM will submit an application for a Regulation 17 exemption for noise in accordance with the Environmental Protection (Noise) Regulations 1997.

10.7 BLASTING NOISE AND VIBRATION

The EPA's objectives in relation to blasting noise and vibration are:

- to protect the amenity of the nearby residents from impacts resulting from blasting activities associated with the proposal by ensuring noise and vibration levels meet statutory requirements and acceptable standards.

Applicable Guidelines and Standards are:

- *Environmental Protection (Noise) Regulations 1997;*
- Australian Standard AS2187.2-1993: Explosives - Storage, Transport and Use - Use of Explosives.

Issues

Blasting noise (or air blast overpressure) and ground vibration will be generated during the operation of the Project as a result of blasting activities. When a blast is fired, the explosive energy is used to break the rock. The more energy used to break the rock the more efficient the blast. However, even in a very efficient blast, some energy escapes and is transmitted acoustically as air vibration waves and seismically as ground vibration waves. Air and ground vibration waves also reduce (or attenuate) outwards from the blast and eventually become too small to be felt by people.

In society there is a wide variation in vibration tolerance, depending on social and cultural factors, psychological attitudes and an expected interference with privacy and an increase in the awareness of rights of the individual. Some people complain regarding vibration at levels slightly above perception levels, i.e. as soon as they feel it. Others become accustomed to and tolerate relatively high levels of vibration, e.g. residents in close proximity to railway lines and freeways. Some of the reactions to vibration include a 'fright' factor or being startled by a sudden vibration event (Terrock Consulting Engineers, 2006; Appendix E2).

Standards for Airblast and Ground Vibration

The *Environmental Protection (Noise) Regulations 1997* state that:

> *(3) No airblast level resulting from blasting on any premises or public place, when received at any other premises, may exceed:*
>
> *(a) 125 dB L Linear peak between 0700 hours and 1800 hours on Monday to Saturday inclusive; or*
> *(b) 120 dB L Linear peak between 0700 hours and 1800 hours on a Sunday or public holiday.*
>
> *(4) Notwithstanding subregulation (3), airblast levels for 9 in any 10 consecutive blasts (regardless of the interval between each blast), when received at any other premises, must not exceed:*
>
> *(a) 120 dB L Linear peak between 0700 hours and 1800 hours on Monday to Saturday inclusive; or*
> *(b) 115 dB L Linear peak between 0700 hours and 1800 hours on a Sunday or public holiday.*

No airblast level resulting from blasting on any premises or public place, when received at any other premises, may exceed:

(a) 90 dB L Linear peak outside the periods between 0700 hours and 1800 hours on any day except where that blasting is carried out in accordance with regulation 8.28(4) of the Mines Safety and Inspection Regulations 1995; or
(b) the levels specified in subregulations (3) and (4) outside the periods between 0700 hours and 1800 hours, as appropriate for the time when it was intended that the blast be fired, if the exception in paragraph (a) applies.

Australian Standard AS2187.2-1993: *Explosives - Storage, Transport and Use - Use of Explosives* recommends the following standards for air blast and ground vibration respectively:

- maximum air vibration level of 133 dBL to prevent structural damage and recommended peak air vibration level of 120 dBL;
- maximum peak particle velocity of 10 mm/s, which takes into consideration both human discomfort and structural integrity.

British Standard 7385 - 2:1993 '*Evaluation and measurement for vibration in buildings: Guide to damage levels from ground-borne vibration'* recommends higher ground vibration levels on the basis of protection of structural integrity alone. Whilst the impacts of blasting on important buildings such as heritage listed buildings may require special consideration on a case-by-case basis, generally the British Standard does not recommend reduction in guidance values unless these buildings are structurally unsound. It must be noted however, that damage can also occur to buildings for many reasons unrelated to blasting including:

- temperature expansion and contracting cycles;
- shrinking of concrete and concrete products during ageing;
- expansion and contraction of reactive clay soils with moisture content;
- shrinking of plaster sheet and filling products with age;
- poor building practice; and
- shrinking of timber in the drying process.

A number of standards have attempted to address the issue of whole body response to vibration in buildings (American National Standards Institution S3.18-1979) and annoyance of vibration from blasting (Australia and New Zealand Environment Conservation Council guidelines *Technical Basis for Guidelines to Minimise Annoyance due to Blasting and Ground Vibration*).

The standards and limits applied by the regulatory authorities at the Fimiston Open Pit take into consideration both human response criteria and structural damage limit criteria. Buildings exposed to the levels of vibration permitted by the operating condition limits will not be damaged by the vibration from blasting.

The current airblast and vibration standards and limits specified in the KCGM *Revised Noise and Vibration Monitoring and Management Programme* are:

- Ground vibration from blasting will not exceed 10 mm/s at houses. No more than 1 in 10 consecutive blasts will exceed 5 mm/s at houses.
- Between 07:00 and 18:00 hours Monday to Saturday airblast overpressure from blasting will not exceed 125 dBL (linear peak) at houses and no more than 1 in 10 consecutive blasts will exceed 120 dBL (linear peak) at houses.
- Between 07:00 and 18:00 hours on a Sunday or public holiday airblast overpressure from blasting will not exceed 120 dBL (linear peak) at houses and no more than 1 in 10 consecutive blasts will exceed 115 dBL (linear peak) at houses.

These standards and limits will be applied to the Fimiston Operations Extension Project.

Blasting During Mining of the Golden Pike Cutback

Terrock Consulting Engineers was commissioned by KCGM to investigate the potential environmental effects of blasting during the Golden Pike Cutback. This study is presented as Appendix E2.

KCGM is required to measure airblast and ground vibration from current blasting operations. The recorded measurements are reviewed after each blast and compared to regulatory vibration limits. Additional vibration performance evaluation may also be conducted, such as stemming performance by inspection of wave-traces. Other blasting factors, such as fragmentation and loading efficiency, are evaluated as part of effective mine management.

Detailed analyses of the results of blast monitoring from six routine monitoring stations were conducted for over 140 Chaffers West area blasts from 6 June 2003 to 18 March 2004. The blasts were located from the –70 mRL bench to the –120 mRL bench. The levels recorded at the three monitors closest to the Boulder township (Delta, Echo, and Foxtrot) were analysed in detail. From these analyses, models were developed to permit prediction of blasting impacts for the Golden Pike Cutback.

The ground vibration assessment has shown that with worst case assumptions, the maximum ground vibration levels resulting at privately owned houses from blasting at the pit perimeter will not exceed 5 mm/s. The average levels resulting at privately owned houses will not exceed 2 mm/s. Maximum ground vibration levels resulting at the closest industrial buildings will not exceed 10 mm/s. The average levels resulting at the closest industrial buildings will be around 2 mm/s. These predicted ground vibration levels from blasting of the Golden Pike Cutback comply with the current vibration standards and limits specified in the KCGM *Revised Noise and Vibration Monitoring and Management Programme*.

The airblast assessment shows that for blasts at the pit perimeter, airblast levels at the closest privately owned houses will generally not exceed 115 dBL, with less than 1 in 10 blasts resulting in airblast levels in the range 115 to 120 dBL. Airblast levels resulting from blasting at the pit perimeter at nearby industrial premises will generally be in the range 115 to 120 dBL, with levels at the closest industrial buildings reaching the range 120 to 125 dBL on occasions. Blasting of the Golden Pike Cutback is expected to comply with the airblast limits specified in the KCGM *Revised Noise and Vibration Monitoring and Management Programme*. The presence of the Environmental Noise Bund will also further reduce the predicted airblast impacts.

Airblast and ground vibration impacts will be less for blasts located at greater distances and lower depths from the pit perimeter of the Golden Pike Cutback. The accuracy of the models and the assumptions made in this investigation will be assessed by the continuation of the blast vibration monitoring programme, with continual review of the results and modification of the blasting specifications (and loading controls) as required.

Management

The investigation into airblast and ground vibration levels resulting from blasting in the Golden Pike Cutback has shown that the maximum levels will not exceed the limits specified in the *Revised Noise and Vibration Monitoring and Management Programme*, and that average levels will generally be well below these limits. Since these limits take into consideration human response criteria, they are considered conservative for the protection of structural integrity.

In accordance with KCGM's existing Ministerial requirements open pit blasting operations are carried out so that:

- the air-blast over pressure level generated by any blast, does not exceed 125 dB linear peak; and
- not more than one in any ten consecutive blasts results in an air-blast over pressure level greater than 120 dB linear peak when measured at the approved monitoring site (Site F).

Routine blast monitoring was established in 1993 for blasting activities within the Fimiston Open Pit and incorporated in the KCGM's *Revised Noise and Vibration Monitoring and Management Programme*. Through implementation of this programme, KCGM commits to undertake all reasonable, practicable and safe measures to minimise noise and vibration emissions from its blasting operations. This programme will be revised and implemented for the Fimiston Gold Mine Operations Extension. A quarterly noise and blast monitoring report is submitted to the DEC in accordance with statutory requirements. KCGM will continue this reporting during implementation of the Fimiston Gold Mine Operations Extension.

To minimise adverse impacts on the surrounding area it will be necessary to control blast noise and vibration during blasting of the Golden Pike Cutback by adequate blast design, execution and monitoring. KCGM will ensure quality assurance procedures and practices are implemented for blasting of the Golden Pike cutback to control flyrock, overpressure and vibration.

Predicted Outcome

Blasting operations will be managed so that maximum airblast overpressure and ground vibration comply with the *Noise and Vibration Monitoring and Management Programme* which is based on Australian Standard AS 2187.2/1993, to ensure the EPA's objectives are met.

Management Action 4

KCGM will revise and implement the existing Noise and Vibration Monitoring and Management Programme for the Fimiston Operations Extension Project.

10.8 AIR QUALITY

The EPA's objective in relation to air quality is:

- to ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

Applicable Standards and Guidelines are:

- EPA Guidance Statement No. 55 Implementing Best Practice in proposals submitted to the Environmental Impact Assessment Process (EPA, 2003); and
- National Environmental Protection Measure (NEPM) Guidelines for Ambient Air Quality.

10.8.1 Mercury Emissions

Issues

At Kalgoorlie, mercury occurs naturally in the mineral coloradoite (HgTe). This mineral is one of 17 telluride minerals identified within the Kalgoorlie Lodes and is considered to be the most common of the telluride minerals within the deposit (see Appendix F1).

Studies of the distribution of telluride mineralisation in the Kalgoorlie lodes are considered to be too limited to make definitive observations however they do provide a sound basis for understanding telluride distribution. Its presence has been noted over a wide vertical range - having been located in mines from the 200 ft (69 m) level (just below the level of oxidation) to depths as great as 2,500 ft (865 m). It has also been recorded in drilling to 1,380 m.

Approximately 70% of the historic high grade telluride zones are above the 200 m depth although they also occur down to 1,000 m. These high grade zones are found in all units of the Golden Mile Dolerite as well as in the Paringa Basalt and the Black Flag Beds. Work by Shackleton *et al* (2002) strongly suggests that there is no lateral or vertical variation in the distribution of any tellurides. There also appears to be a relatively poor correlation between mercury and gold which is expected given the variety in gold bearing minerals with only part of the gold related to telluride.

Analysis of mercury concentrations from underground and pit wall samples undertaken by KCGM indicates that low concentrations of mercury exist in the Western Lodes of the Fimiston Open Pit, (those west of the Golden Mile Fault) which includes the area of the Golden Pike Cutback (refer to Figure 13 in Appendix F1). Investigation by KCGM shows that there is no evidence to suggest that the concentration of mercury in the ore remaining in the Fimiston Open Pit will increase with the proposed Project (Appendix F1).

Mercury is soluble in the cyanide solution used to dissolve the gold from the ore. It, together with the gold, is captured onto the activated carbon. Following the stripping of the gold the used carbon is "regenerated" by passing it through a kiln. The regeneration process results in the release of the mercury from the carbon and this is emitted via a stack at the Fimiston Mill. Preliminary air dispersion modelling undertaken by ENVIRON in July 2005 indicated that ground level mercury concentrations from the Fimiston Operations are below World Health Organisation guideline level of 1 µg/m^3 (annual average) (Appendix F2).

Management

KCGM has undertaken extensive investigations regarding effective controls for reducing mercury emissions. Air quality controls were initially implemented including the precautionary operation of the carbon kilns during periods with winds of an easterly component.

Feasibility studies are being undertaken by various specialist consultants in Australia and North America, into a range of abatement and engineering controls to reduce emissions. A hypersaline wet scrubber system was installed in December 2005 in the duct circuit between the carbon kilns and the emission stack to capture mercury and enable it to be encapsulated within the tailings stream. This system was installed as a trial and test results are pending.

KCGM will continue to liaise with relevant stakeholders to ensure that mercury emissions are being effectively managed to the satisfaction of the regulatory authorities and the community.

10.8.2 Dust

Issues

KCGM commissioned ENVIRON Australia (ENVIRON) to assess the predicted ambient dust concentrations arising from the proposed extension to the existing Fimiston Gold Mine Operations. The findings of this study are presented in Appendix G1 and summarised below.

The Air Dispersion Model (TAPM) was used to predict the local meteorology at Kalgoorlie and produce an 'Ausplume' compatible meteorological input file. Ausplume was used to predict the ground level concentrations of particulate matter less than 10 microns (PM_{10}) and Total Suspended Particulates (TSP) arising from current operations and proposed extension of the Fimiston Open Pit. The assessment was based on synoptic meteorological data for the year 2004. Winds generated by TAPM are consistent with the annual summary statistics for the Metals Exploration (MEX) monitoring station and historical data provided by the DEC.

The model validation studies undertaken using the Beta Attenuation Monitor (BAM) monitoring data at Boulder Shire Yard (BSY) indicated the difference in the predicted versus observed concentrations at BSY was within 20%, indicating that the model predicted ground level concentrations were in the same range as that observed at the monitoring site.

Emission estimates utilised in the modelling reflect the additional controls employed by KCGM to ensure that dust emissions during construction and operation are below NEPM guidelines beyond the facility boundary. The emission estimates generated in this study were based on the model validation work undertaken to ensure that model predictions were consistent with observations. This has resulted in a reduction of the emission estimates by 60% compared to those detailed in the NPI report.

The modelling results indicate that the 24 hour average PM_{10} ground level concentrations are predicted to be below the NEPM standard at the nominated locations for both the current and proposed operations with the exception of the Hewitt St and Clancy St dust monitoring location. However, review of the 99th percentile 24 hour average concentrations at Clancy St indicate that the concentrations are below the NEPM guidelines. This is viewed as a more robust statistic because it removes the undesirable influence of unusual (stochastic) events, while still representing the highest concentrations. The modelling had indicated that there is a marginal decrease in the predicted ground level concentrations of PM_{10} due to the proposed extension at the Hewitt St dust monitoring location (Figure 21). However at other locations to the west of pit the emissions from the proposed extension will be marginally higher than current emissions.

The modelling study did not include assessment of $PM_{2.5}$ impacts. However to demonstrate there will be no $PM_{2.5}$ exceedences at sensitive locations, the maximum concentrations over the modelled year were extracted and the particle mass fraction of 0.293 applied (determined from Particulate Size Distribution Data, Table 8 of Appendix G1) to determine the contribution of $PM_{2.5}$ at sensitive locations. The maximum predicted ground level concentrations of $PM_{2.5}$ were below the nominated NEPM guideline values for the current and proposed scenarios at all nominated receptors with the exception of Hewitt St. This exceedence is similar to that for the PM_{10} modelling scenarios.

Similarly, the predicted 24 hour average TSP concentrations for both the current and proposed scenarios are at or below the nominated guideline values (Kwinana EPP) for all locations with the exception of Hewitt St (Figure 22). In general the model predicted marginally lower ground level concentrations for the proposed scenario compared to the current scenario due the reduction in the mining rates and the increased depth of the pit.

The proximity of the Hewitt St receptor and the prevailing winds are the primary factors influencing the predicted PM_{10} and TSP concentrations at this location. A review of the ambient TSP monitoring data collected at Hewitt St indicate that extrapolated 24 hour average concentrations[2] of TSP are below 100 µg/m^3 indicating that the model tends to over predict TSP concentrations at this location. However as both the maximum 24 hour TSP and PM_{10} modelling indicates values above nominated guidelines, further real-time monitoring will be undertaken at this site to obtain a better understanding of actual dust impacts and to facilitate improved management of activities that may result in dust generation.

Management

The objective of KCGM's dust management and monitoring program is to pro-actively manage site operations to ensure that dust levels do not exceed NEPM criteria for PM_{10} at the KCGM dust monitoring locations.

Dust generated from blasting of the Golden Pike Cutback, land clearing and waste rock dump construction will be managed under a Revised Dust Monitoring and Management Programme. Through the implementation of this programme, KCGM commits to undertake all reasonable, practicable and safe measures to minimise dust emissions from its operations.

Dust management for mining the Golden Pike Cutback, land clearing, the construction of waste rock dumps and general operations will incorporate the following practices:

1. Progressive rehabilitation to minimise exposed areas;
2. Monitoring of current and forecast wind conditions using daily forecasts and real time wind speed and direction information to determine the most appropriate conditions to undertake potentially dust-generating activities (e.g. blasting, construction activities);
3. Use of water trucks and water cannons in areas that could produce dust. Fresh water will be used on areas to be rehabilitated;
4. Use of additional dust control measures (i.e. a dust binding agent);
5. Visual inspections for dust formation on a regular basis;

[2] Hewitt St monitor only collects 8 hour concentrations so data were extrapolated to provide 24 hour average concentrations.

6. Suspending work as deemed necessary from inspections, public feedback or prevailing wind conditions;
7. All relevant contractors and staff involved will undertake a site-specific induction to raise awareness including the importance of dust control; and
8. Ongoing consultation with stakeholders to determine the success of the dust management practices.

The proposed Dust Monitoring and Management Programme will incorporate both a predictive and reactive control strategy to control dust emissions from KCGM Operations. KCGM currently employ a predictive and reactive system for blasting emissions and during any construction activities undertaken at KCGM.

Predictive Control Strategy

The predictive control strategy is used to determine if forecast or actual meteorological conditions are likely to disperse these dust emissions towards town (Kalgoorlie). The predictive control strategy utilises the BoM daily forecast and real time wind speed and direction wind data to inform KCGM whether additional controls are required during construction and ongoing operation activities such stopping work or additional watering of roads, stockpiles and exposed areas.

Reactive Control Strategy

The reactive control strategy is currently triggered via inspections or public feedback. If the dust levels are deemed to be potentially unacceptable then work may stop or additional control measures will be employed.

KCGM is currently considering the setting of trigger values based on both meteorological measurements as well as dust measurement at the nominated allocated dust monitors that form the dust monitoring network.

Limits and targets will be defined based on achieving PM_{10} levels below the NEPM of 50 $\mu g/m^3$ at the KCGM dust monitors to reduce potential impacts on the adjacent community. However it must be recognised that there is some difficulty in determining the exact source of dust due to the numerous contributing sources, therefore KCGM will focus on periods when the prevailing winds indicate that the potential dust is from the Open Pit operations.

This reactive strategy will be considered based on the results of the Proposed Monitoring Program, i.e. pursuant to the progressive replacement of the High Volume Samplers with real time monitors. Real-time data will be used (in conjunction with meteorology and operational information) to inform KCGM if a more advanced dust control strategy would be warranted.

In addition, KCGM undertake continuous improvement programs which will ensure that the revised Dust Management Plan will undergo continuous improvement based on the efficiency of the control strategy. For instance an opportunity to improve water truck efficiency was recently identified and implemented. The diameter of the water discharge pipe at the filling station was increased to reduce the time taken to fill the water trucks and therefore reduce their standby time. Continuous improvement initiatives will continue to be identified throughout the life of the KCGM operation.

Proposed Monitoring Program

KCGM owns and operates a network of high volume dust monitors. These are located in close proximity to the Fimiston Open Pit and are primarily used to and monitor dust from blasting. The monitors are operated from 9:00am to 6:00pm on days when blasting is undertaken (blasting is only carried out between 9:00am to 5:30pm). The results of the dust monitoring network are provided to the DEC as part of the KCGM Annual Environmental Report.

KCGM has recently installed two Beta Attenuation Monitors (BAM) that can collect real-time data to assess short-term impacts. As part of the reviewed Dust Monitoring and Management Plan KCGM will progressively replace and update the existing high volume dust monitors with real-time monitors such as the BAMs or early warning monitors such as the EBAMs. However the suitability of these monitors will need to be investigated first, prior to implementation.

Predicted Outcome

The Fimiston Gold Mine Operations Extension is not expected to result in any noticeable change in dust impacts from existing operations. KCGM will continue to implement the Revised Dust Monitoring and Management Programme to ensure environmental values and health, welfare and amenity of people and land uses are not adversely affected.

Management Action 5

KCGM will revise and implement the existing Dust Monitoring and Management Plan for the Fimiston Operations Extension Project

10.9 GREENHOUSE GASES

The EPA's objective in relation to greenhouse gases is:

- to minimise emissions to levels as low as practicable on an ongoing basis and consider offsets to further reduce cumulative emissions.

Applicable Standards and Guideline are:

- EPA Guidance Statement No.12, Minimising Greenhouse Gas Emissions (EPA 2002a); and
- EPA Guidance Statement No. 55 Implementing Best Practice in proposals submitted to the Environmental Impact Assessment Process (EPA, 2003).

Issues

The greenhouse effect is a natural phenomenon that warms the earth and enables it to support life. However, since the industrial revolution, the amount of greenhouse gases in the atmosphere has increased dramatically, resulting in increased global warming. The six greenhouse gases specifically covered by the Kyoto Protocol are carbon dioxide (CO_2), methane (CH_4), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF_6) and nitrous oxide (N_2O) (Commonwealth of Australia, 1998). To compare warming potential of the different gases, their impact is usually expressed in terms of CO_2 equivalents, where the potential of each to lead to heating in the atmosphere is expressed as a multiple of the heating potential of CO_2 (i.e. t CO_2e).

The main sources of greenhouse gases from KCGM's operations are:

- combustion of diesel fuel for the mining vehicles; and
- combustion of diesel and gas to meet the Project's power requirements.

In 2005, the total greenhouse gas emissions from existing KCGM operations were calculated to be 408,356 t of CO_2e. This comprised of the following:

• Electricity generation and consumption:	239,388 t	(59%)
• Diesel consumption:	160,503 t	(39%)
• LPG use:	4,911 t	(1.2%)
• Explosives use:	3,317 t	(0.8%)
• Petrol consumption:	237 t	(0.06%)

Changes to the current quantity of greenhouse gas emissions released annually as a result of the Project are expected to be negligible. As mining in the Fimiston Open Pit gets deeper, distances to haul ore and waste will increase. These haulage distances will marginally increase diesel consumption and therefore greenhouse gas emissions until approximately 2011. After this period, mining at depth will enable a greater proportion of ore to be targeted directly therefore reducing the requirement to haul large amounts of waste rock to the surface.

There will be no significant change to the current power requirements of the Fimiston Operation which is one of the main contributors of greenhouse gas emissions.

Estimation of greenhouse gas emissions presented in Table 18 for the remaining life of mine of the Fimiston Operations incorporated emissions from power consumption and automotive diesel consumption.

Table 18: Projected Annual CO_2 emissions

YEAR	GREENHOUSE GASES	
	TOTAL t CO_2-e	EMISSIONS INTENSITY kg CO_2-e/ t ore milled
2006	440,779	33.66
2007	440,779	33.53
2008	440,779	32.80
2009	440,779	32.73
2010	440,779	32.96
2011	418,009	31.17
2012	413,146	30.58
2013	403,084	30.34
2014	352,215	26.32
2015	289,836	21.51
2016	289,836	21.57
2017	26,846	28.41

The quantity of CO_2 emissions from the operation remains consistent until 2011. From 2010 to 2016 CO_2 emissions per tonne of ore milled steadily decrease as mining is able to more effectively target ore at depth and reduce the quantity of waste recovered and hauled from the open pit. The slight increase in emissions per tonne of ore milled in 2017 is attributed to a significant reduction in ore expected to be processed as the mining operations come to a close.

Management

Newmont Pty Ltd, one of the joint owners of the KCGM operation is a signatory to the "Global Greenhouse Challenge" and KCGM routinely monitors and reports greenhouse emissions to Newmont under this programme.

KCGM is committed to minimising greenhouse gas emissions as far as practicable as demonstrated by its commitment to Strategic Energy Management. KCGM's Strategic Energy Management programme aims to improve energy efficiency of the operation by identifying and implementing improvement opportunities in the areas of equipment and processes.

Improvements during 2004/2005 in the open pit aimed to improve the quality of fuel/lubricants and increase the speed that the haul trucks are able to travel up the ramps, without increasing fuel burn. This was undertaken to improve the efficiency of fuel consumption per tonne of ore hauled.

Quality standards for fuel and oil delivered to site were set in supply contracts to reduce the risk of poor oil and fuel being delivered to site, thereby reducing the potential for poor engine performance, emissions, faults and unscheduled downtime for maintenance. Fuel and oil tanks supplying the mining fleet were cleaned and fitted with filtration systems and breathers to prevent contamination.

In March 2005, 'kidney looping' of oil from all truck axle compartments during servicing commenced. This is where oil is circulated through a dialysis pump and filter assembly to extend the life of the oil. This enabled the oil drain interval to be extended from 2,000 hours to 10,000 hours thus reducing axle oil usage. This process is currently being introduced to other components on the fleet.

KCGM also improved ramp angles and therefore ramp speed of the haul trucks. Fuel coolers were fitted and fuel settings modified to improve overall fuel burn and haul cycle times, reducing total fuel consumption.

In addition to reduced greenhouse gas emissions further benefits achieved were:

- improved productivity per truck reducing the need to increase truck numbers;
- decrease in oil consumed;
- reduction in hydrocarbon waste;
- reduced transport risk; and an
- increase in the amount of waste oil recycled;

The Fimiston Operations Extension Project has been designed to minimise the land area and total amount of biomass cleared particularly by utilising existing TSFs for tailings storage rather than clearing vegetation for a new TSF.

Cleared vegetation for the Golden Pike Cutback and NWRDs will be stockpiled for use in rehabilitation, to provide mulch and a seed source to assist revegetation and will not be burnt. Clearing of the proposed waste rock dump areas will be undertaken as determined by the generation of waste rock. Progressive rehabilitation of existing waste rock dumps will be undertaken as mining progresses in line with KCGM's Rehabilitation Plan and will provide some offset to the generation of greenhouse gas emissions. The planning and design of new haul roads and dumping routes are undertaken in the most efficient manner, to minimise vehicle movements, and the use of natural resources.

KCGM will continue to look for ways to improve energy efficiency, reduce greenhouse gas emissions and investigate offset opportunities, as part of continuous improvement and strategic energy management.

In March 2006, KCGM advised its intent to participate in the Greenhouse Challenge Plus programme. KCGM will enter into a Cooperative Agreement to voluntarily undertake cost-effective measures that abate greenhouse gas emissions. The focus of achieving abatement will be on improvement in energy efficiency, waste management, sink enhancement and adopting appropriate production practices to minimise greenhouse gas emissions.

Predicted Outcome

Greenhouse Gas emissions from the Fimiston Operations Extension Project will be kept as low as practicable in accordance with the EPA's Objective.

10.10 WASTE MANAGEMENT

EPA's Objective with regards to waste management is:

- to ensure that liquid and solid wastes do not affect groundwater or surface water quality or soils.

Applicable Guidelines and Standards are:

- EPA Position Statement No. 8, Environmental Protection in Natural Resource Management (EPA 2004c).

10.10.1 Waste Rock Dumps

Issues

The NWRDs will cover approximately 115 ha of ground surface area and be constructed to a maximum height of 100 m. This maximum height is no greater than the waste rock dump heights currently approved. These maximum heights also comply with the airport height restrictions.

Backfilling the Fimiston Open Pit with waste rock is maximised as much as possible as it has the advantage of providing a short haul dumping location and minimises the final surface waste rock dump footprint. There are two areas within the final pit scheduled for in pit dumping. These northern and southern backfill dumps have a capacity of 184 Mt, equivalent to 34% of total waste dumping requirements.

Waste dumping in both the southern and northern backfill dumps is planned to be undertaken as soon as mining is completed in these areas. Backfilling essentially utilises peripheral pit areas where mining is completed early in the mine plan and where in pit dumping does not restrict access to mining the deeper central area of the pit. The central section of the pit will remain unfilled as this is the last area to be mined and may be used as a portal into underground mining operations should this be feasible in the future.

Management

KCGM will endeavour to minimise the overall footprint of the waste rock dumps by maximising the amount of waste backfilled into the Fimiston Open Pit and use of the existing dumps. Access to the underground operation through the Sam Pearce Decline at the northern end of the Fimiston Open Pit currently restricts the area available for in-pit waste storage. The potential for access to future underground mining from the southern end of the Fimiston Open Pit also restricts backfilling in this area at this stage.

Waste rock dumps will be built to industry standards that have been adopted into KCGM's *Standard Operating Procedure - Dump Management*. The waste rock dumps will be stable and non-eroding and constructed to comply with the standard height restrictions applicable to the Kalgoorlie airport.

Waste rock dumps will be rehabilitated in accordance with KCGM's Rehabilitation Plan outlined in Section 10.11. Annual Landscape Function Analysis (LFA) monitoring will be undertaken on rehabilitated waste rock dump areas.

10.10.2 Acid Rock Drainage

Issues

Acid drainage at mining operations occurs through the presence of sulphide minerals, notably pyrite (FeS_2). Oxygen and water must also be present for oxidation of these minerals and formation of acid drainage. Environmental issues are caused not only by the acid, but also from metals that are mobilised from the surrounding rock at low pH. The potential for oxidation of sulphide minerals is increased during mining as the minerals are exposed to the elements.

Acid drainage can be moderated or buffered by the presence of natural acid neutralising minerals in the mine waste. Carbonate alteration minerals such as ferroan dolomite and calcite are common in the Kalgoorlie District gold deposits.

Approximately 95% of waste rock from the Fimiston Open Pit is Golden Mile Dolerite which is not potentially acid generating. Geologists have identified a black shale formation known as the Black Flag Beds as the lithological unit at KCGM most likely to oxidise and potentially generate acid. The volume of waste rock within the remaining pit shell that can be classified as Black Flag Bed represents about 7% of the total waste rock within the 0.5g/t gold cut-off. Given that the Black Flag Bed material appears to have the greatest potential for acid generation, any impacts from acid drainage from waste rock mined for the remainder of the mine life are expected to be manageable (Appendix F3).

An acid drainage risk evaluation study undertaken concluded that the risk of acid drainage formation in the Fimiston waste rock dumps is in general low, although a slightly higher risk of localised acid drainage resulting from past management of waste rock, in particular the Black Flag Bed waste rock (Appendix F3). The anticipated quantities of Black Flag Bed waste rock in the remaining life of the mine are relatively low, but as a precautionary measure, these will be managed as if they are acid forming.

Management

KCGM undertakes total sulphur analysis on all material to be mined, whether ore or waste and potentially acid generating material is identified. Black Shale material is placed within the waste rock dump where it can be buffered from above and below by dolerite and basalt waste which has a neutralising effect on any acid that may be generated. KCGM has a policy of not dumping Black Flag Beds waste rock within 50 m of the final face of a waste rock dump.

Even though the risk of acid generation is considered low, KCGM will undertake a phased approach to the development of an acid drainage management strategy for the operations. Phase 1 is designed to gather more definitive information on the potential for acid generation to occur at KCGM and may identify if additional procedures are required to respond to potential issues before they occur. This involves undertaking static and kinetic test work on waste rock lithologies. Some long-term kinetic tests are currently underway with some Black Flag Bed material on the old Lakewood dump. Upon evaluation of this Phase, the need for additional test work will be determined which may include quantifying the risk of acid rock drainage and determining the management approaches.

10.10.3 Tailings Management

Issues

Ore processing techniques will not be altered as part of this Project. Tailings material is currently directed to the Fimiston I and Fimiston II TSFs that cover an area of 110 ha and 350 ha respectively. Annual independent geotechnical reviews undertaken of the Fimiston I and Fimiston II TSFs have not identified any significant geotechnical issues of concern. As discussed in Section 4.4, KCGM is considering two options for the disposal of tailings; either a further increase in the maximum heights of the Fimiston TSFs or to re-commission the Kaltails TSF to use in conjunction with the Fimiston TSFs. Preliminary modelling of the stability of the Fimiston I and Fimiston II TSFs and the Kaltails TSF has been carried out for maximum embankment heights of 50 m, 60 m and 45 m respectively. The modelling indicates the factors of safety for the raised TSFs meet the minimum factors of safety recommended by the Australian National Committee on Large Dams (ANCOLD) for both static and seismic conditions (Section 11.4.3).

Seepage from TSFs has the potential to raise the level of the groundwater and alter the groundwater quality within the area. Natural groundwater in the area is saline to hypersaline with salinities ranging from 20,000 mg/L to 200,000 mg/L and the DEC have recognised that the beneficial use of groundwater in the area is for mining purposes. A comprehensive network of groundwater monitoring and production bores monitor groundwater levels and quality on a regular basis.

From the seepage modelling discussed in Section 10.5, it was concluded that raising the Fimiston TSFs to a height of up to 60 m, should cause no adverse effects provided the groundwater management activities are continued according the SGMP.

Management

Tailings Storage Facility Management

Tailings management will be undertaken as per KCGM's current tailings deposition procedures and in compliance with the DEC Licence to Operate. Management strategies ensure that the active area of tailings discharge is rotated to maximise drying time and to maintain the supernatant water centred on the decant tower for collection and return to the plant. The procedures also include regular inspections and operational checks of the TSFs including the pipeline infrastructure between the plant and the facility. Geotechnical assessments of each facility are undertaken annually to ensure the stability of these facilities is monitored and maintained.

Management actions currently undertaken on the Fimiston I and II TSFs are outlined in Table 19. The Kaltails TSF will also be managed in accordance with this management programme should the option to use the Kaltails TSF proceed.

Table 19: Tailings Storage Facility Management

MONITORING FREQUENCY		
6-HOURLY	**DAILY**	**MONTHLY OR GREATER**
• pipeline integrity checks • embankment integrity • seepage from embankments • visual check of tailings level versus embankment • spigot discharge location and operation • flow into decant and fines entrainment • fauna mortality • evidence of dusting	• location of decant pond • condition of access ramps • tailings solids to TSF cells in tonnes • water to TSF cells in tonnes or cubic metres • water return to plant in tonnes or cubic metres	• piezometer pore pressures (monthly) • decant water analysis (monthly) • pond area, wall and beach freeboard (monthly) • operational review by qualified engineer (annually) • comprehensive freeboard monitoring survey (biannually) • silt removal from return water pond (as required) • photographic monitoring programme of vegetation (annually)

Groundwater Management

The TSFs will also be managed as per the KCGM SGMP referred to in Section 10.5 and provided as Appendix D1. The primary focus of the SGMP is groundwater level management as the major environmental value in the area around the TSFs is vegetation. Protection of vegetation requires the depth to groundwater to be maintained sufficiently deep so as not to impact on the soils or roots from which plants source water.

KCGM also undertakes groundwater and vegetation monitoring in accordance with the requirements of the DEC licence for operation of the Fimiston Mill and the Water and Rivers Commission (WRC) licence for operation of the Eastern Borefield. The 2005/2006 SGMP is re-evaluating the suitability of this existing monitoring programme by extending the monitoring requirements to include:

- an increased frequency of monitoring groundwater levels and water quality;
- the inclusion of additional water quality parameters; and
- a complete review of the vegetation monitoring programme.

Additional commitments by KCGM in the 2005/2006 SGMP include:

- investigations to establish historical groundwater levels;
- the installation of five semi-continuous groundwater level monitors;
- the construction of an additional 15 monitoring bores; and
- increasing groundwater recovery based on groundwater level criteria.

A review of KCGM's performance in terms of the SGMP will be undertaken annually in conjunction with the DEC. Modifications to the targets and requirements under this SGMP can be implemented following this review. Tailings management at Kaltails will also be managed under a revised version of this SGMP should the option to use the Kaltails TSF proceed.

Predicted Outcome

Waste will be managed in a way that will protect groundwater and surface water quality and soils.

10.11 REHABILITATION AND DECOMMISSIONING

The EPA's objective in regards to decommissioning is:

- to ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values.

Applicable Standards and Guideline are:

- Australian and New Zealand Environment and Conservation Council and Minerals Council of Australia (ANZMEC/ MCA), Strategic Framework for Mine Closure;
- EPA Position Statement No. 6, Towards Sustainability (EPA 2004a);
- EPA Guidance Statement Rehabilitation of Terrestrial Ecosystems, No. 6, June 2006 (EPA, 2006a); and
- DoE - Mine Void Water Resource Issues in Western Australia.

Issues

The Project extends the KCGM life of mine for an additional five years until closure of surface mining operations in 2017. Progressive rehabilitation of tailings storage facilities and waste rock dump areas is currently undertaken by KCGM in conjunction with the rehabilitation of historical mining areas located on KCGM's leases.

Through this Project, KCGM has defined the final footprint of the operation which has enabled closure planning to commence in conjunction with the regulators and the community. KCGM recognises the importance of closure planning and the need to develop plans well in advance of scheduled closure.

Management

KCGM has developed a Conceptual Mine Closure Strategy that outlines KCGM's commitment and approach to the closure of its operations. This closure strategy provides the basis from which to develop detailed closure plans in conjunction with the regulatory authorities and the community that will detail agreed commitments and targets for the closure of all aspects of its operations. The Conceptual Mine Closure Strategy is provided in Appendix B1.

Rehabilitation

Progressive rehabilitation is undertaken through the life of mine and to date has included tailings storage facilities, waste rock dumps and historically disturbed areas on KCGM's leases. KCGM is currently developing a Rehabilitation Management Plan that formalises KCGM's strategy of progressive rehabilitation on tailings storage facilities, waste rock dumps and other disturbed areas. The Plan also describes the process for achieving and monitoring rehabilitation success. The Rehabilitation Management Plan will incorporate the following aspects:

- Standards for the design and construction;
- Typical waste characterisation and any limitations or considerations this may present;
- Species of flora and vegetation typically used in rehabilitation programmes;
- Methods of seeding/planting and additional soil supplements utilised during revegetation programmes;
- Rehabilitation success monitoring programmes;
- Review of previously rehabilitated areas and remedial work required;
- Details of research programmes and evaluations that have taken place; and
- Objectives for the development of long-term research for the assessment of various rehabilitation methods at KCGM.

KCGM has also engaged an independent consultant to undertake a review of historical rehabilitation trials, research programmes and rehabilitated areas to evaluate the successes and failures of previous rehabilitation at KCGM. This information will provide valuable information for achieving rehabilitation success in the future.

Decommissioning

The proposed end land use for KCGM's tenements has not yet been decided as KCGM recognises the importance of community consultation in the decision-making process. However, it is expected that the majority of the land surrounding the Fimiston Open Pit will be rehabilitated with native flora to improve the visual amenity of the area and to provide a semi-natural habitat for native fauna and flora. The waste rock dumps and Environmental Noise Bund will provide a barrier to prevent unauthorised access (and act as abandonment bunding) to the Fimiston Open Pit and will form a hilly vegetated backdrop to the City of Kalgoorlie-Boulder.

It is envisaged that the TSFs will be capped with waste rock and rehabilitated with native vegetation to control any potential dust generation from erosion of the tailings surface and to re-establish native flora and fauna habitat. Decommissioning and rehabilitation at the Mt Percy TSF in 2001 was successful in reducing dust generated from the facility and vegetation growth is progressing.

Investigations will be undertaken to identify and evaluate potential uses for the final Fimiston Open Pit void. After mining and dewatering activities cease, the Pit is expected to partly fill with water to a level consistent with the natural surrounding groundwater table. A pit lake study is currently underway to determine the potential timing, depth and quality of the water. As part of this Project, KCGM has identified an opportunity to partially backfill an area of the pit with waste rock. At closure however, the option to backfill the Fimiston Open Pit is not economically feasible due to the depth and spatial extent of the pit.

It is planned for the public to have continued access to view the "Super Pit" from a permanently established Tourist Lookout located on the western edge of the Fimiston Open Pit. KCGM has also made provisions for the Historical Loopline Tourist Railway Society to construct part of the Loopline Railway atop a section of the proposed Environmental Noise Bund. This railway is expected to become a tourist legacy for the City of Kalgoorlie-Boulder.

KCGM considers it essential to involve the community in the closure planning of its operations. Structured consultation will be undertaken during the development of closure plans to determine the community's expectations and to give them the opportunity to provide input on the landforms and structures that remain. KCGM recognises that some infrastructure other than mining features may have potential heritage value and significance to the community. Stakeholder consultation will continue during the development of agreed closure criteria and throughout the stages of implementation and post-closure monitoring and reporting.

Predicted Outcome

Rehabilitation will minimise the impacts of land disturbance, resulting in safe, stable and functioning landforms.

Management Action 6

KCGM will implement a Rehabilitation Management Plan for the Fimiston Operations

Management Action 7

KCGM will implement the Conceptual Mine Closure Strategy for the Fimiston Operations

Figure 18
Conceptual Hydrogeological Model for Fimiston I TSF

Client: KCGM	ENVIRON		
Project: 30-0146	Drawn: KP	Date: Jan -06	

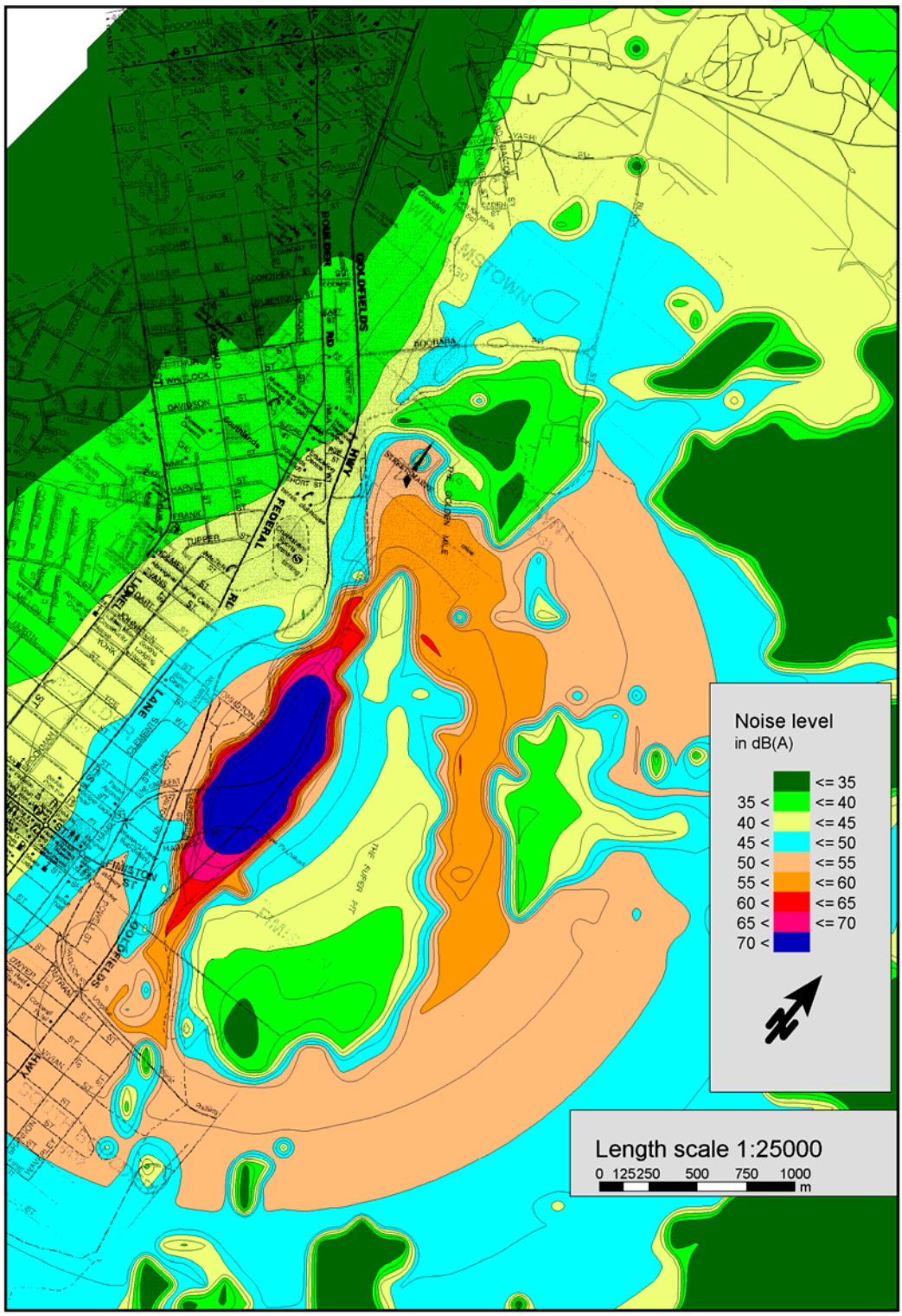


Figure 19

KCGM Golden Pike Cutback Noise Contours At Existing Ground Level with 20m High Noise Bund

Client: KCGM	ENVIRON	
Project: 30-0146	Drawing Ref: GP1012 Drawn : Herring Storer Acoustics	Date: 01 August 06

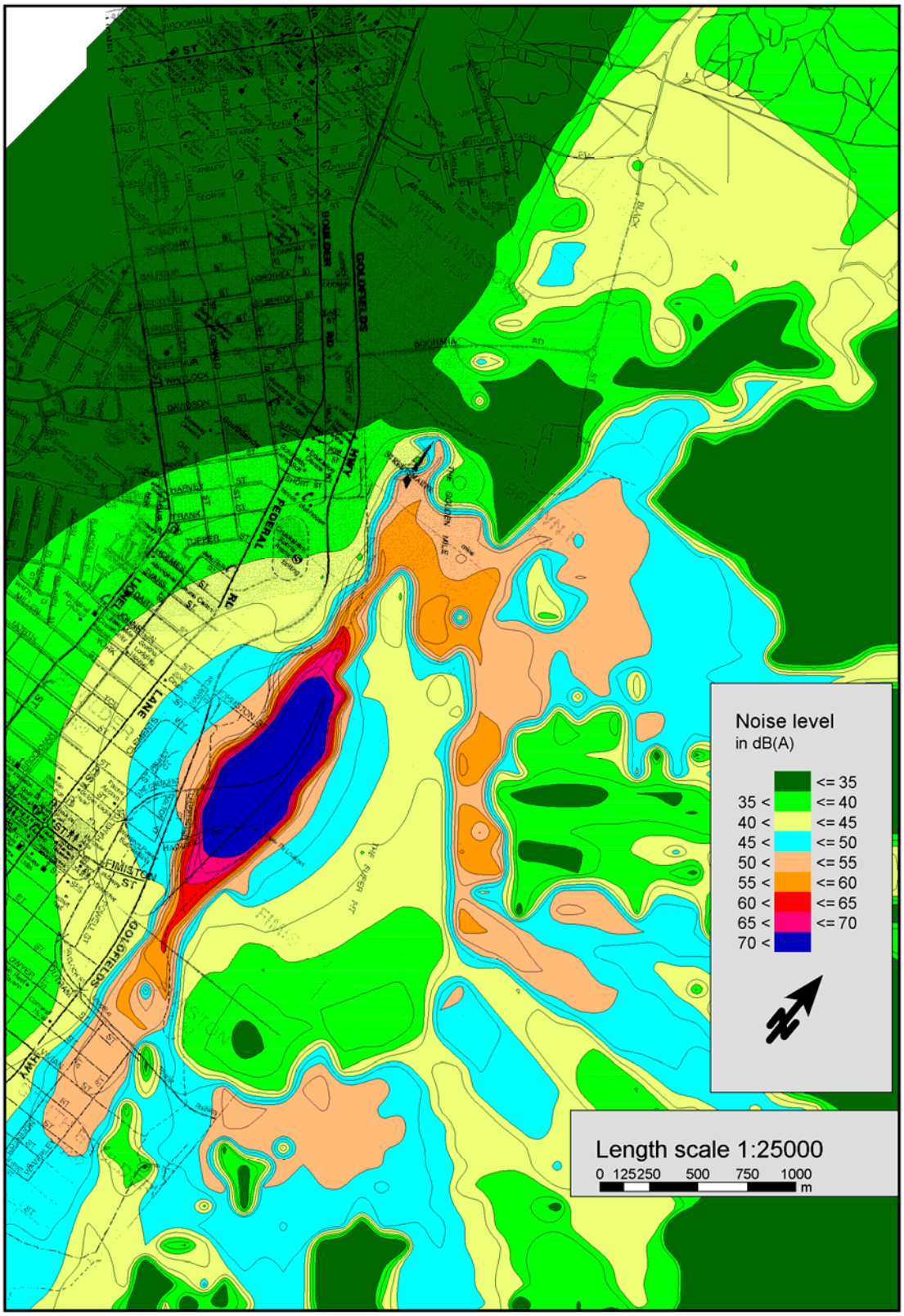
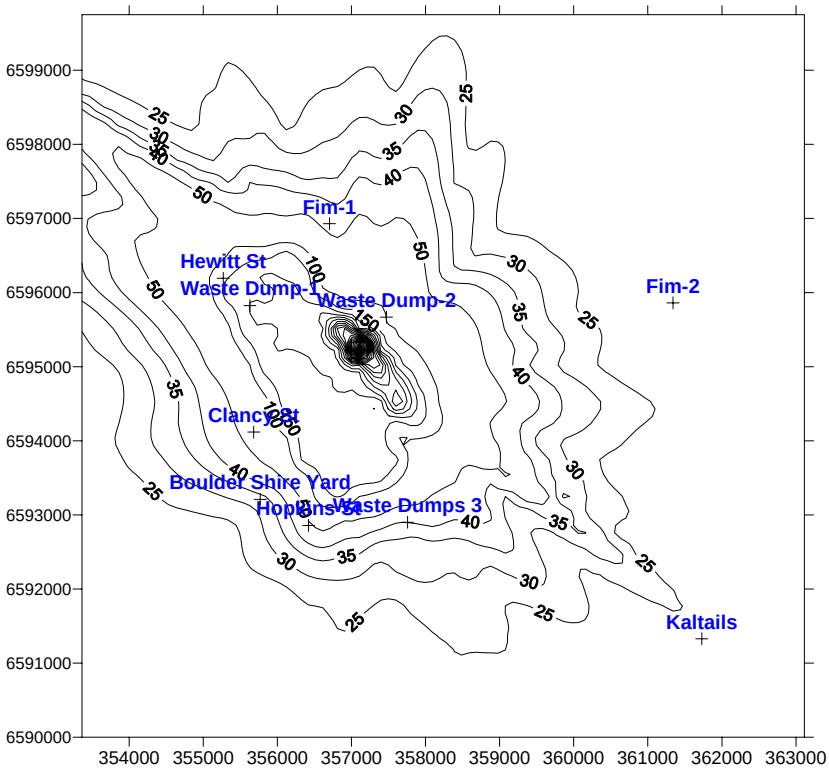


Figure 20

KCGM Golden Pike Cutback Noise Contours At 20m Below Existing Ground Level with 20m High Noise Bund

Client: KCGM	ENVIRON	
Project: 30-0146	Drawing Ref: GP21012 Drawn : Herring Storer Acoustics	Date: 01 August 06



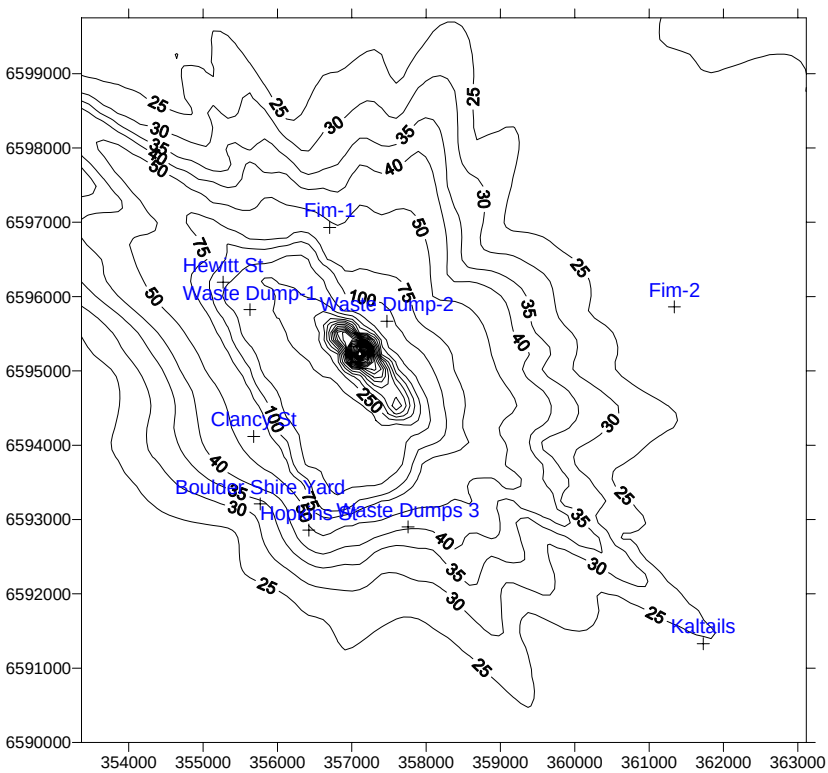


Figure 21

Maximum Predicted 24-hour average ground level concentrations for PM_{10}, existing operation (top), proposed extension (bottom) (µg/m³)

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: NS	Date: Jun 06

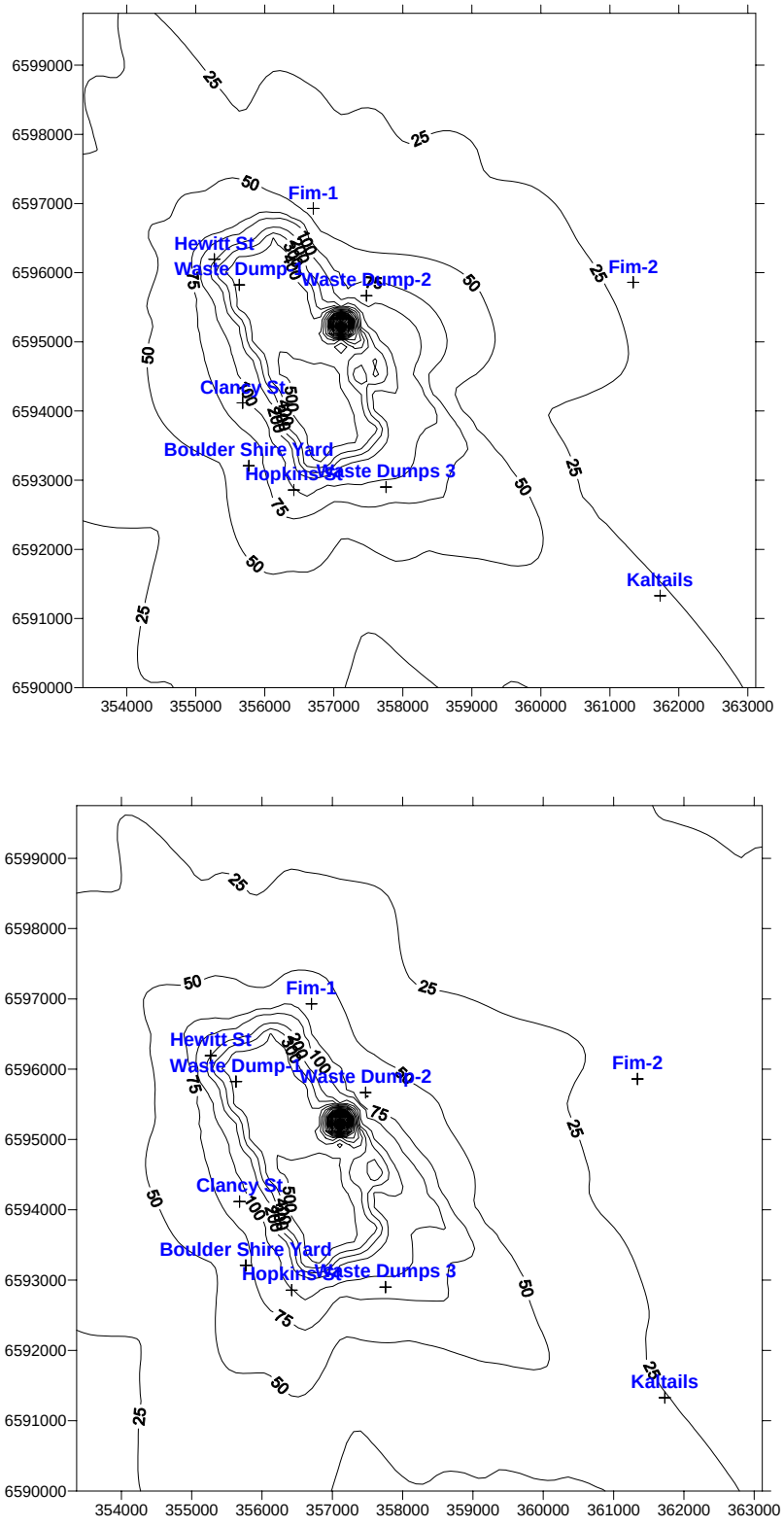


Figure 22

Maximum predicted 24-hr average ground level concentrations for TSP, existing operation (top), proposed extension (bottom) (µg/m³)

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: NS	Date: Jun 06

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11. SOCIAL IMPACTS AND MANAGEMENT

11.1 ABORIGINAL HERITAGE

The EPA's objective in regards to heritage is:

- to ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.

Applicable Guidelines and Standards are:

- EPA Position Statement No. 6, Towards Sustainability (EPA, 2004a); and
- EPA Guidance Statement No. 41, Assessment of Aboriginal Heritage (EPA, 2004d).

Issues

An ethnographic survey was undertaken in 1989 in conjunction with the Aboriginal Site Survey undertaken by O'Connor and Quartermaine (1989) for the original CER for the KCGM operation. Additional surveys have been conducted by O'Connor in 2000, 2001 and 2004. The survey areas covered by these studies encompass proposed Project areas.

Eight sites of ethnographic significance have been identified. Of these sites the Muruntjarta site is the closest to the Project area and is adjacent to the toe of the existing Croesus waste rock dump. This site will not be disturbed by the Project.

An Aboriginal survey conducted prior to the commencement of the Kaltails Project found no registered Aboriginal sites or evidence of Aboriginal activity. A review of literature and knowledge of the ethnographic conditions conducted indicated that the potential for sites in the Kaltails area is low particularly as there is no permanent fresh water at the site (AGC, 1988).

There are four Native Title Claims that incorporate KCGM and the Special Purpose Kaltails leases, three of which are currently in mediation. There are no Native Title issues associated with this Project because the KCGM's mining leases were held prior to Native Title and therefore Native Title rights are extinguished.

Management

In conjunction with local Aboriginal groups and the Department of Indigenous Affairs (DIA), KCGM is establishing a site wide management plan to ensure Aboriginal ethnographic and archaeological sites within the immediate vicinity of KCGM operations are protected and respected. The plan will include annual site inspections and audits.

KCGM will ensure that necessary approvals are obtained under the *Aboriginal Heritage Act* 1972 and that these sites are managed in accordance with this Act and to the standards set by the DIA.

Predicted Outcome

The Project will comply with the *Aboriginal Heritage Act* 1972 and will not have any adverse impacts on sites of Aboriginal heritage significance, thus meeting the EPA objectives.

Management Action 8

KCGM will consult with Aboriginal groups as required in respect to the management of ethnographic sites in the vicinity of the Project.

11.2 NON-INDIGENOUS HERITAGE

The EPA's objective in regards to heritage is:

- to ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.

Applicable Guidelines and Standards are:

- EPA Position Statement No. 6, Towards Sustainability (EPA, 2004a).

Issues

There are no non-indigenous heritage sites located within the Project Area. There are many non-indigenous sites in the City of Kalgoorlie-Boulder recognised for their heritage value, including the Kalgoorlie Post Office that is listed on the Commonwealth Heritage List under the *Environmental Protection and Biodiversity Conservation Act 1999*.

There are 122 sites listed on the Register of the National Heritage Estate and 45 sites registered on the Kalgoorlie-Boulder Municipal Inventory under the *Heritage of Western Australia Act 1990*.

Initial community feedback raised concerns regarding airblast and vibration from blasting causing damage to the structural integrity or cosmetic nature of buildings in the form of cracks. KCGM is currently required to ensure that maximum airblast and ground vibration levels from blasting not exceed the limits specified in the *Revised Noise and Vibration Monitoring and Management Programme*. These limits, based on Australian Standard AS2187.2-1993, take into consideration human response criteria as well as building integrity criteria, and are considered conservative for the protection against blasting impacts on buildings. The impacts and management of blasting and vibration on man-made structures is addressed in Section 10.8.

Management

KCGM will continue to monitor and address impacts from its operation through continued consultation with the local community. KCGM has established mechanisms to enable the community to raise any issues that may be of concern regarding KCGM operations. KCGM will endeavour to address any issues raised relating to non-indigenous heritage, in a timely manner.

Refer to Section 10.8 for an outline of management measures in relation to blasting and vibration.

Predicted Outcome

There will be no impact on sites of non-indigenous heritage from the Project to meet the EPA Objective.

11.3 SEISMICITY

Applicable Guidelines and Standards relating to seismicity are:

- Geotechnical Consideration in Open Pit Mines Guideline (DME, 1999); and
- Guidelines on the Safe Design and Operating Standards for Tailings Storage (DME, 1999a).

Issues

Mining

Seismicity is a form of vibration or movement of the ground. Natural seismic events (earthquakes) can occur down to depths of over 20 km and generally occur along pre-existing fault lines. They are caused by the compression of the ground by the earth's natural tectonic stress fields. The background level of natural earthquake activity in the Kalgoorlie area has been observed to be above average for Australia, as tectonic forces act on the Kalgoorlie fault complex. It is the existence of this fault complex that aided in the formation of the Golden Mile deposit. Mining induced seismic events are different from natural seismic events and the two are easily distinguished.

Mining induced seismic events generally occur very close to mine workings (typically within 200 m), are normally very small with little impact outside the mine and reduce in occurrence after mining ceases. They are associated with the redistribution of natural stresses around mine excavations, which at KCGM include the underground workings and active open pit.

There are few examples of pit slope failures in hard rock that can be attributed solely to the effects of seismicity. Most seismically induced failures occur in highly to extremely weathered materials, or modern sediments. Natural seismic events have very long wavelengths, much greater than the size of the pit wall. Such events therefore tend to have little impact on hard rock slopes such as those of the Golden Pike Cutback.

A geotechnical assessment undertaken by BFP consultants (July, 2005) (Appendix H1) examined geotechnical stability of the Golden Pike Cutback and the location of the Open Pit abandonment bund in view of the seismic activity experienced at KCGM. The results of a stress analysis during this assessment concluded that the anticipated seismic activity is not expected to have a detrimental effect on the pit wall stability.

There is no evidence to date suggesting that blasting within the Fimiston Open Pits has induced perceptible seismic events. From time to time blasting may cause collapse of the abandoned underground workings within the pit. These events can be detected with the microseismic recording system. KCGM has a very detailed set of procedures and work practices relating to mining through underground workings and these include managing such events.

Tailings Storage Facilities

Seismic events have the potential to impact on the structural stability of tailings storage facilities. Design criteria for the construction and subsequent height increases of the Fimiston I and Fimiston II TSFs included the requirement to meet the minimum factor of safety for both Operating Base and Maximum Credible Earthquake cases.

An assessment of the Fimiston I TSF in 2003 and the Fimiston II TSF in 2005 by external consultants, Golder Associates confirmed that both facilities met the minimum recommended factors of safety required for pseudo-static (earthquake) loading conditions (Section 11.4.3). This analysis utilised data gathered from crustal earthquakes during the period 1954 to 2004 and also from information gathered from KCGM's seismic monitoring system for Mt Charlotte and the Fimiston Open Pit.

Isostatic Rebound

Initial stakeholder consultation highlighted an issue regarding the effects of isostatic rebound caused by global warming on seismic activity at KCGM. Isostatic rebound is a geophysical concept that explains the upward movement of the earth's crust following the melting of ice sheets or glaciers. Ice sheets that formed over the surface of the earth in the last Ice Age, depressed the crustal surface of the earth under the weight of the ice mass (isostatic depression). The upward movement or 'rebound' is the response of the earth's crust to this weight being removed when the ice melts. Evidence of isostatic rebound is known to be common along the shorelines in glaciated regions around the world (Dept of Education, 2005).

A change in the load upon the earth's crust can cause it to bend and these stresses can lead to fractures or the reactivation of pre-existing faults. Australia is located within the Indo-Australian tectonic plate and most seismic activity occurs at the boundaries of this plate with adjoining plates, although some seismic activity also takes place within the Indo-Australian tectonic plate itself. Given the lack of research in this area, it is difficult to quantify how isostatic rebound will affect intra-plate movement and specifically the level of seismicity in Western Australia and Kalgoorlie.

However, as previously discussed, the effects of seismicity alone on pit walls is considered to be negligible. Therefore any regional seismic event caused by isostatic rebound is expected to have negligible impact on the stability of the operation. The gradual effects of global warming on the earth and the probability of isostatic rebound influencing the level of seismic activity at KCGM is therefore not considered significant.

Management

The Fimiston Open Pit has been equipped with a microseismic recording system since 1997. Any seismic events above a certain magnitude are registered. There is no current evidence to suggest that seismicity causes pit wall damage, however, the potential impact of seismicity upon long term pit wall stability will continue to be monitored and reviewed throughout the operation of the Fimiston Open Pit.

KCGM will undertake further modelling of stability and a risk-based dam break assessment for the TSFs at final maximum height as part of the design evaluation process. Seismic shock loading on the TSFs can be simulated by stability modelling packages available at KCGM. Simulations will be undertaken to predict the effects of seismic events on the stability of the tailings options outlined as part of this Project.

Predicted Outcome

Due to the observed effects of natural seismicity on hard rock open cut mining operations, no detrimental effects are expected to arise from local or regional seismic activity.

Mining induced seismicity is generally localised and small scale and as such, is not expected to cause any problems with pit wall stability or the surrounding infrastructure.

11.4 PUBLIC SAFETY

Applicable Standards and Guidelines relating to Public safety are:

- Australian Standard AS/NZS 4360: 1999, Risk Management;
- EPA Guidance Statement No. 3 Separation Distances between Industrial and Sensitive Land Uses (EPA, 2005a); and
- EPA Draft Guidance Statement No. 33 Environmental Guidance for Planning and Development (EPA, 2005b).

Public Safety issues are of high importance due to the proximity of mining operations with the City of Kalgoorlie-Boulder. KCGM has operated with a blast clearance area of 400 m since the commencement of operations in 1991. This 400 m buffer distance was adopted after considerable technical analysis, public debate and investment by both Government and KCGM and was based on the risk of flyrock from blasting and to a lesser extent pit wall stability. Refer to Section 6.6.1 for additional information.

KCGM believe that coupled with over 14 years mining experience and the availability of advanced mining technology, it can demonstrate that risks of flyrock from blasting and pit wall instability can be reduced sufficiently for KCGM to operate with a blast clearance area of 200 m, without comprising the safety of the community.

KCGM has undertaken comprehensive studies to demonstrate that through the implementation of management actions, the risk from flyrock and geotechnical considerations associated with the Golden Pike Cutback can be controlled to acceptable levels. The results of these investigations are outlined in the sections below.

KCGM is supportive of the proposed independent public safety review process, whereby KCGM will provide the flyrock and pit wall stability studies to DoIR. These studies will be reviewed by independent consultants prior to the forwarding of a recommendation to the State Government. This will ensure that public safety issues are considered in a rigorous and properly independent manner.

11.4.1 Flyrock

Issues

Flyrock refers to rock that is generated from within the blast and projected varying distances beyond the blasting area. Variations in the distance that flyrock is thrown is a direct result of collar rock conditions and the loading practices of the blast. Uncontrolled blasting practices have the potential to generate flyrock that can be thrown great distances which then has the potential to cause damage to equipment and property, or harm or injury to people.

Terrock Consulting Engineers (2005) was commissioned by KCGM to examine current blasting practices and the generation of flyrock at KCGM's operations and compare these with modified blasting practices recently used at Chaffers West Cutback (Appendix H2). The purpose of the study was to examine if current safety factors could be maintained whilst reducing the blast clearance area, by reducing flyrock throw from blasting to as low as reasonably achievable. If the current 400 m Blast Clearance Area were to be maintained around the Golden Pike Cutback, then this boundary would extend across the Eastern Bypass Road and into areas where industrial and residential properties exist. KCGM currently owns all residential property within this 400 m area, but there are also a few industrial properties, not owned by KCGM.

Current practice for routine production blasting in the sulphide, oxide and transition zones within the Fimiston Open Pit, has shown that flyrock is contained within 95 m of the blast. To achieve the safety clearance factor for plant and equipment, this maximum throw distance is doubled, i.e. 190 m or a safety factor of '2'. For personnel safety, this distance is doubled again, i.e. 380 m or a safety factor of '4'. This is consistent with the 400 m Blast Clearance Area within which KCGM currently operates.

Mining at the Chaffers West Cutback that incorporated improved procedures for blasting, showed that with more efficient confinement of explosives, (i.e. controlling the height of stemming material) flyrock throw can be limited to 50 m (Figure 23). Therefore, for a safety clearance factor of '2' to plant and equipment the maximum throw distance is 100 m. For personnel safety this distance is 200 m or a safety factor of '4'.

The maximum extent of a potential 200 m blast clearance area would be situated within land currently controlled by KCGM as shown on Figure 24. The investigations and modelling demonstrated that with improved blasting performance such as that recently utilised during surface blasting at the Chaffers West Cutback, a 200 m blast clearance area will provide an adequate buffer given that blasting practice controls are implemented to reduce the flyrock throw distance. Improved blasting practices are important for those blasts within the area closer to the final pit outline and blasts undertaken at or close to the ground surface.

It should be noted that the 200 m extent shown on Figure 24 is the worst case scenario. When blasting is conducted at levels below the pit perimeter, the horizontal throw of flyrock is reduced by the pit wall. The Environmental Noise Bund located to the west of the open pit also provides similar benefits for reducing horizontal throw. The pit wall and Environmental Noise Bund introduce an additional safety margin for preventing flyrock from blasts in the upper benches extending beyond the mining area.

Management

KCGM is required to comply with the *Mines Safety and Inspection Act 1994* and take any such precautions that are necessary to prevent injury to persons and to minimise the risk of damage to property. The Act states that if there is a risk that debris from blasting could constitute a danger to persons or if flyrock could land on public roads or property, then blasting mats will be used and secured in a manner which will contain the debris during the whole blasting operation. The nature or extent of KCGM blasting is such that blasting mats may not be effective. Therefore KCGM will ensure that the blast design (including charge distribution, stemming length and type, and delay of sequence) is such as to minimise the risk of flyrock.

KCGM will adopt the practices recommended by specialist consultants to minimise the potential impacts from flyrock generated during blasting. Modified blasting practices will be introduced during blasting particularly in the area identified near the pit perimeter. This will ensure that the throw of flyrock is limited to 50 m and that a safety factor of '4' is maintained. Modified blasting practices were introduced into blasting activities at the Chaffers West Cutback and proved effective in reducing the throw of flyrock.

The risk of flyrock during blasting of the Golden Pike Cutback will be reduced to as low as reasonably achievable by the following risk controls:

- Elimination – No toe blasts will be undertaken and 'free-dig' techniques will be used to avoid blasting if possible;
- Substitution – Electronic detonators (or similar alternative technology) rather than traditional detonators will be used for greater precision, reduced airblast and ground vibration;
- Engineering Measures – Mechanical methods used where practicable for secondary breaking;
- Administrative Controls – Quality Assurance Procedures regarding charge mass per unit length of blast hole and minimum stemming lengths will be used. Specified blasting design and loading procedures will be used to reduce flyrock where secondary blasting is required;
- Personal Protection – Temporary closure of the Eastern Bypass Road during blasting of near surface rock along the Golden Pike cutback (not expected to exceed 15 minutes on 8 occasions for a 200 m blast clearance area or 61 occasions for a 400 m blast clearance area, with emergency vehicles using the Eastern Bypass Road given priority over blasting). Industrial and KCGM owned residential properties within the Blast Clearance Area may also be evacuated during a blast if it is deemed that a blast clearance area greater than 200 m is required.

KCGM recognises the need to have strict controls in place for the loading practices of blasts on and near the surface of the Golden Pike Cutback. As such, KCGM will examine the potential risk from flyrock for each individual blast and ensure that the revised procedures are closely followed to manage this risk. KCGM's proposed management measures are outlined in more detail in the Blast Management Plan presented in Appendix H3.

The blast clearance area varies according to the position of primary blast holes and will move closer to the open pit as mining and blasting get deeper. This reduction in the potential risk from blasts at a greater depth or at a greater distance away from the pit perimeter is due to the pit wall and the Environmental Noise Bund acting as barriers to limiting the horizontal throw of flyrock.

Preliminary blast designs for the Golden Pike Cutback indicate a total of 86 separate blasts will be required for the first four benches (from surface to 30m below surface) which according to the current schedule will be mined over around 18 months. The approximate blast clearance area for each of these blasts has been determined and is shown in the table below.

Table 20. Predicted Blast Clearance Areas for Blasts within First Four Benches.

BLAST CLEARANCE AREA	SURFACE (-60 BENCH)	10M BELOW SURFACE (-70 BENCH)	20M BELOW SURFACE (-80 BENCH)	30M BELOW SURFACE (-90 BENCH)	TOTAL BLASTS	PERCENTAGE OF BLASTS
200m	0	4	0	0	4	5 %
250m	2	3	6	3	14	16 %
300m	4	6	5	6	21	24 %
350m	3	4	5	7	19	22 %
400m	5	6	8	9	28	33 %

The investigation undertaken by Terrock Consulting Engineers which is based on assessment of flyrock measurements taken in the KCGM Fimiston Open Pit is provided in Appendix H2. The Terrock investigation report, supplemented by current flyrock data will be independently peer reviewed.

Since the commencement of the Fimiston Open Pit in the early 1990's, KCGM has built up considerable expertise in controlling the impacts of blasting and has achieved a high success rate of blasting within the parameters set.

In April 2006, a joint exercise between Ausdrill, Dynos and KCGM assisted the Kalgoorlie-Boulder City Council to blast cap rock that was holding up construction of a dam that was being dug for the new Golf Course project. The thickness of the rock was approximately 5 m. There was significant infrastructure in the area, including the rail line, a pipeline and an above ground concrete water storage dam belonging to the Water Corporation. There were a number of houses to the west of the dam and well within the designated blast clearance area. Therefore it was important that the blast design and implementation reduced the risk for vibration, overpressure and flyrock to as low as reasonably achievable.

Stringent vibration limits were placed on the blast by the Water Corporation, and KCGM. KCGM undertook the design of the blast and the loading of the holes, and established a blast clearance area of 200 m. This blast was successful in achieving the desired outcome of fragmentation without flyrock and excessive vibration.

Predicted Outcome

Blasting operations will be managed to ensure that the potential for flyrock is as low as reasonable achievable.

11.4.2 Pit Wall Stability

Issues

KCGM commissioned BFP Consultants (February 2004) (Appendix H1) to undertake a geotechnical analysis of the Golden Pike Cutback to assist in the assessment of potential risks associated with mining in the area. The scope of the geotechnical assessment included:

- A review the proposed slope design for the Golden Pike Cutback area;
- Confirmation of the overall slope stability and the possible slope controlling mechanisms for the Golden Pike cutback; and
- Consideration of DoIR guidelines in relation to mine abandonment, and identification of the appropriate distance from the crest that should be maintained to accommodate any potential long-term pit slope deterioration.

At KCGM, the major controls on slope stability have been related to structural controls and the orientation/location of old workings. Groundwater has not presented a stability problem in the Fimiston Open Pit because dewatering from the 25-Level in Chaffers Shaft (810 m below surface) since 1989 has maintained groundwater levels well below current mining operations. With the recent removal of the Chaffers Headframe as part of the Chaffers Cutback, dewatering is now undertaken by a dewatering bore located on the south-eastern edge of the Fimiston Open Pit (700 m below surface). The majority of Golden Pike Cutback was shown by the study to be in competent rock with lesser zones of fractured/weak zones present.

The initial study concluded that the slope design of the Golden Pike Cutback may be considered conservative and that cutback slopes with north-northeast pit slope dip directions inter-ramp slope angles of up to 55° would be acceptable. The stability of the oxide material was not considered to be compromised by the presence of the Environmental Noise Bund. Expected seismic activity was assessed to have no detrimental effect on pit wall stability.

Further examination by BFP Consultants in July 2005 included the geotechnical issues relating to the stability of the proposed pit abandonment bund taking into account the expected geotechnical parameters and the eventual condition of the pit after closure when the groundwater has achieved its stable condition. Numerical analysis of the pit slope stability was undertaken using a 2D model calibrated using current pit monitoring. Construction of a three dimensional model will be undertaken to address long-term pit slope stability, particularly post-closure.

The results of stress analysis calculated a minimum factor of safety of 2 for the most aggressive slope adjacent to the Golden Pike Cutback, and circular failure analyses provided a factor of safety in excess of 5 (through the weathered materials). Analysis undertaken with the consideration of a flooded pit provided similar results.

These results are well above the limits suggested by the DoIR (DME, 1997) as design guidelines, shown graphically on Figure 25. On this basis, BFP considered that the fresh rock slopes are not at risk of overall failure and that location of the abandonment bund on the projection of 25° from the base of the weathered horizon was suitable as shown on Figure 26. The proposed realigned Environmental Noise Bund is beyond the abandonment bund position recommended by BFP and is therefore considered appropriate for this purpose.

KCGM considers that this comprehensive geotechnical analysis satisfies the requirement specified in the DoIR guideline that states, "*in cases where the mine owner wishes to locate the abandonment bund closer to the edge of the open pit than specified by this guideline, it must be demonstrated that the stability of the ground mass between the pit edge and the abandonment bund can be ensured for the very long term*".

The assessment reports undertaken by BFP Consultants are presented in Appendix H1.

Management

Monitoring of slopes within the Fimiston Open Pit is undertaken using an auto-prism 24 hour Automatic Slope Monitoring System to detect movements in the walls. Slopes considered to be of doubtful stability or critically important are also monitored with a Slope Stability Radar (SSR). The monitoring of incremental movements provides important information on pit wall stability. The SSR monitoring system automatically alerts personnel of any wall movement detected. Regular berm inspections are conducted (where practicable) as an additional monitoring tool.

To reduce the potential impact of long term weathering in the Golden Pike Cutback, sections of the crest of the pit may be backfilled with fresh waste rock to minimise the potential deterioration of the weathered material if a pit lake should form.

Predicted Outcome

The design of the Golden Pike Cutback reduces the risk of pit wall failure to well below acceptable levels.

11.4.3 TSF Embankment Stability

Issues

The issue of TSF embankment stability relates to the continued structural integrity of the TSFs under conditions of increased loading and seismicity. While the annual technical reviews of the Fimiston TSFs include assessments of the stability of the structures, KCGM commissioned Golder Associates to undertake additional field studies to supplement the available geotechnical information on the *in situ* condition of the tailings stored in the Fimiston and Kaltails TSFs (Golder, 2006; Appendix D6).

The field studies included piezoprobe testing, which provides information on the grading characteristics of the material in the tailings profile, the pore water pressures, permeability coefficients and the undrained shear strength of the tailings.

Stability analyses were carried out for the Fimiston I and Fimiston II TSFs at the maximum embankment heights of 40 m (Fimiston I) and 45 m (Fimiston II), proposed in the Notices of Intent currently before the regulators (Appendix D2; D3), and at the current embankment height of the Kaltails TSF. Figure 18 shows a conceptual hydrogeological model of Fimiston II TSF. The results of the analyses, under both static conditions and earthquake loading conditions, indicated that embankment instability was unlikely. An assessment of the potential for liquefaction of the tailings to occur concluded that the potential was negligible.

In line with the proposals to either further increase the maximum heights of the Fimiston TSFs or to re-commission the Kaltails TSF, preliminary modelling of the stability of the Fimiston I and Fimiston II TSFs and the Kaltails TSF has been carried out for maximum embankment heights of 50 m, 60 m and 45 m respectively (Appendix D6). The material parameters and phreatic surface data adopted for the analyses are based on the interpreted results of the earlier piezoprobe investigations and supported by previous stability analyses.

Parameters adopted for effective stress analyses are supported by past laboratory test results. The selection of a conservative, but appropriate, acceleration coefficient for modelling the “worst case” seismic condition is based on a study of seismicity in the Kalgoorlie area and corresponds to 50% of the Peak Ground Acceleration. The results of the earlier modelling and of the current modelling at the increased maximum heights are summarised in the following table.

Table 21: Factors of Safety Against Failure for Maximum Embankment Heights

PRELIMINARY STABILITY MODELLING	FIMISTON I	FIMISTON II			KALTAILS
		CELL A/B	CELL C	CELL D	
Proposed Maximum Embankment Heights (m)	50	60	58	55	45
Factor of Safety Under Static Loading	2.0	1.9	2.5	2.3	1.7
Factor of Safety Under Maximum Credible Seismic Loading	1.0	1.1	1.3	1.2	1.1

The Australian National Committee on Large Dams (ANCOLD) provides guidelines on best practice for construction of large dams, including appropriate factors of safety for slope stability. The factors of safety used in the preliminary assessment represent the ratio between the sum of the resisting forces and the sum of the activating forces on the TSFs slope. As the above table shows that the factors of safety are greater than one, this indicates that the slopes of the TSFs would maintain stability, even under maximum credible seismic (earthquake) loading. These numbers also indicate that the factors of safety exceed (are better than) the minimum factors of safety recommended by ANCOLD for both static and seismic conditions.

There is a marked difference in the maximum annual rates of rise of the tailings for the two tailings storage options being considered as summarised in Table 22.

Table 22: Maximum TSF Embankment Heights and Tailings Rates of Rise

	FIMISTON I	FIMISTON II			KALTAILS
		CELL A/B	CELL C	CELL D	
Option 1 - Fimiston I & Fimiston II TSFs					
Maximum Height to 2017(m)	50	60	58	55	N/A
Maximum Rate of Rise (m/yr)	3.3	3.3	3.3	3.4	N/A
Option 2 - Fimiston I, Fimiston II & Kaltails TSFs					
Maximum Height to 2017 (m)	40	45	45	42.2	45
Maximum Rate of Rise (m/yr)	1.6	2.2	2.5	2.5	2.6

Option 1 shows significantly greater rates of rise of the TSF than does Option 2, due to the significantly greater storage area offered by Option 2.

The higher rates of rise encountered for Option 1 would be expected to result in the following responses:

- slower drying and consolidation of the deposited tailings and hence lower *in situ* tailings densities and higher moisture content of the deposited tailings;
- reduced ability to source embankment construction material from the tailings beaches and possibly resulting in the need to import construction material from alternative sources such as the old Croesus TSF or the Mount Percy TSF; and
- marginally reduced factors of safety against embankment failure.

The inherent risks associated with tailings storage Option 2, which utilises the Kaltails TSF and minimises the heights of the Fimiston I and Fimiston II TSFs, would be lower than Option 1, which only utilises the Fimiston I and Fimiston II TSFs. Option 1 is preferred because it reduces the overall environmental footprint of the operation. The risks associated with increasing the height of the Fimiston I and Fimiston II TSFs have yet to be fully quantified, and while these are not expected to be significant, KCGM feels it is appropriate to have Kaltails as a contingency.

The varying rates of rise would be expected to have only minor influence on the rate of seepage loss from the respective TSF.

Management

The programmes that will be undertaken to monitor the stability of the TSFs, irrespective of the tailings storage option implemented, will include the following:

- regular monitoring of piezometers in the TSF embankments and supplementing the existing array of piezometers as the embankment heights increase;
- monitoring settlement stations installed on the TSF embankments;
- daily visual inspection of perimeter embankments, crests and beaches for possible signs of instability;
- annual review of tailings management procedures; and
- annual assessment of TSF embankment stability.

KCGM will undertake further modelling of stability and a risk-based dam break assessment for the TSFs at final maximum height as part of the design evaluation process.

Predicted Outcome

The stability evaluations carried out to date on the Fimiston and Kaltails TSFs have indicated the embankments to be stable under both static and seismic conditions. There are no grounds for assuming that the continued use, and resulting height increase, of the TSFs will lead to a diminishing of the structural integrity of the structures.

11.5 AMENITY

The EPA's objective in regards to amenity is:

- to ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonable practicable.

Applicable Standards and Guideline are:

- EPA Position Statement No. 6, Towards Sustainability (EPA, 2004a); and
- DoIR Safety Bund Walls Around Abandoned Open Pit Mines.

Issues

Blasting of the Golden Pike Cutback predominantly in the initial surface or near surface blasts, may require the closure of a small section of the Eastern Bypass Road at the time of the blast (see Section 11.4.1). During favourable wind conditions, blasting operations may take place around once per day for approximately 15 minutes. Road closures have previously been undertaken by KCGM for blasting at other cutback areas (Stores and Chaffers West Cutbacks) and have not been known to present a significant issue with the community.

Concerns have been raised as to the impacts on the nearby residents of Williamstown and Ninga Mia in relation to waste rock dumps and general mining operations. The proposed location of the northern waste dumps located to the south and east of Bulong Road and Black Street respectively is within 600 m of the nearest resident located in Williamstown. The Ninga Mia community is located approximately 900 m from the most northern area of the NWRDs.

Potential impacts to these communities will be from noise and dust during the construction and use of the NWRDs. Vibration is not expected to be any greater an issue for these communities than for residences on the western side of the Pit as they are located at a greater distance from the potential blasting area. The visual amenity of the NWRDs is not

expected to be a significant issue as the height of the waste dumps will be no greater than those currently constructed at the operation.

Management

Management of the road closures in the past during periods of blasting at the Golden Pike Cutback have been undertaken in accordance with KCGM's Blast Clearance Area procedures. These procedures detail specific sequential actions to be undertaken by blast control personnel to ensure public safety is maintained during blasting operations. Road closures are undertaken to be as efficient as possible to avoid delays and inconvenience to road traffic. A review of these procedures will be undertaken as part of this Project and will include the consideration of access for emergency vehicles. Outcomes of any review will ensure that public safety is not comprised at any time during blasting operations.

KCGM will ensure that dust and noise emissions that may affect the residents of Williamstown, Ninga Mia and other neighbouring communities comply with the relevant legislative requirements including the National Environmental Protection Measure (NEPM) *Environmental Protection (Noise) Regulations 1997.* Construction activities would be restricted to day time (between 0700hrs and 1900hrs).

These issues will be managed in accordance with KCGM's noise and dust management monitoring and management programmes referred to in Sections 10.6 and 10.8 respectively. Rehabilitation of waste rock dumps will be undertaken progressively as per KCGM's Fimiston Rehabilitation Management Plan to establish a vegetative cover that will improve the visual amenity.

Predicted Outcome

It is predicted that the EPA's objectives with regards to amenity will be achieved.

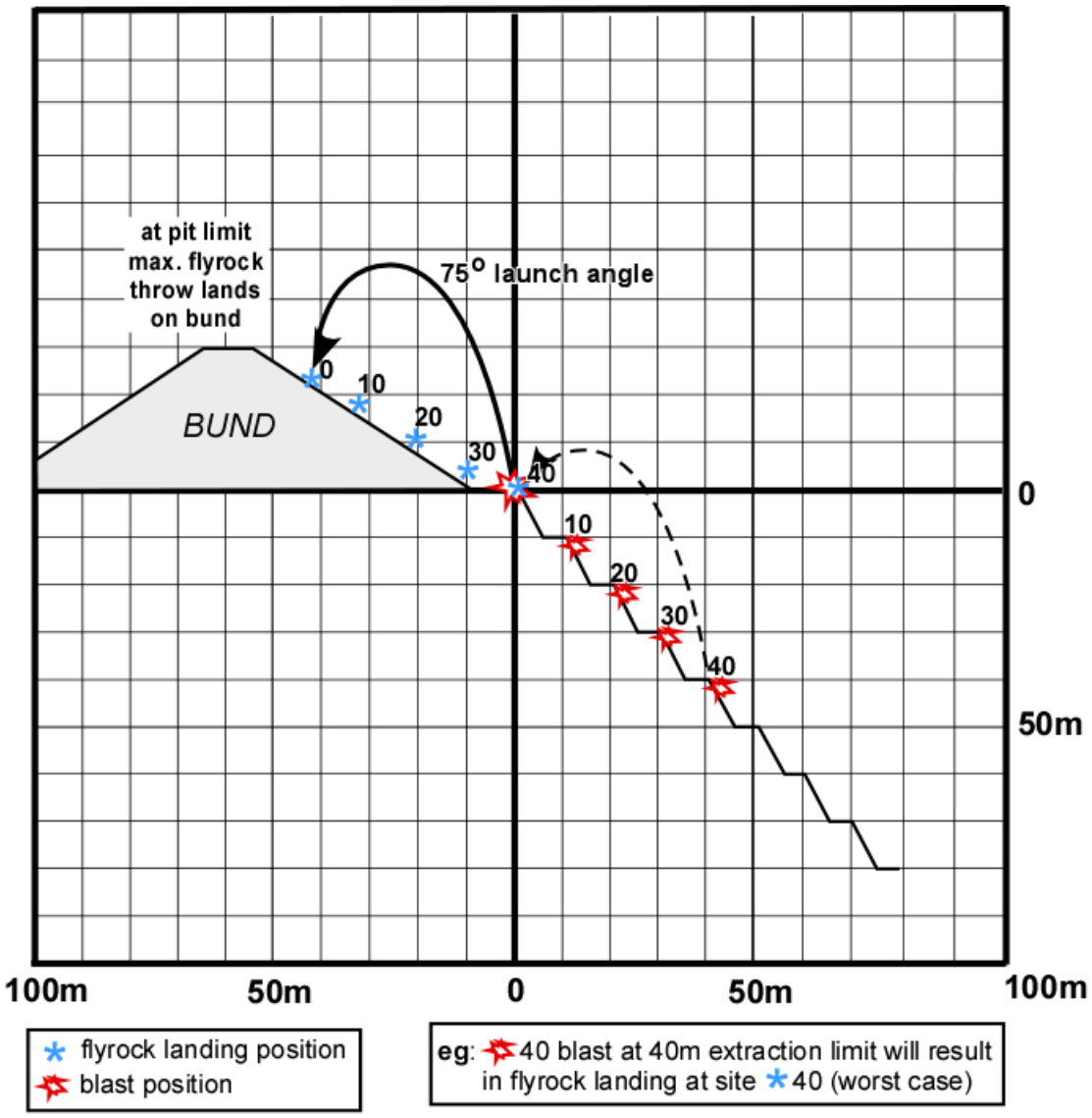

Figure 23
Flyrock Projection from Modified Blasting Practice when Blasting at the Pit Perimeter- Maximum 50 m Throw

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: -	Date: Jan -06

Figure 24
Location of Maximum 200 m Blast Clearance Area

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: - Terrock	Date: Jan -06

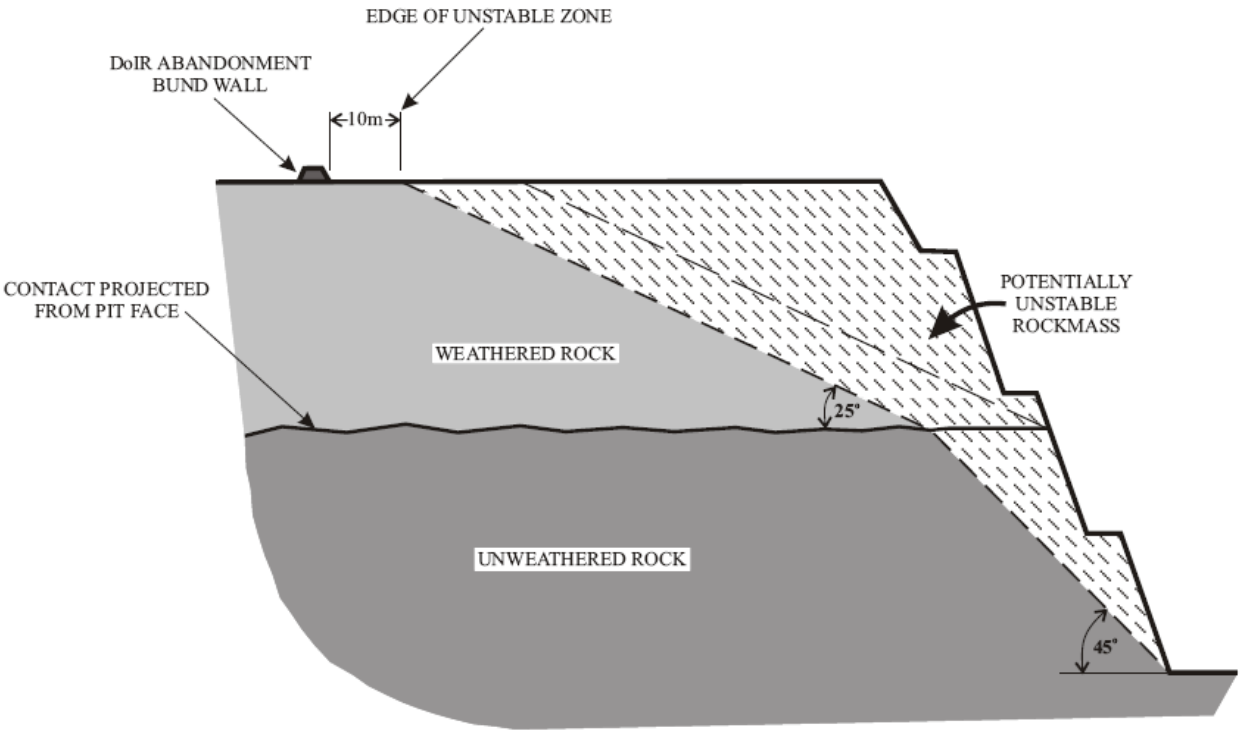

Figure 25
DoIR Guidelines for the Abandonment Bund Location on the West Wall

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: Terrock	Date: Jan -06

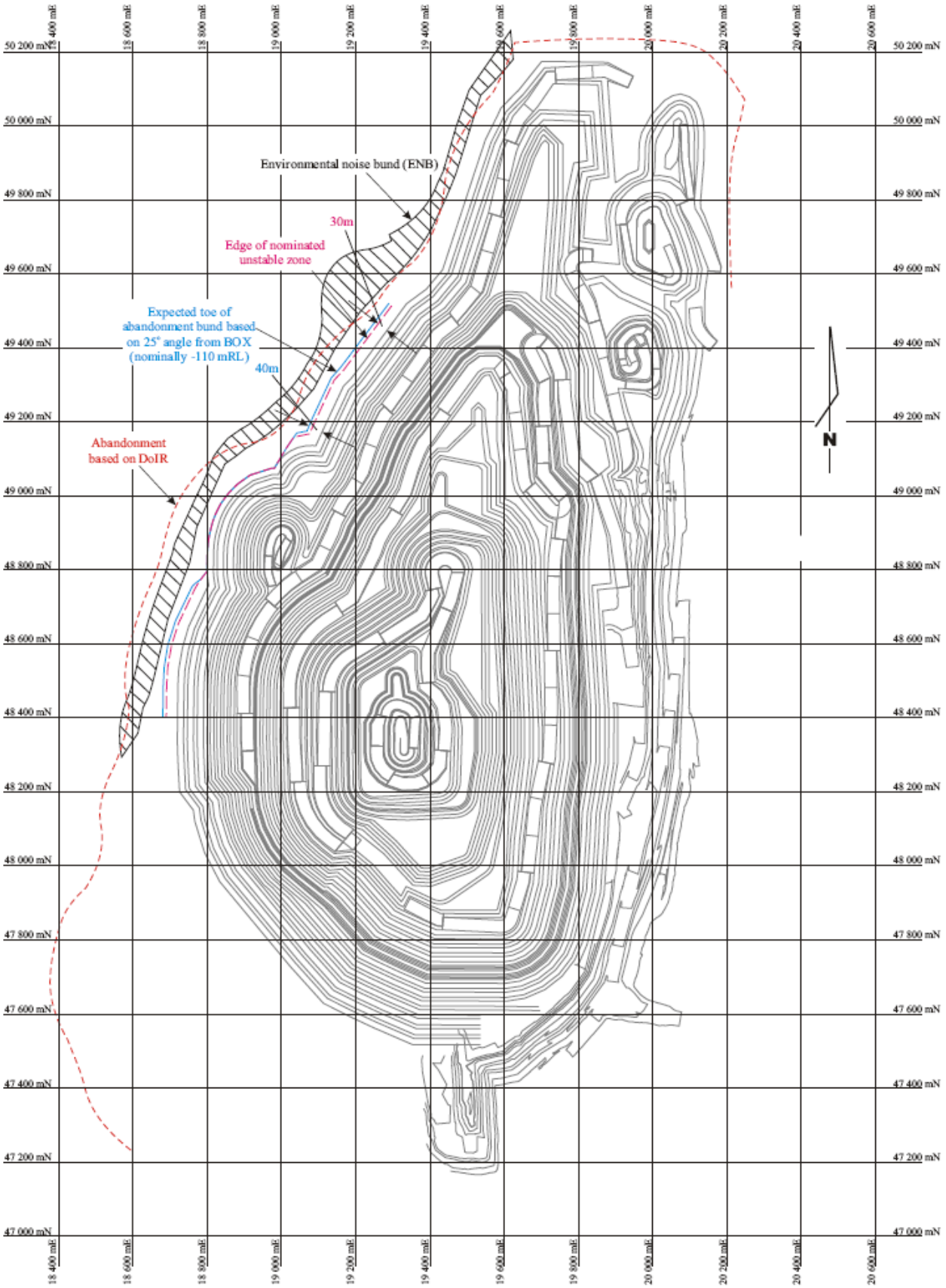

Figure 26
Recommended Eastern Toe Position of Abandonment Bund (in light blue) in Comparison to the Proposed Realigned Environmental Noise Bund

Client: KCGM	ENVIRON	
Project: 30-0146	Drawn: Terrock	Date: Jan -06

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12. SUMMARY OF ENVIRONMENTAL FACTORS AND MANAGEMENT

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
BIOPHYSICAL					
Vegetation and Flora	To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	Rehabilitated areas of the Golden Pike Cutback and the Northern Waste Rock Dump (NWRD) locations.	Disturbance to 161 ha of historically cleared, disturbed and rehabilitated areas will cause a minor loss to vegetation in the area. No Declared Rare Flora have been identified within the Project area. Two priority flora species which were planted during rehabilitation activities in the Golden Pike area were recorded. Potential impacts on vegetation from seepage from the Kaltails or Fimiston I and II TSFs.	Clearing will be minimised where possible. Vegetation will be re-established by rehabilitating available areas as soon as practicable after disturbance. The use of Fimiston I and II TSFs or Kaltails TSF is preferred over construction of a new TSF, to eliminate impacts from vegetation clearing. Potential seepage impacts on vegetation will be managed and monitored through the Seepage and Groundwater Management Plan.	Meet the EPA objective

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
Terrestrial Fauna	To maintain the abundance, diversity and geographic distribution of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	Rehabilitated habitats in the Golden Pike Cutback and the NWRD areas.	Minor impacts on fauna within rehabilitated areas and areas historically disturbed.	Clearing of fauna habitats will be minimised where possible. Management of impacts on vegetation as outlined above. Vegetation and the creation of fauna niches will be established during post rehabilitation activities, as soon as practicable after disturbance. Fauna management in the vicinity of TSFs will be in accordance with licence conditions and the International Cyanide Management Code.	Meet EPA objective.

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
Water Resources	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected.	Groundwater is naturally hypersaline. Primary beneficial use of this water is for mining and mineral processing.	No increase in the use of potable or saline water is required; however annual consumption will be extended for the additional life of mine for five years. This consumption of primarily hypersaline groundwater is not expected to impact on the resource.	Continue to implement water conservation strategies throughout the operation and continue to identify opportunities for conservation and reuse.	Meet EPA objective.
Surface Drainage	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected.	Fimiston Operations are in the catchment of the Hannan's salt lake. An ephemeral drainage line flows from north of the operations, south towards Hannan's Lake and passes between Fimiston II TSF and the rest of the operations.	The Project will not have a significant impact on any major surface drainage features. Localised alteration of surface water flow cause water starvation or prolonged saturation of the surface and adverse impacts on native vegetation.	The Project will be designed to ensure altered surface drainage does not adversely impact on native vegetation.	Meet EPA objective.

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
Conservation Areas	To protect the environmental values of areas identified as having significant environmental attributes.	Lakeside Conservation Reserve located near the Kaltails TSF.	Potential impacts on vegetation health due to a rise in water levels from seepage from the Kaltails TSF.	A network of production bores established around the Kaltails TSF will be operated to maintain groundwater at levels to protect vegetation should Option 2 for tailings management be selected. The Seepage and Groundwater Management Plan will be revised should Option 2 for tailings management be selected.	Meet EPA objective.
POLLUTION MANAGEMENT					
Air Quality	To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Fimiston Operations	Ore characteristics from the Golden Pike Cutback will be similar to ore that is currently mined and processed. Therefore no significant change in mercury emissions from processing this ore is anticipated.	Introduction of additional emission controls and continued investigation of opportunities for emission reduction for the Carbon Regeneration Kiln.	Meet EPA objective.

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
Air - Particulate Dust	To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Regional dust emissions are high due to the arid climate, large number of industries and fugitive dust sources in the region.	Land clearing, blasting, earthmoving, waste dumping and tailings deposition have the potential to create a dust nuisance for adjacent land uses.	All operations will be undertaken in accordance with the *Revised Dust Monitoring and Management Programme*. Specific procedures will include blasting under favourable wind conditions, dust suppression measures, progressive rehabilitation, and measures to reduce dust generation from haulage.	Meet EPA objectives.
Environmental Noise	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.	The Kalgoorlie area is subject to noise from existing industrial and urban sources. Existing measured noise levels from these sources generally exceed the assigned noise levels in the *Environmental Protection (Noise) Regulations 1997.*	Noise generated from the use of mobile equipment such as drills, excavators and haul trucks has the potential to impact on adjacent residential communities. Noise emissions from the open pit will reduce as mining gets deeper.	All operations will be undertaken in accordance with the *Revised Noise and Vibration Monitoring and Management Programme.* Specific management measures may include using 'quietest reasonably available' equipment, fitting mobile equipment with 'Smart Alarms' and noise bunding.	Meet EPA objective. A Regulation 17 exemption will be submitted for existing Fimiston Operations and construction of the outer wall of the NWRDs.

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
Blasting Noise (Overpressure) and Vibration	To protect the amenity of nearby residents from impacts resulting from blasting activities associated with the proposal by ensuring the noise and vibration levels meet statutory requirements and acceptable standards.	KCGM's blast times for existing operations are scheduled for 1pm and/or 5pm each day, subject to favourable wind conditions for dust management.	Blasting has the potential to impact on the nearby community through noise and vibration.	All operations will be undertaken in accordance with the *Revised Noise and Vibration Monitoring and Management Programme*. Blasting requirements outlined in this plan are based on AS2187.2/1993. Specialist techniques for blasting in areas sensitive to noise and vibration may be adopted for selected blasts at the Golden Pike Cutback.	Meet EPA objectives.
Waste Management	To ensure that liquid and solid wastes do not affect groundwater or surface water quality or lead to soil contamination.	Existing operations have waste rock dumps located around the open pit. Tailings are deposited in Fimiston I and Fimiston II TSFs.	A risk evaluation of the Fimiston operations has identified that there is a very low to low risk of acid rock drainage. Potential impacts to the groundwater quantity and quality from the use of Fimiston I and II or Kaltails TSF for the Project.	An acid rock drainage strategy is implemented at KCGM for existing and proposed operations. Potential impacts from TSFs will be managed through the Seepage and Groundwater Management Plan.	Meet EPA objective.

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
Groundwater	To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Groundwater is naturally hypersaline. Primary beneficial use of this water is for mining and mineral processing. Impacts on groundwater in the vicinity of the Fimiston I, Fimiston II and Kaltails TSFs have historically been observed. This is currently controlled by groundwater abstraction bores.	Potential impacts to the groundwater quality and quantity from potential seepage from the Kaltails or Fimiston I and II TSFs.	The Fimiston I and II TSFs or Kaltails TSF will be managed in accordance with the Seepage and Groundwater Management Plan.	Meet EPA objective.
SOCIAL SURROUNDINGS					
Aboriginal Heritage	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	Eight sites of ethnographic significance have been identified in the vicinity of KCGM's operations.	No impact on any sites of Aboriginal heritage significance.	KCGM will consult with appropriate Aboriginal people as required in respect to the management of ethnographic sites in the vicinity of the Project.	Meet EPA objective.

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
Seismicity		The background level of natural earthquake activity in the Kalgoorlie area is considered above average for Australia due to the presence of the Kalgoorlie fault complex.	The results of a stress analysis concluded that the expected seismic activity will have no detrimental effect on the pit wall stability. Preliminary stability modelling of the TSFs indicated these would remain stable at proposed heights under maximum credible earthquake loading.	Continue to monitor seismic events with the microseismic recording system. Detailed design of TSFs will consider seismic loading.	Meet EPA objective.
Amenity	To ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonable practicable.	The region has been affected by mining operations for more than 100 years. Mining is an integral part of the region's economy and tourism.	Visual amenity is not expected to be significantly altered by the Project. A small number of closures of the Eastern Bypass Road will be required during the initial stages of blasting. Impacts from dust, noise and blasting are not expected to change significantly from existing operations.	Progressive rehabilitation will ensure adverse visual amenity is reduced. Management through existing Dust, Noise and Vibration Programmes. Road closures will be managed by standard procedures previously utilised by KCGM.	Meet EPA objective.

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
Public Safety		A 400 m Safety Exclusion Zone was historically applied to reduce the risk to the Public.	Low risk from flyrock during blasting. Improved blasting measures mean the current Blast Clearance Area is overly conservative. Low risk of pit wall instability along the western boundary of the Fimiston Open Pit. Low risk of TSF instability with increased embankment height.	KCGM will adopt recognised management strategies to ensure the risk from flyrock is maintained at acceptable levels. The Blast Clearance Area has been revised to 200 m for some blasts, subject to strict controls. The 24-hr Automatic Slope Monitoring System will continue to monitor the stability of the Fimiston Open Pit walls. Detailed design of increased TSF embankment heights will be required as part of DoIR approvals.	Meet EPA objectives. Meet DoIR requirements.

ENVIRONMENTAL FACTOR	EPA OBJECTIVE	EXISTING ENVIRONMENT	POTENTIAL IMPACTS	ENVIRONMENTAL MANAGEMENT	PREDICTED OUTCOME
OTHER					
Rehabilitation and Decommissioning	To ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values	Historically disturbed areas have been rehabilitated by KCGM as part of 'Greening of the Golden Mile' revegetation programme. Progressive rehabilitation of KCGM's existing operations has commenced and is ongoing.	This Project has defined the closure of the open pit mining operations in 2017. Planning for closure in conjunction with regulators and the community is required to ensure closure criteria are established for the KCGM operation.	KCGM has developed a Conceptual Mine Closure Strategy that outlines KCGM's commitment and approach to mine closure and forms the basis on which to commence detailed mine closure planning in conjunction with regulators and the community. KCGM will prepare and implement a Rehabilitation Management Plan for Fimiston Operations (revised annually).	Meet EPA objectives.

13. ENVIRONMENTAL MANAGEMENT ACTIONS

No.	TOPIC	ACTIONS	OBJECTIVES	TIMING	ADVICE FROM
1	Groundwater	KCGM will manage the Fimiston TSFs and Kaltails TSF (if used) in accordance with a Seepage and Groundwater Management Plan.	• To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected; and • To ensure that the quality of water emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	During construction, operation and post-closure (for a period of time as agreed in the detailed Closure Plan for TSFs).	DoIR DoW
2	Noise	KCGM will revise and implement the Noise and Vibration Monitoring and Management Programme for the Fimiston Operations Extension Project.	• To protect the amenity of the community from noise impacts associated with development or land use by ensuring that statutory requirements and acceptable standards are met.	Prior to construction (revision of the Plan) During construction, operation, rehabilitation and closure (implementation of the Plan)	DEC (Noise Branch)
3	Noise	KCGM will submit an application for a Regulation 17 exemption for noise in accordance with the *Environmental Protection (Noise) Regulations 1997*.	• To protect the amenity of the community from noise impacts associated with development or land use by ensuring that statutory requirements and acceptable standards are met.	Prior to construction (submission) During construction, operation and closure (implementation)	EPA
4	Overpressure and Vibration	KCGM will revise and implement the existing Noise and Vibration Monitoring and Management Programme for the Fimiston	• To protect the amenity of the community from overpressure and vibration impacts associated with blasting by ensuring that statutory requirements and acceptable standards are	Prior to construction (revision of the Plan) During operation	DEC (Noise Branch)

No.	TOPIC	ACTIONS	OBJECTIVES	TIMING	ADVICE FROM
		Operations Extension Project.	met.	(implementation of the Plan)	
5	Air Quality (Dust)	KCGM will revise and implement the existing Dust Management Plan for the Fimiston Operations Extension Project	• To ensure that air emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards	Prior to construction (revision of the Plan) During construction, operation and closure (implementation of the Plan)	DEC (Air Quality Branch)
6	Rehabilitation	KCGM will implement a Rehabilitation Management Plan for the Fimiston Operations	• To ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values.	Prepare plan by July 2006. Implement during operations and closure. Plan to be revised annually.	DoIR
7	Mine Closure	KCGM will implement the Conceptual Mine Closure Strategy for the Fimiston Operations	• To ensure, as far as practicable, that rehabilitation achieves a stable and functioning landform which is consistent with the surrounding landscape and other environmental values.	Implement during operations and closure. Strategy to be revised every 3 years	DoIR
8	Aboriginal Heritage	KCGM will consult with Aboriginal groups as required in respect to the management of ethnographic sites in the vicinity of the Project.	• To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	Ongoing throughout construction, operations and closure	DIA

14. CONCLUSIONS

Kalgoorlie Consolidated Gold Mine's (KCGM's) Fimiston Operations is currently the largest gold producing operation in Australia and is recognised as a major contributor to the regional and State economy.

KCGM is proposing to extend the current open pit life of mine from 2012 to 2017. This will involve mining a cutback along part of the western edge of the Fimiston Open Pit, referred to as the Golden Pike Cutback, to allow for widening and deepening of the pit to a depth of around 600m (-670 mRL). The Project also requires additional areas for the storage of waste rock and tailings.

KCGM recognises the unique situation of the Fimiston Operations being located close to the City of Kalgoorlie-Boulder, where mining has been part of the landscape for over 100 years. The design of the Project and proposed management measures have been developed keeping in mind the principles of environmental protection outlined in the State's *Environmental Protection Act 1986*, and the Environmental Protection Authority's Position Statement No. 6 Towards Sustainability. KCGM's ongoing commitment to responsible development of its projects and environmental excellence is demonstrated in the Corporate Policies of KCGM, and its JV owners, Newmont and Barrick.

In designing the Project, KCGM has endeavoured to minimise the impact of the Project by constraining the footprint of the proposal to existing mining areas and historically disturbed land. This includes the area of the Golden Pike Cutback and proposed Northern Waste Rock Dumps which were historic mining areas that have been rehabilitated by KCGM as part of its "Greening of the Golden Mile" revegetation programme. KCGM also proposes to expand existing tailings storage facilities for the disposal of tailings rather than clear native vegetation to construct a new facility; and backfill part of the Fimiston Open Pit (the Super Pit) to minimise the area of waste dumps required.

The key environmental issues related to the proposal are noise, dust, blasting impacts and seepage from the tailings storage facilities. KCGM considers that these issues can be adequately managed through revision of existing management practices to have no significant impact on the surrounding environment and community. Specifically KCGM will revise the existing Noise and Vibration Monitoring and Management Plan, Dust Monitoring and Management Plan and Seepage and Groundwater Management Plan and implement these during construction, operation and closure of the Project. Best practice management measures have been incorporated into these plans where appropriate for the operations.

KCGM and its consultants have also undertaken a review of public safety in the design of the Project to ensure that the risk to the public is as low as reasonably achievable and

complies with acceptable standards. During the review it was shown that improvements in blasting technology and methods have meant that the current 400 m Safety Exclusion Zone is overly conservative. Taking into account flyrock from blasting and pit wall stability, it was demonstrated that a Blast Clearance Area of 200 m from the edge of the proposed Golden Pike Cutback on the western side of the Super Pit, will provide more than adequate protection for the public.

On completion of the Project, closure will be undertaken in accordance with the Conceptual Mine Closure Strategy presented as Appendix B1. This closure strategy provides the basis from which to develop detailed closure plans in conjunction with the regulatory authorities and the community that will detail agreed commitments and targets for the closure of all aspects of its operations.

KCGM considers it essential to involve the community in the closure planning of its operations. Structured consultation will be undertaken during the development of closure plans to determine the community's expectations and to give them the opportunity to provide input on the landforms and structures that remain.

KCGM recognises that some infrastructure other than mining features may have potential heritage value and significance to the community. To this end it is planned for the public to have continued access to view the "Super Pit" from a permanently established Tourist Lookout and provisions have been made for the Historical Loopline Railway Society to construct part of the Loopline Railway atop a section of the proposed realigned Environmental Noise Bund.

KCGM believes that the proposal can be implemented in an environmentally and socially responsible manner which will contribute to the long-term historic value of the Kalgoorlie area and protect the natural environment in the vicinity of the Project.

This PER has been prepared in accordance with EPA guidelines and the agreed Scoping Document for the Project. The document is intended to allow the public and government agencies to review the potential environmental impacts of the Project and the proposed management measures made by KCGM. KCGM welcome feedback on the Project from interested stakeholders, and guidelines for making a submission on this Project are presented in the front of this document.

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16. GLOSSARY

Abbreviations

ANZECC	Australian and New Zealand Environment and Conservation Council
CALM	Conservation and Land Management (Department of)
CER	Consultative Environmental Review
CRG	Community Reference Group
DIA	Department of Indigenous Affairs
DLI	Department of Land Information
DMA	Decision Making Authorities
DoE	Department of Environment
DEC	Department of Environment and Conservation (formerly Department of Environment and Department of Conservation and Land Management)
DoCEP	Department of Consumer and Employment Protection
DoH	Department of Health
DoIR	Department of Industry and Resources
DPI	Department of Planning and Infrastructure
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EPASU	Environmental Protection Authority Services Unit
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
IUCN	International Union for the Conservation of Nature and Natural Resources
JV	Joint Venture
LFA	Landscape Function Analysis
MCA	Minerals Council of Australia
NEPM	National Environmental Protection Measure
NPI	National Pollution Inventory
NSESD	National Strategy for Ecological Sustainable Development
NWRD	Northern Waste Rock Dump
ODAC	Office of Development Approvals Coordination
PACU	Process Approvals Co-ordination Unit
PER	Public Environmental Review
PDD	Project Definition Document
PIL	Public Interaction Line
TPS	Town Planning Scheme
TSF	Tailings Storage Facility
SECRIS	Safety, Environmental and Community Relations Information System
SEZ	Safety Exclusion Zone
SGMP	Seepage and Groundwater Management Plan
WRC	Water and Rivers Commission

Definitions:

Aquifer: A zone of rock or soil which is saturated with water and through which water can easily move. An aquifer is created when all the cracks and voids in soil and rock are filled with water.

Beneficial Use: The current or future uses of an identified resource. Beneficial Use is also referred to as the Environmental Value of a resource. Beneficial use designations provide objectives for the management, use and protection of the resource.

Borefield: A group of bores to monitor or withdraw groundwater.

dB L_{A10} 1 hour slow: means the A weighted noise level exceeded for 10% of the time, determined over a time period of one hour with a sound level meter set to measure in slow dynamic response mode.

Decant Water: Is water recovered from the tailings storage facility surface after the solids (tailings) have settled.

Eastern Borefield: This is the bore network that is constructed around the two Fimiston TSFs and comprises all of the Production and Monitoring Bores and associated infrastructure.

Electrical Conductivity (EC): A measure of the electrical current transferred through water. The EC of water is a relatively reliable indicator of its TDS or Salt content.

Environmental Value: A quality, characteristic or attribute that is conducive to ecological health or any beneficial use, which requires protection from the effects of pollution, waste discharges and deposits. Two types of environmental value are considered, ecological and social.

Groundwater Level: The upper surface of groundwater, or the level below which an unconfined aquifer is saturated with water (also known as the watertable). At its simplest, this level is that of water in a bore or well that is constructed in an unconfined aquifer. For a confined aquifer, the groundwater level in a bore or well (also known as the piezometric or potentiometric level) is the level to which water from the aquifer rises, representing the groundwater pressure in that confined aquifer.

Groundwater Quality: The chemical, physical, and biological characteristics of water with respect to its suitability for a particular use.

Historic Groundwater Levels: Depth to groundwater that is agreed to be reasonably indicative of natural levels that occurred before mining activity and which may occur post mine closure.

Licence: A statutory document, issued under Part V of *The Environmental Protection Act 1986*, permitting a person or organisation to discharge, emit, or deposit wastes into the environment subject to a variety of conditions relating to control measures, monitoring, volume, timing, nature, and composition of waste. Licences may often be varied or rescinded at any time. Breaches of licensing conditions may result in prosecution.

Life of Mine: The period of time for which a mine is operational.

Monitoring Bore: A small diameter bore that is used for monitoring groundwater quality and groundwater levels. These are not used for groundwater extraction and are not typically able to be equipped to become a Production Bore.

Paddock: An area which the TSF is divided into which the tailings slurry is deposited. Fimiston I TSF is a single paddock and Fimiston II TSF is a three paddock facility.

pH: a measure of the acidity or the basicity of a solution ranging on a scale from 0 (acidic) to 7 (neutral) to 14 (basic).

PM_{10}: Particles with a diameter of 10 µm or less

$PM_{2.5}$: Particles with a diameter of 2.5 µm or less

Production Bore: A large diameter bore that is primarily used for extracting groundwater to lower the groundwater level. It is usually permanently equipped with a pump and associated power and pipeline services.

Supernatant Pond: This is the pool of water that forms on the surface of an active TSF paddock and comprises water that has bled to the surface from the tailings slurry as it settles. The water then flows to the low point on the TSF surface from where it is reclaimed for reuse in the Plant.

Tailings: Finely ground rock from which minerals have been removed which may include process chemical residues; discarded portion of the ore.

Total Dissolved Solids (TDS): A measure of the weight of dissolved solids in water. This is the salt content of the water.

Transect: A common ecological tool used to observe vegetation along a defined path.

Water Table: The upper surface of the groundwater. The zone immediately below the watertable is saturated. The aim of the Seepage and Groundwater Management Plan is to keep the watertable at least 4 metres from the soil surface.

WAD Cyanide: WAD (Weak Acid Dissociable) is a measure of the concentration of cyanide ions that when mixed in a weak acid will revert to the free cyanide state. This value includes the free cyanide concentration. This is typically used as a measure of the potential toxicity to fauna if ingested. The typical guideline value of 50ppm is used. Concentrations above this value may be harmful to fauna.

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Appendix A1

Environmental Scoping Document
Fimiston Gold Mine Operations Extension (Stage 3)
and Mine Closure Planning

Appendix B1

KCGM Conceptual Mine Closure Strategy: KCGM

Appendix C1

Vegetation Survey of Three Rehabilitated Sites: Jim's Seeds Weeds and Trees

Appendix D1

KCGM Seepage and Groundwater Management Plan: KCGM

Appendix D2

Addendum to Notice of Intent for Increasing the Capacity of the Fimiston I Tailings Storage Facility at KCGM: Golder Associates (2003)

Appendix D3

Addendum to Notice of Intent: Proposed Increase in the Storage Capacity of the Fimiston II Tailings Storage Facility at KCGM:
Golder Associates (2005)

Appendix D4

Kaltails TSF Hydrogeological Review: Environmental Resources Management Australia

Appendix D5

Review of Groundwater and Seepage Recovery 1993 – 2005
Fimiston I and Fimiston II Tailings Storage Facilities:
Peter Clifton & Associates

Appendix D6

Implication of Increases in the Height of the Fimiston and Kaltails Tailings Storage Facilities on Structural Stability: Golder Associates

Appendix E1

Acoustic Assessments
Golden Pike Development Including Noise Bund Construction
Supplementary Information For Golden Pike Development
Northern Waste Rock Dumps:

Herring Storer Acoustics

Appendix E2

Effects of Blasting in the Golden Pike Cutback:
Terrock Consulting Engineers

Appendix E3

Kalgoorlie Consolidated Gold Mines Pty Ltd., Revised Noise and Vibration Monitoring and Management Programme: KCGM

Appendix F1

Distribution of Tellurides and Mercury in Fimiston Open Pit: KCGM

Appendix F2

KCGM Gidji Roaster and Fimiston Carbon Kiln Stack Testing and Modelling Summary: KCGM

Appendix F3

Acid Drainage Risk Evaluation:
HLA Envirosciences Pty Limited

Appendix G1

KCGM Dust Modelling Study for Super Pit Expansion: ENVIRON Australia Pty Ltd

Appendix H1

Geotechnical Assessment of Golden Pike Cutback Requirements of Pit Abandonment and Design Change Associated with the Golden Pike Cutback: BFP Consultants Pty Ltd

Appendix H2

Golden Pike Cutback Flyrock Control and Calibration of a Predictive Model: Terrock Consulting Engineers

Appendix H3

Blast Management Plan: KCGM