

Kalgoorlie Consolidated Gold Mines

Fimiston Operations

Noise and Vibration Monitoring and Management Programme



October 2010

DOCUMENT HISTORY		
Version	Date	Document Changes
1	JAN 1993	New Document. Submitted to the EPA to meet requirements of Condition 5 of Ministerial Statement 188.
2	JUN 2004	Revised to meet requirements of the Southern Landform Extension Project Section 45C Approval.
3	AUG 2009	Revised to meet requirements of Ministerial Statement 782 and the Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2009.
4	APR 2010	Revised to include the recommendations of the Appeals Committee regarding an appeal against the Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2009.
5	OCT 2010	Finalised in response to feedback from the OEPA and the DEC in regards to the April 2010 Provisional NVMMP.

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1 INTRODUCTION

Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM) manages the mining and ore processing operations at the Fimiston Open Pit, Mt Charlotte Underground Mine, Fimiston Mill and the Gidji Roaster on behalf of joint venture owners Barrick Gold of Australia Ltd and Newmont Asia Pacific Ltd. KCGM was formed in 1989 by the amalgamation of several small scale mining operations along Kalgoorlie's Golden Mile ore body. KCGM's mining operations are currently projected to continue until 2018.

Mining activities conducted at KCGM, such as blasting, crushing, exploration drilling, materials handling and dumping of waste rock, can generate noise, blast vibration and overpressure. Due to KCGM's close proximity to the City of Kalgoorlie-Boulder this can potentially impact upon nearby residents.

The Noise and Vibration Monitoring and Management Programme (NVMMP) has been developed and implemented by KCGM in accordance with conditions set by the Minister for Environment since the early 1990's. The first version of the NVMMP was developed in 1993 to meet the requirements of Condition 5 of Ministerial Statement 188 (1991), as part of the approval for the Consultative Environmental Review for the Fimiston Mine and Waste Dumps. The NVMMP was subsequently revised in 2004.

This version of the NVMMP has been developed to meet the requirements of Clause 8 of the Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2009 (NR17V) and Condition 9.6 of Ministerial Statement 782 (2009), as part of the Fimiston Gold Mine Operations Extension (Stage 3) and Mine Closure Planning Public Environmental Review.

One appeal against the NR17V approval was received and an Appeals Committee was appointed by the Minister. The Appeals Committee Report was subsequently reviewed by the Minister and while the appeal was dismissed in March 2010, two recommendations made by the committee require implementation. These recommendations have also been included in this NVMMP.

KCGM believes this NVMMP provides best practices and procedures to enable the Fimiston Operations to continue in a reasonable and practicable manner, while providing an acceptable noise environment for the residents of the City of Kalgoorlie-Boulder. Through implementation of this NVMMP, KCGM commits to undertake all reasonable, practicable and safe measures to meet the relevant noise and vibration standards.

This NVMMP covers:

- Environmental Noise Modeling and Verification;
- Environmental Noise and Blast Overpressure and Vibration Control Strategies;
- Monitoring and Reporting of Noise, Overpressure and Vibration; and
- Community Consultation and Complaint Management.

This version of KCGM's NVMMP (October 2010) supersedes all previous NVMMP documents.

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2 HISTORY OF FIMISTON NOISE APPROVALS

KCGM's operations commenced prior to the development of the *Environmental Protection (Noise) Regulations 1997* (Noise Regulations) and historically operated in accordance with Ministerial Conditions for the Project. KCGM was granted approval by the Western Australian Minister for the Environment in October 1991 under Ministerial Statement No. 188 *Fimiston Project Stage II – Mine and Waste Dumps (248)*.

Condition 4 of Statement 188 required the Minister to set noise level standards for the Fimiston Operations. In November 1992 the *Noise Level Standards for Operations at Kalgoorlie* were established within which the Minister recognised the unique situation of the KCGM operations:

“The residential areas of Kalgoorlie-Boulder affected by noise from mining activities have existed for many years and are located very much closer to the mine sites than the standards today would permit. 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 mining and mineral processing activities.”

Without further approvals mining in the Fimiston Open Pit would cease in around 2012. To continue operations, KCGM submitted a proposal to the Environmental Protection Authority (EPA) to undertake the *Fimiston Gold Mine Operations Extension (Stage 3) And Mine Closure Planning*. The Public Environmental Review (PER) for this project was released in September 2006 and included the Golden Pike Cutback (along the western edge of the open pit) and additional storage areas for waste rock and tailings. This project will extend KCGM mining and mineral processing operations to around 2021.

As part of the PER process it was highlighted that the applicability and enforceability of the 1992 Ministerial Noise Standards was unclear and it was proposed that this be clarified. It was identified that the existing Fimiston Operations may not comply with the most stringent night time assigned noise levels under the Noise Regulations even with controls in place. It was also noted that the ambient noise levels in Kalgoorlie-Boulder with no mining activity occurring are also above the night time assigned noise levels.

In February 2007, KCGM applied to the Minister for the Environment in accordance with Regulation 17 of the Noise Regulations for approval to allow noise emissions to vary from the standards specified. The EPA released its report and recommendations for both the PER (Bulletin 1273) and Regulation 17 Application (Bulletin 1274) in December 2007 and forty seven submissions were received.

Following consideration of the submissions the Minister for the Environment granted KCGM's application for a Noise Regulation 17 Variation. The *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2009* was published in the Government Gazette in July 2009. One appeal against this approval was received and an Appeals Committee was appointed by the Minister. The Appeals Committee Report was subsequently reviewed by the Minister and while the appeal was dismissed in March 2010, two recommendations made by the committee require implementation.

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3 ENVIRONMENTAL NOISE MODELLING AND VERIFICATION

Since September 1991 KCGM has been guided by noise consultants Herring Storer Acoustics through its undertaking of extensive modelling and assessment of KCGM operations and plans. Based on the recommendations from this work, KCGM has adopted management practices to minimise noise emissions from its mining and mineral processing activities (refer to Section 4.2).

3.1 Modelling

Modelling is carried out to quantify the noise environment, establish a model for planning purposes and to develop noise control strategies.

The modelling is primarily undertaken using the SoundPlan software programme to predict, assess and map noise. KCGM understands this programme is recognised by the DEC as a reliable tool in the forward planning, applications assessment and operation of sites which contain noise sources as part of their operations.

The noise sources used in the modelling have been taken from actual measurements of equipment used at KCGM.

3.2 Model Validation and Direct Noise Measurements

Noise measurements have also been taken at fixed sites in residential areas. These direct measurements were carried out during the middle of the night in order to minimise the effects of other noise sources in the city.

The measurements served two main purposes:

- Validation of the predictions of the model; and
- Assessment of background noise levels in the absence of mining. In order to achieve this goal, a complete shutdown of the mining operation was undertaken.

3.3 Modelling to Identify Environmental Noise Reduction Opportunities

NR17V approval Clause 9 requires KCGM to undertake all reasonable measures to reduce noise, with the aim of a 3dB reduction within 5 years. KCGM has engaged Herring Storer Acoustics to undertake a site-wide noise modelling programme for different mining stages and operational activities. The aim of this modelling is to identify areas which can be further investigated for additional noise control.

Modelling will enable noise sources (and locations) to be rank ordered for the BPS receiver point. This is a useful tool for prioritising noise control either by way of equipment modifications, re-routing roads or the addition of internal noise barriers.

Once target areas are identified KCGM will undertake a cost / benefit analysis of the potential noise control projects and proposed timing of implementation. Where possible an estimate of the cost per dB reduction for these projects will be included to determine if changes are both reasonable and practicable.

Updates regarding the outcomes of this modelling will be provided to the DEC in the quarterly and annual noise reports (Section 6.5).

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4 ENVIRONMENTAL NOISE CONTROL STRATEGY

KCGM has developed and implemented an environmental noise control strategy to minimise the noise emissions from its mining and mineral processing activities. The strategy ensures compliance with environmental noise standards and is based on noise modelling and assessment conducted at KCGM.

KCGM has prioritised noise control from its operations over many years and has a focus on continual improvement. KCGM is committed to investigating and where practicable, using the best technologies and procedures in terms of noise control.

4.1 Environmental Noise Levels

Noise levels for KCGM are set in the *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2009*. These noise levels were set based on reference locations and prevailing weather conditions. The $L_{A\ 10}$ and $L_{A\ max}$ levels for specific reference locations are determined by adding to the decibel values (Table 1), the Weather Influencing Factor (WIF) (Table 2) for that location (according to the wind speed and direction at the time measurements are taken).

Table 1 KCGM Fimiston Operations Approved Noise Levels

Reference Location	Time of Day	Approved Level (dB)	
		$L_{A\ 10}$	$L_{A\ max}$
Kalgoorlie Technical School (KTS)	Day ¹	50 + WIF ²	62 + WIF
	Evening ³	45 + WIF	52 + WIF
	Night ⁴	45 + WIF	52 + WIF
Boulder Primary School (BPS)	Day	50 + WIF	62 + WIF
	Evening	45 + WIF	52 + WIF
	Night	45 + WIF	52 + WIF
Outram Street, Boulder (OST)	Day	52 + WIF	65 + WIF
	Evening	49 + WIF	60 + WIF
	Night	49 + WIF	60 + WIF
York Street, Boulder (YST)	Day	52 + WIF	65 + WIF
	Evening	49 + WIF	60 + WIF
	Night	49 + WIF	60 + WIF
Barton Street, Williamstown (BSW)	Day	50 + WIF	65 + WIF
	Evening	45 + WIF	55 + WIF
	Night	45 + WIF	55 + WIF

¹ Day: 0700 to 1900 hours Monday to Saturday and 0900 to 1900 hours Sunday and Public Holidays

² WIF = Weather Influencing Factor

³ Evening: 1900 to 2200 hours all days

⁴ Night: 2200 on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays

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Table 2 KCGM Fimiston Operations Approved Weather Influencing Factors (WIF)

Wind Direction	Wind Speed (km/h)	Reference Location				
		BSW	KTS	YST	BPS	OST
Calm	<2	3	6	4	6	5
Northerly	≥2	-2	6	5	6	5
North Easterly	≥2	2	6	5	6	4
Easterly	≥2	4	6	5	6	4
South Easterly	≥2	4	6	5	6	3
Southerly	≥2	4	6	5	4	2
South Westerly	≥2	3	5	4	2	2
Westerly	2-7	0	6	2	2	3
Westerly	>7	-4	-2	-3	-3	3
North Westerly	2-7	-4	3	2	4	4
North Westerly	>7	-6	-1	-1	3	3

4.2 Management of Environmental Noise

KCGM's operations are planned and managed so that due consideration is given to noise emission levels. KCGM has identified activities and equipment that are significant noise sources and developed methods for minimising their impact.

4.2.1 Environmental Noise Bund

A key noise management feature at KCGM has been the establishment of the environmental noise bund (Figure 1). Prior to the commencement of the KCGM operations results of modelling work indicated that an earthen bund between the Fimiston Operation and City of Kalgoorlie-Boulder would significantly reduce nuisance noise (Figure 2).

The first stage of the environmental noise bund was constructed using waste rock in 1993. Other modifications were undertaken between 1999 to 2001. The construction of the Southern Environmental Noise Bund Extension to close the noise emission corridor from the southern end of the open pit operation commenced in August 2004 and is progressing. Construction of the Environmental Noise Bund Realignment for the Golden Pike Cutback commenced in mid June 2007 and was around 60% complete in July 2010.

With the increasing depth of the open pit and height of the waste rock landforms the environmental noise bund is becoming less effective for the general Fimiston Operations. However noise bunding is still a very effective noise control measure for specific activities in close proximity to the bunds (i.e. Golden Pike Cutback).

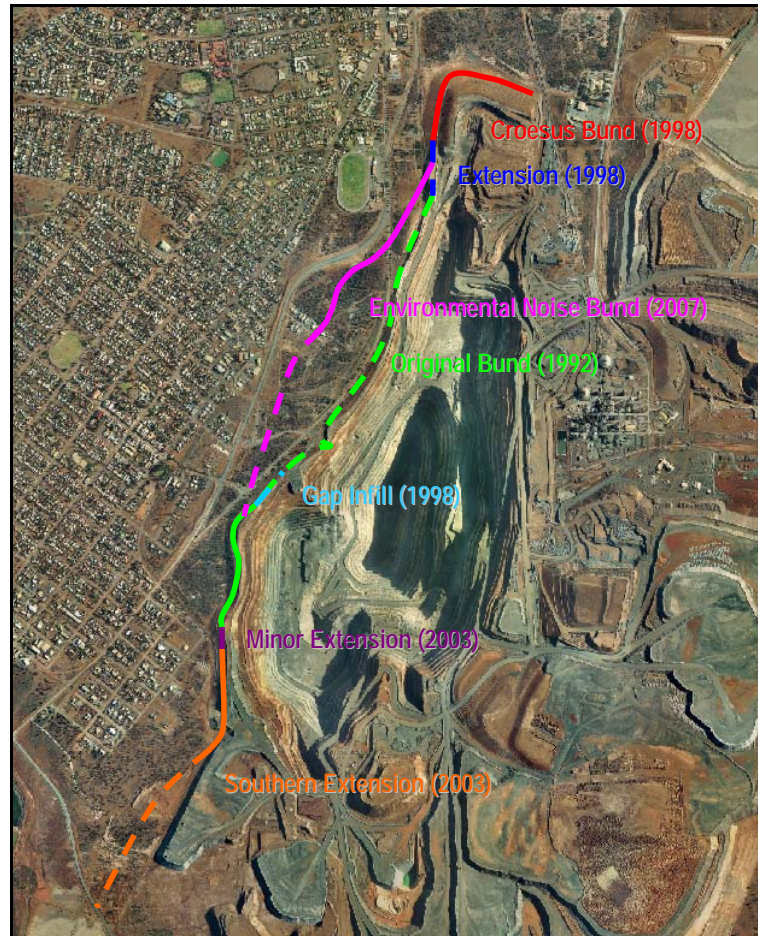


Figure 1 KCGM Environmental Noise Bund Construction History

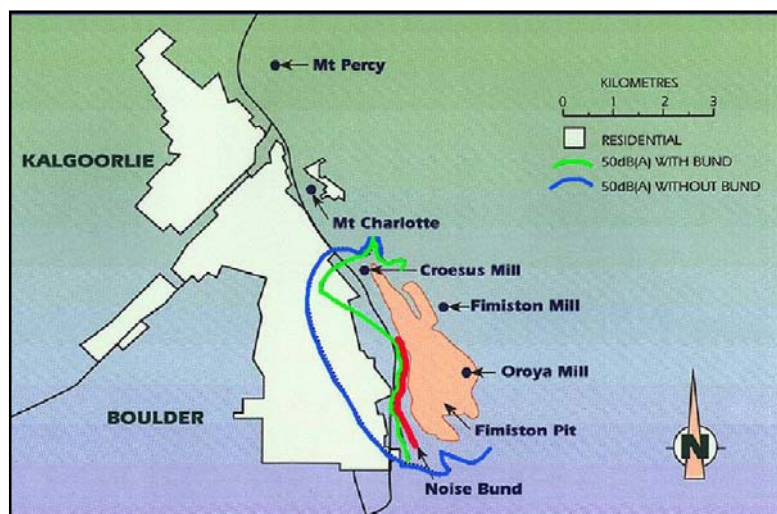


Figure 2 Impact of Environmental Noise Bund on the 50dB_(A) Contour

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Noise controls utilised during the construction of the environmental noise bund include:

- Ensuring the quietest equipment available is used;
- Ensuring the operation of equipment for the construction of the noise bund is restricted to 1900 to 0700 hours Monday to Saturday and not on Sunday or public holidays;
- Ensuring that all contractors and staff involved with the construction of the noise bund undertake an area-specific induction to raise awareness of potential environmental impacts on the community (e.g. noise and dust) and the importance of noise control;
- Ensuring action is taken (as appropriate) in response to feedback from stakeholders regarding noise management practices; and
- Undertaking modelling to determine predicted noise levels and best practice controls during construction.

4.2.2 Surface Activities

Noisier activities, such as long hole percussion drilling and rock breaking (Figure 3), could result in higher noise emission levels when carried out at the surface. Where required, these activities are restricted to the time period only 0700 to 1900 hours Monday to Saturday and 0900 to 1900 hours Sundays and public holidays.



Figure 3 Rock Breaking

During mining of the Golden Pike Cutback there is the potential for increased noise emission levels when vehicle movement and loading occurs near ground surface level. As the depth of mining increases the noise emission levels experienced at neighbouring premises will decrease as the pit wall effectively acts as a height extension to the environmental noise bund.

To minimise the potential impact of noise from mining of the Golden Pike Cutback, surface activities will be limited to days only (0700 to 1900 hours Monday to Saturday and 0900 to 1900 hours Sundays and public holidays) until reaching a level that is 20 metres below the undisturbed ground surface level.

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Construction of the waste rock landform to the north east of the Fimiston Operations has the potential to increase noise emission levels received by the residents of Williamstown. To minimise the potential noise emissions from the dumping of waste rock, KCGM will construct a 20m high bund along the northern edge of the waste landform. The construction of this bund will be limited to days only (0700 to 1900 hours Monday to Saturday and 0900 to 1900 hours Sundays and public holidays) and in advance of the waste landform construction. Subsequently, additional bunds will be constructed prior to the dumping of waste rock occurring on each lift of the waste landform.

4.2.3 Waste Rock Transportation to Mt Charlotte Glory Hole

Backfilling of underground voids at Mt Charlotte is an important part of the operation to ensure the safety and stability of the mine. This is achieved by dumping rock to the Glory Hole which is open to the ground surface at Mt Charlotte. This backfilling was initially undertaken by haul trucks, however due to residents' concerns; an alternative method for transportation of the waste rock was required.

In 2000, decommissioned conveyor equipment, already located at Mt Charlotte was extended and modified for the backfilling job. The conveyor eliminated the need to use haul trucks and has significantly reduced the noise emission levels associated with the transportation of waste rock to the Mt Charlotte Glory Hole.

Part of the conveyor design included an elevated section to cross Williamstown Road (Figure 4). This section is fully enclosed and internally lined with insulation to reduce noise. The cover also eliminates any danger of rocks falling as a result of spillage or belt breakage. An additional noise control measure includes an enclosure constructed around the transfer chute on the western side of the conveyor.

During normal operations, the conveyor is used during dayshift (0700 to 1900 hours Monday to Saturday only). The use of haul trucks may still be required to complete the backfilling operation after Mt Charlotte closes if other conveyor modifications cannot be made.

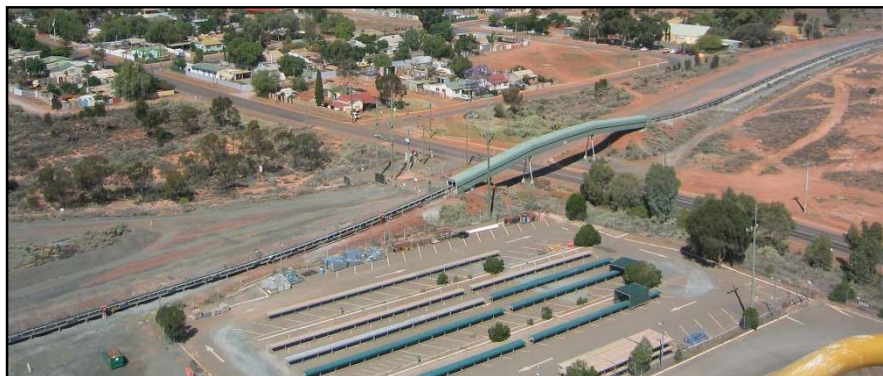


Figure 4 Fimiston to Mt Charlotte Overland Conveyor

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4.2.4 Resource Definition Drilling

KCGM's exploration drilling operations can occur in close proximity to residential properties in the City of Kalgoorlie-Boulder, and hence require some form of noise control.

In June 2002 a detailed noise management plan was developed by Herring Storer Acoustics (HSA) for a KCGM resource definition drilling programme on the western side of the Fimiston Open Pit that was in close proximity to residential areas. Due to the similarities between this drilling programme and other programmes conducted by KCGM (i.e. proximity to residential areas and equipment used) the noise control principles and practices developed by HSA are used to manage potential noise impacts for drilling programmes which fit this profile.

Noise control measures may include restricting times of operation and procedures to be followed for certain potentially noisy operations or engineered noise control. Environmental Management Plans are developed for each drilling project near residential areas including the assessment of predicted and assigned noise levels.

As part of the 2002 drilling programme KCGM designed and constructed trailer mounted acoustic screens (Figure 5). One of the key design features (other than noise control) was that the screen was portable and easy for the operators to use. The acoustic screen is an important noise control feature of KCGM's resource definition drilling noise management programme.



Figure 5 Drill Rig Acoustic Screen

4.2.5 Mobile Equipment

Noise emission levels from mobile equipment used for production (e.g. haul trucks, front end loaders, face shovels and drills) are measured and appropriate engineering noise controls applied to the extent that such techniques are reasonable, practicable and safe in a mining environment.

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A mining noise investigation conducted in 2000 identified that additional improvements could be made in the area of haul truck noise. Based on these findings, during 2002 KCGM undertook an improvement program to retrofit existing trucks with quieter engines. New trucks purchased since this time have quieter engines and fans as a standard.

KCGM continues to work with suppliers and manufacturers to investigate further opportunities to minimise noise characteristics of equipment where practicable through procurement specifications.

In 2009 KCGM commenced exploring the success of using sound suppressant mufflers in the Caterpillar 793C haul trucks. Noise investigations have indicated that noise from haul trucks in residential areas is dominated by exhaust noise over engine noise and as such any reduction of exhaust noise is considered significant.

In August 2009, muffler exhaust measurements were taken before a truck was sent offsite to be rebuilt and installed with a sound suppressant muffler. In February 2010, the truck was tested when it returned to site with a new muffler and results indicated a 2 dB_(A) sound pressure level reduction.

KCGM will continue to explore the potential for this modification on a larger number of trucks and investigate other suppliers with the aim of achieving further noise reduction. It is anticipated once the maximum achievable reduction is achieved, sound suppressant mufflers will be rolled out progressively.

Noise assessment and modeling has identified haul trucks as the primary source of noise from KCGM's operations. KCGM has therefore focused on reducing noise emission levels of the haul trucks and ensuring that they do not deteriorate and become noisier over time.

KCGM undertakes six-monthly noise monitoring of individual haul trucks (793C) to enable analysis of noise performance trends and identify if additional maintenance is required. KCGM will be guided by noise consultant advice and recommendations based on the results of this monitoring programme regarding the development of a specific procedure to reduce truck noise during maintenance.

The noise monitoring is undertaken in accordance with *AS2012.1-1990: Acoustics - Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors - Stationary test condition - Determination of compliance with limits for exterior noise*.

During each six-monthly noise monitoring run a minimum of 75% of the 793C trucks are measured, this allows for trucks which may be unavailable due to breakdown and scheduled maintenance. If over time the variation in individual truck noise is quite small the percentage of trucks measured may be reviewed.

Results of the six-monthly noise monitoring of haul trucks is included in KCGM's Annual Noise Monitoring and Management Report submitted to the DEC (Section 6.5.3).

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4.2.6 Reversing Alarms

Reversing warning alarms are required for safety purposes on mobile equipment operating on any mining or mineral processing site in accordance with Regulation 13.3(1) of the *Mines Safety and Inspection Regulations 1995*. The signals from audible alarms are by design intrusive in nature and are recognised as a significant environmental noise source.

KCGM operations originally utilised “smart alarms” on mobile equipment which were able to adjust their output so that the signal is adjusted to 5dB_(A) above background noise levels. Thus the emitted signal (reversing alarm) is reduced during quiet periods (e.g. at night).

In 2006 KCGM became aware of a new type of reversing alarm which utilises broadband frequency noise as opposed to tonal noise as the warning signal. Testing of the Brigade Electronics PLC broadband reversing alarm, model BBS-102 indicated that:

- They attenuate more with distance (such that the overall dB(A) levels are lower); and
- The tonality of normal and smart alarms is not present as it is spread over several $\frac{1}{3}$ octave centre frequencies.

In 2007, broadband reversing alarms were successfully trialed on equipment at the Fimiston crusher area. This is a restricted work area with a small crew which helped with the initial education programme. The crusher area is also in a high elevation area. The alarm performance was evaluated over a number of months in particular to see if there was any community feedback as the broadband alarm sound is very different from “normal”.

As a result of this successful trial KCGM is installing broadband reversing alarms on mobile equipment permanently onsite at the Fimiston Operation. Broadband reversing alarms were rolled out to the larger open pit mining fleet during 2009 and the loaders, dozers and graders during 2009 and the first quarter of 2010. The alarms will be installed on the remaining mobile equipment during the second half of 2010.

KCGM purchased a Letourneau Loader in 2008 and the standard horn was identified as a target for noise reduction investigation. During the first quarter of 2010, two green lights were fitted to the loader facing the front and the side above the two front tyres. A control switch, when activated at night, engages the lights rather than the horn. The lights are visible to the truck drivers and used to indicate when loading is complete (replacing the need to use the horn) thus reducing overall noise emissions and a potentially annoying noise source.

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5 BLAST OVERPRESSURE AND VIBRATION CONTROL STRATEGY

KCGM has developed and implemented a blast overpressure and vibration control strategy to minimise the impacts from its mining activities. The strategy ensures compliance with relevant standards and is based on recommendations of specialist consultants and past experience.

5.1 Blast Overpressure and Vibration Levels

Blast overpressure and vibration levels for KCGM are set in Ministerial Statement 782 Conditions 9-3 and 9-5. Table 3 outlines blast overpressure limits and standards from Regulation 11 of the *Environmental Protection (Noise) Regulations 1997*. Table 4 outlines vibration limits (measured as peak particle velocity (ppv)) for the Fimiston Operation.

Table 3 KCGM Fimiston Operations Blast Overpressure Levels

Day and Time	Blast Frequency	Overpressure Limit
0700 to 1800 hours Monday to Saturday	No blast <i>greater than</i>	125 dB L _{Linear peak}
	9 in any 10 consecutive blasts <i>less than</i>	120 dB L _{Linear peak}
0700 and 1800 hours Sunday or public holiday	No blast <i>greater than</i>	120 dB L _{Linear peak}
	9 in any 10 consecutive blasts <i>less than</i>	115 dB L _{Linear peak}
1800 to 0700 hours ⁵ Any Day	No blast <i>greater than</i>	90 dB L _{Linear peak}

Table 4 KCGM Fimiston Operations Blast Vibration Levels

Blast Frequency	Vibration PPV Limit ⁶
90% of blasts per year less than	5 mm/sec
No blast greater than	10 mm/sec
9 in any 10 consecutive blasts less than	5 mm/sec

⁵ Except where blasting is in accordance with Regulation 8.28(4) of the Mines Safety and Inspection Regulations 1995, levels apply as appropriate for the time when it was intended that the blast be fired.

⁶ Vibration limits can be measured or calculated in accordance with section J4.2 of *Australian Standard 2187.2-2006*, for the protection of human comfort at any houses and low rise buildings, theatres, schools and other similar buildings occupied by people and not owned by the proponent.

5.2 Management of Blast Overpressure and Vibration

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 set parameters. These parameters or restrictions applied through regulatory controls or commitments by KCGM.

5.2.1 *Blasting Times*

Primary blasting is only carried out during daylight (between 0700 and 1800 hours) and, on most occasions occurs at a publicised time each day (generally 1300 or 1700 hours). Where weather, safety or production requirements preclude blasting at the set time blasting may be undertaken at short notice. Whenever possible, explosives placed for surface blasts are fired when weather conditions are such that the impact of blast overpressure and dust emissions on residential areas of Kalgoorlie-Boulder are minimised.

Ministerial Statement 782 Condition 9.1 requires that blasting outside of the hours 0700 to 1800 will only be undertaken in accordance with Regulation 8.28(4) of the *Mines Safety and Inspection Regulations 1995*. If this blasting occurs KCGM will submit a report to the DEC within 36 hours (Section 7.2.2).

In accordance with Ministerial Statement 782 Condition 9.4, KCGM will take all reasonable effort to avoid blasting on Sundays.

5.2.2 *Procedures and Training*

KCGM has internal procedures and training for blasting to ensure that the quality of the blast design and set up is within the set guidelines. It has been shown that charging the rock to specification will significantly reduce undesirable events that may be produced from a shot during the blasting process.

KCGM have been blasting in the current environment since 1989 and have built up considerable expertise in controlled blasting. The Chaffers Cutback commenced in 2003 and it involved blasting in ground conditions similar to what will be encountered in the Golden Pike cutback (i.e. oxide, transitional then to fresh rock conditions). Considerable trialling of the use of electronic detonators and minimum charge weight was undertaken to ensure vibration control.

5.2.3 *Quality Assurance*

KCGM has a quality assurance (QA) system of continuous measurement and review of drilling, charging and firing practices to ensure the best possible outcomes from a blast.

Daily production at the Fimiston Open Pit is approximately 250,000 tonnes per day. Blasting has to keep pace with this level of production, requiring the drilling and loading of about 300 holes per day. Often these holes are loaded in a difficult environment because of the number of old workings in the area. Monitoring the results of these blasts helps establish a sound knowledge base that can be used for future blasting.

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Several QA studies have been completed to measure every aspect of drilling and charging. The aim of these studies was to see how accurately the KCGM drill and blast crews can follow the blast design given the pressures of being able to blast in a timely manner. The studies have revealed that the more intense the QA, the more accurate is the drill and blast process. Drilling and blasting to design leads to fewer undesirable outcomes.

5.2.4 Personnel and Supervision

It is recognised that the selection of very competent personnel and their subsequent supervision will largely overcome the 'human factor' in the implementation of procedures and quality assurance systems in the drilling and blasting process.

To assist this, KCGM have encouraged the concept of a professional culture within the respective drilling and blasting crews. For example videos of blasts are examined by blast crews in detail for evidence of surface ejection and discussion will arise as to their possible causes.

In addition, any blasts which exceed the KCGM internal limits are recorded in the Incident Reporting System where they will prompt a full investigation and provide notification to the people responsible for preparing the blast. With each incident there is an increase in the knowledge base in working in this environment of all involved personnel. Human errors are also recorded so that all the crew can continually examine and improve their work and back-up systems.

5.2.5 External Projects

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.

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 200m. This blast was successful in achieving the desired outcome of fragmentation without flyrock and excessive vibration.

5.2.6 Research and Development

KCGM has been very proactive in promoting less invasive blasting techniques while still achieving the mining outcomes required. Following are a number of initiatives designed to provide information on and improvements in blasting techniques at KCGM.

- 'Near Field' Vibration Study

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This study was undertaken jointly with technical personnel from Orica in May 2006. By understanding how the rock behaves when subject to the pressure waves of a blast, it is possible to 'fine tune' blasting methods to minimise blasting vibration.

- Electronic Detonators

KCGM has been involved in a considerable amount of research into the use of electronic detonators, driven in part from the perceived environmental benefits (reduced vibration) of extremely accurate timing that is 'customised' for particular ground conditions. The experimentation with electronic detonators is continuing.

- Studies into 'Domain Blasting'

This is where the rock strength is predicted by examining the penetration rate of drills or studying the geology of the area. The aim of the exercise is to have a formal prediction process that prevents weaker rock areas being overcharged, which will lead to overpressure and flyrock. Domain blasting studies have been completed.

- High Speed Camera

KCGM utilises a high speed camera capable of showing blasts in one two-thousandth of a second frames. This, coupled with a better blast monitoring systems will be able to give KCGM a better understanding of what processes are leading to unfavourable events within blasts.

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6 ENVIRONMENTAL NOISE MONITORING PROGRAMMES

KCGM conducts environmental noise monitoring in accordance with the requirements of the *Environmental Protection (Noise) Regulations 1997*. Clause 7 of the NR17V Approval requires that both continuous and compliance noise monitoring programmes are undertaken.

6.1 Continuous Environmental Noise Monitoring

Since 1993, continuous noise monitoring, as far as practical, has been conducted at the Kalgoorlie Technical School (KTS) and Boulder Primary School (BPS) including the assessment of noise triggers. Where the noise monitoring results show that mining noise is causing an unusual increase in trigger events these are investigated to determine the source of the noise. If the source can be identified, reasonable, practicable and safe action is taken to reduce the noise where possible.

The continuous noise monitoring data from KTS and BPS is influenced by other noise sources such as traffic and social activity and does not only represent noise emission levels from the Fimiston Operations. Therefore it is not a reliable indicator for determining compliance with the noise level standards set in the NR17V Approval (Table 1).

The continuous noise monitoring data does however provide a reference for the comparison of noise levels over time. Data from the continuous noise monitoring programme are included in KCGM's quarterly and annual noise reports and advertised quarterly in the local Kalgoorlie Miner newspaper (Section 6.5).

6.1.1 Monitoring Equipment

Continuous noise monitoring is undertaken using a Class 2 type RTA Technology Environmental Noise Logger Model RTA02 (or similar). The RTA02 is a self contained sound level measuring instrument with statistical processing capabilities. Sound levels are sampled at a rate of 10 samples per second and the L_{eq} , L_{max} , L_1 , L_{10} , L_{50} , L_{90} , L_{95} and L_{max} statistical levels are calculated.

Additionally, the logger incorporates a Sony ICD-ST10 digital recorder (or similar) programmed to turn on for predefined conditions each day. This noise trigger recording function is used to establish the contribution of mining noise at the monitoring site.

The noise trigger function is set to operate between 1900 hours and 0700 hours. This is the time when mining noise is most noticeable as traffic noise is at a minimum. A noise trigger event is recorded when the noise level exceeds 60 dB_(A) between 1900 and 2200 hours and 55 dB_(A) between 2200 pm and 0700 hours for more than two minutes. The digital recorder stamps all triggers with the date and time of the event.

KCGM Environmental personnel download noise data and noise triggers weekly, the data is then imported into an environmental Monitoring Database on the KCGM network.

KCGM is currently investigating the availability of other monitoring equipment to replace the RTA loggers in conjunction with the real-time monitoring equipment installation recommended by the Appeals Committee (refer to Section 6.4).

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6.1.2 Monitoring Equipment Calibration

Maintenance and field calibration of the RTA02 noise loggers is conducted on a weekly basis by KCGM Environmental personnel in accordance with an internal standard operating procedure.

The field calibration is undertaken using a 100Hz Rion NC-73 sound level calibrator, or equivalent. The calibrator is calibrated by a NATA authorised company every two years.

The noise loggers are calibrated every two years by a NATA accredited laboratory. The calibration meets the requirements of Australian Standard AS1259.1 1990 "Sound Level Meters Part 1: Non-integrating" and Australian Standard AS1259.2 1990 "Sound Level Meters Part 2: Integrating-averaging".

6.2 Compliance Environmental Noise Monitoring

Compliance environmental noise monitoring is undertaken each quarter by specialist noise consultants to determine compliance against the noise level standards set in the NR17V Approval (Table 1). The measurement and assessment of noise levels at the five reference locations is undertaken in accordance with Part 3 of the *Environmental Protection (Noise) Regulations 1997*.

KCGM's compliance noise monitoring programme involves the:

- Measurement of noise levels ($L_{A\ 10}$ and $L_{A\ max}$) at five reference locations set in the NR17V Approval (Figure 6); and
- Review of weather monitoring data, i.e. wind speed and direction to determine the applicable WIF (Table 2).

The five reference locations are:

- Barton Street Williamstown (BSW) - any place at or adjacent to the intersection of Barton Street and Baden Street, Williamstown;
- Boulder Primary School (BPS) - any place within the boundary of the premises known as Boulder Primary School, Brookman Street, Boulder;
- Kalgoorlie Technical School (KTS) - any place within the boundary of the premises known as Kalgoorlie Technical School, corner Davidson Street and Wilson Street, Kalgoorlie;
- Outram Street Boulder (OST) - any place at or adjacent to the intersection of Outram Street and Shannon Street, Boulder;
- York Street Boulder (YST) - any place on York Street, between Lane Street and Hamilton Street, Boulder.

The compliance noise monitoring is performed during the evening and/or night periods to minimise the sources of contributing noise (other than mining i.e. traffic). Monitoring commences at around 2100 hours on five consecutive nights each quarter. This monitoring time has been selected as it represents the time at which the Kalgoorlie-Boulder residents could be most affected by mining noise from Fimiston Operations and because the evening and night have the lowest approved levels.

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The compliance noise measurements are undertaken using manned sound level meters and contributing noise (other than mining) is excluded from the sound pressure level logs. Digital noise recordings are also taken during the sampling period.

Weather conditions (wind speed and direction) are considered during compliance monitoring as they can influence the noise levels received at the monitoring locations. The NR17V Approval requires that a WIF is applied to calculate the approved noise levels. Compliance noise monitoring measurements are compared against the approved levels once the WIF is determined and applied.

If the compliance noise monitoring measurements indicate levels higher than the approved levels, KCGM will immediately investigate and identify the source. When the source is identified, reasonable, practicable and safe action will be taken to reduce the noise where possible. Additional monitoring will also be undertaken to confirm that any action has resulted in noise levels meeting the approved levels.

KCGM may also undertake additional noise monitoring based on feedback from the community. Results of the compliance noise monitoring in comparison to the approved noise level at the five reference locations are included in KCGM's quarterly and annual noise reports (Section 6.5).

KCGM considers that it is now more relevant to the community to advertise (and provide on the website) the results from the quarterly compliance monitoring rather than the current continuous noise monitoring trigger data. KCGM will propose an alternative advertisement format to be approved by KCGM's Community Reference Group (Section 6.5.2).

6.3 Weather Monitoring

Weather monitoring equipment at KCGM's weather station MEX (Figure 6) is used to determine the WIF (Table 2) to calculate the noise level standards set in the NR17V Approval that KCGM must comply with (Table 1).

The MEX weather station has a MET ONE model 50.5 sonic anemometer installed which measures real time (5-minute averaged) wind speed and direction data. The anemometer is calibrated on a two yearly basis, or as required by the manufacturer.

Monitoring data are stored in the Process Information (PI) system, which is a process historian. The processed data are transferred to the operational control systems where it can be viewed live by operators as part of the air quality management programme.

Weather data can also be obtained from the Bureau of Meteorology site located at the Kalgoorlie-Boulder airport if required.

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Figure 6 Noise Monitoring Network Location Plan

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6.4 Real-Time Noise Monitoring

One appeal against the NR17V approval was received and an Appeals Committee was appointed by the Minister. The Appeals Committee Report was subsequently reviewed by the Minister and while the appeal was dismissed in March 2010, two recommendations made by the committee required implementation. One of the recommendations relates to real time monitoring and reporting specifically to;

- Detail, where practicable, the work required for the future installation and maintenance of a real-time noise monitoring site that is accessible by the public via the internet and preferably through the KCGM website.

6.4.1 NR17V Appeals Committee Recommendation Details

The Appeals Committee recommended that as part of the NVMMP, KCGM install and maintain a real-time noise monitoring site that is accessible by the public via the internet and preferably through the KCGM web site. The data provided should be updated at least every 15-minutes and it is suggested that the $L_{A 50}$ noise level be provided.

Although it is not intended that this data would form part of the compliance monitoring reporting, it would provide the community with some validation if they are aggrieved by the noise emission from the mine. It may also provide valuable data in determining certain meteorological conditions that may result in an increase in noise complaints, which can be used for noise management purposes.

It is envisaged that the site be established within an area representative of the greatest noise impact to residents.

6.4.1 Implementation Plan

A Working Group has been established to discuss and reach consensus on how best to implement the Committee's recommendations. During preliminary meetings a number of potential real-time noise monitoring sites were identified.

KCGM has developed a preliminary implementation plan (Table 5) for the installation of the real time monitoring system. This plan will be discussed in detail with the Working Group.

Outcomes from the Working Group meetings including the progress on implementation of the real-time noise monitoring programme are documented in *KCGM's Proposal to Meet Fimiston Operations Noise Regulation 17 Variation Appeal Committee Recommendations, Noise Amelioration Programme and Real Time Noise Monitoring*.

Updates regarding the implementation of the real-time noise monitoring programmes will also be provided to the DEC in the quarterly and annual noise reports (Section 6.5).

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Table 5 KCGM Real Time Noise Monitoring Preliminary Implementation Plan

Action	Comments	Estimated Timing
Set up a "Working Group"	The Working Group includes KCGM personnel, and representatives from the City of Kalgoorlie-Boulder, DEC, Kalgoorlie-Boulder Community and the Main Roads Department.	July 2010 (completed)
Hold regular meetings with the Working Group	The Working Group has been established to determine, discuss and reach consensus on an appropriate real-time noise monitoring site and what detail of data should be made available on the internet.	3-Monthly (ongoing)
Determine appropriate monitoring site	Potential sites have been identified by working group, assessment by noise consultant underway.	December 2010
Determine appropriate noise logging equipment	A noise logger capable of measuring continuous noise data, and recording noise trigger events, and capable of transmitting data directly to the KCGM network.	January 2011
Determine internet interface	Internet page to display L_{A50} noise level data to be updated every 15-minutes.	February 2011
DEC approval of site and monitoring equipment	The final location is to be approved by the Director of the Environmental Regulation Division, Department of Environment and Conservation.	March 2011
Install and commission the real-time noise logger and communications	Purchase equipment, install and commission equipment and set-up communications.	May 2011
Real-time noise monitoring data available on internet	Internet page goes live. Fortnight validation period after commissioning.	June 2011

6.5 Reporting of Environmental Noise Monitoring and Management Actions

6.5.1 Quarterly Noise and Blast Monitoring Report

KCGM submits a Noise and Blast Monitoring Report to the DEC on a quarterly basis. This report contains the following information in relation to environmental noise monitoring:

- Continuous noise monitoring and trigger event details including:
 - Number of trigger events recorded for the quarter at KTS and BPS;
 - Number of events dominated by mining, traffic or other sources;
 - Number of mining dominated events caused by reversing alarms, trucks or other sources;
- Information on any data loss, maintenance or calibration during the reporting period;
- Compliance noise monitoring results;
- Details of any noise complaints and action taken during the reporting period;
- Comments regarding any noise management activities during the quarter; and
- Graphs of continuous noise levels recorded at the KTS and BPS monitoring sites for the reporting period.

6.5.2 Quarterly Noise Advertisement

KCGM has been advertising noise monitoring results in the Kalgoorlie Miner each quarter for more than 10 years and results are also on the KCGM website (www.superpit.com.au). In 2005 the quarterly noise advertisement format was revised to its current format (Figure 7) based on public feedback.

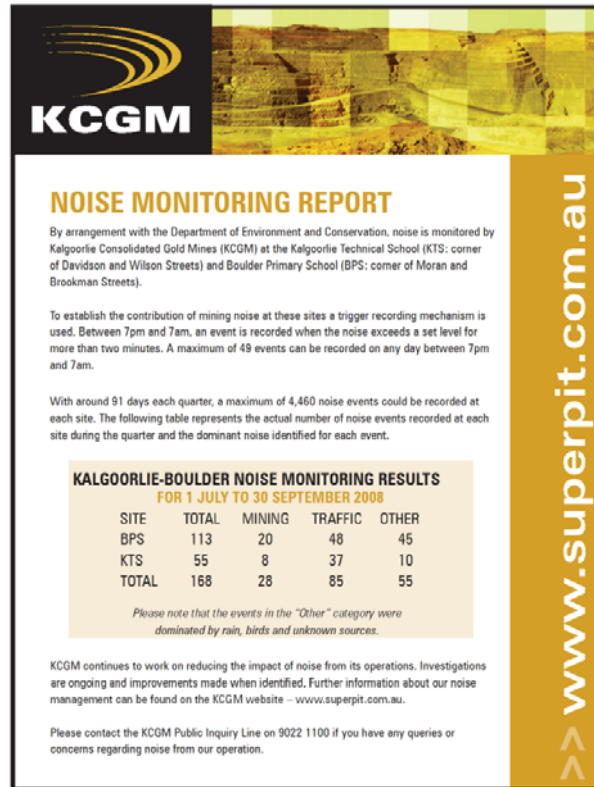
The newspaper advertisement contains information on how many triggers were recorded at the continuous noise monitoring sites and what the dominant noise was for each event recorded. The advert also encourages the community to seek further information or contact KCGM regarding noise by going to the website, or contacting the Public Interaction Line:

- KCGM continues to work on reducing the impact of noise from its operations. Investigations are ongoing and improvements made when identified. Further information on our noise management can be found on the KCGM website – www.superpit.com.au.
- Please contact the KCGM Public Interaction Line on 9022 1100 if you have any queries or concerns regarding noise from our operation.

In consideration of availability of relevant noise monitoring information to the public, KCGM proposes a change to the quarterly noise monitoring advertisement. KCGM considers that it may be more relevant to advertise (and provide on the website) the results from the Quarterly Compliance Monitoring compared with the NR17V approved noise levels (example of data is shown in Figure 8).

KCGM will propose an alternative advertisement format to be approved by KCGM's Community Reference Group at the November or December 2010 meeting.

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KCGM

NOISE MONITORING REPORT

By arrangement with the Department of Environment and Conservation, noise is monitored by Kalgoorlie Consolidated Gold Mines (KCGM) at the Kalgoorlie Technical School (KTS: corner of Davidson and Wilson Streets) and Boulder Primary School (BPS: corner of Moran and Brookman Streets).

To establish the contribution of mining noise at these sites a trigger recording mechanism is used. Between 7pm and 7am, 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 day between 7pm and 7am.

With around 91 days each quarter, a maximum of 4,460 noise events could be recorded at each site. The following table represents the actual number of noise events recorded at each site during the quarter and the dominant noise identified for each event.

KALGOORLIE-BOULDER NOISE MONITORING RESULTS FOR 1 JULY TO 30 SEPTEMBER 2008				
SITE	TOTAL	MINING	TRAFFIC	OTHER
BPS	113	20	48	45
KTS	55	8	37	10
TOTAL	168	28	85	55

Please note that the events in the "Other" category were dominated by rain, birds and unknown sources.

KCGM continues to work on reducing the impact of noise from its operations. Investigations are ongoing and improvements made when identified. Further information about our noise management can be found on the KCGM website – www.superpit.com.au.

Please contact the KCGM Public Inquiry Line on 9022 1100 if you have any queries or concerns regarding noise from our operation.

www.superpit.com.au

Figure 7 Noise Monitoring Advertisement in the Kalgoorlie Miner

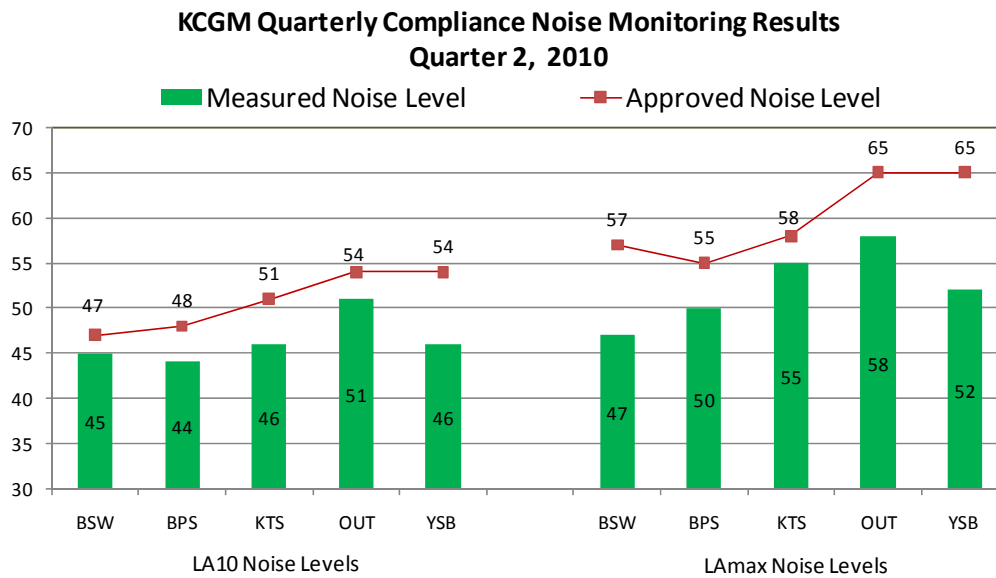


Figure 8 Quarterly Compliance Noise Monitoring Results

6.5.3 Annual Noise Monitoring and Management Report

Clause 10 of the NR17V Approval requires that KCGM prepare and submit an annual report to the DEC Director. The reporting period for the Annual Noise Monitoring and Management Report is 14 July previous year to 13 July current year and the report is due by 14 August each calendar year.

This report contains the following information:

- A summary of the levels of noise recorded at continuous monitoring locations KTS and BPS;
- A summary of the compliance monitoring results conducted at the five reference locations;
- Particulars of actions taken by KCGM during the year to reduce the level of noise emitted from the Fimiston Gold Mine.

The scope of this report is, however, not restricted to the specific requirements of Clause 10. Other areas are included for completeness and in order to ensure all parties are generally informed of KCGM's noise monitoring and management programmes.

6.5.4 Annual Environment Report

KCGM prepares an Annual Environment Report (AER) by 31 March each year which is distributed to Western Australian regulators, within KCGM and to KCGM's Joint Venture Owners. This report primarily outlines compliance and plans for improvement for the period 1st January to 31st December.

The AER is the result of an agreement reached with the two main regulatory bodies that set environmental conditions for KCGM, i.e. the Department of Mines and Petroleum of Western Australia (DMP) and the Department of Environment and Conservation of Western Australia (DEC). Under that agreement, this single report satisfies all regulatory requirements for annual environmental reporting.

The scope of this report is, however, not restricted to regulatory requirements. Other areas are included for completeness and in order to ensure all parties are generally informed of KCGM's environmental programmes.

This report includes a summary of the KCGM noise and vibration management programmes including monitoring results and any management activities undertaken during the reporting period.

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7 BLAST OVERPRESSURE AND VIBRATION MONITORING PROGRAMME

KCGM's blast overpressure and vibration monitoring programme involves recording of overpressure and vibration at reference locations for each blast undertaken. Recording of a blast is triggered by ground vibration exceeding the set trigger level of 0.2mm/sec. KCGM uses a combination of methods for recording blast monitoring data:

- Texcel aTM remote blast monitors;
- Texcel Easylink software;
- KCGM's Operational Management Database (MMRS);
- Geographical Information System (GIS) database;
- Daily Blast Notices;
- Air Quality Control Monitoring; and
- Bureau of Meteorology.

These methods meet the requirements of Section J3.1.2 and J3.4 of Australian Standard 2187.2-2006.

Drill and Blast Personnel

Monitoring of blast overpressure and vibration is undertaken by KCGM Drill and Blast personnel who have acquired, through training and experience, the knowledge and skills required to carry out the task. The Drill and Blast personnel are familiar with the blast monitoring equipment, including the manuals and maintenance procedures. They are aware of the characteristics in each blast including the:

- Size of the blast;
- Designed effective charge of mass per delay;
- Designed blast duration; and
- Distance to all monitoring locations.

MMRS Database

The MMRS database system contains a full history of blast overpressure and vibration responses since 1999. The following information is stored in the MMRS database for each blast undertaken at KCGM:

- Blast size (m³);
- Number of blast holes;
- Planned explosive weight per hole;
- Design timing sequence;
- Method of initiation;
- The date and time of the blast;
- Location of the blast in relation to mine leases;
- Peak particle vibration and peak overpressure level; and
- Design blast hole locations.

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Location of Measurement Transducers

Blast monitors are located at permanent fixed locations recorded in the KCGM Geographical Information System (GIS) database.

Instrument Trigger Levels

The set trigger level for the blast monitoring equipment is recorded in several locations, including the Quarterly Noise and Blast Monitoring Report (Section 6.5.1), Texcel Easylink software and this NVMMMP.

Measurement Equipment and Operator Details

KCGM uses Texcel aTM remote blast monitors which are automatically operated by the Texcel Easylink software. Downloading of data into the MMRS database is conducted on a daily basis by KCGM Drill and Blast personnel.

Location of Blast and Structures

The location of the blast in relation to the mine operation and any structures and/or person who may be affected by the blast is recorded graphically in the KCGM Blast Notice (Figure 9) which is prepared for each blast.

The Blast Notice is distributed electronically around the KCGM site and is put up on noticeboards and emailed to external stakeholders. The Blast Notice contains information on where the blast is located and an action plan for managing access to the blast area and personnel exclusion zone. The location of the blast can also be recorded in the GIS database if required.

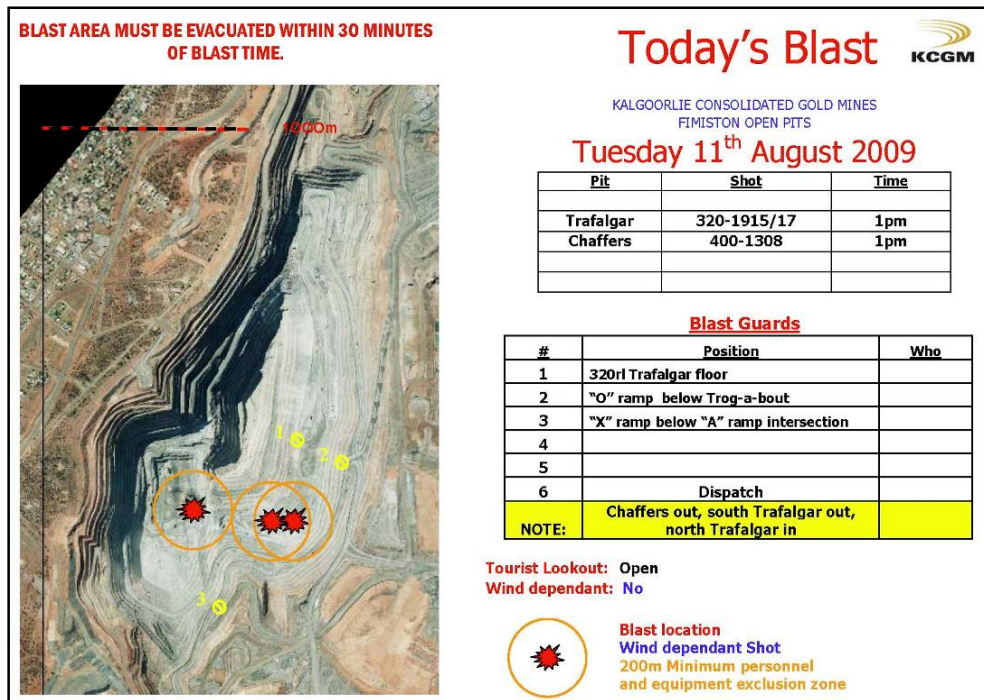


Figure 9 Example KCGM Blast Notice

Blast Measurements

The peak particle velocity values for each of the triaxial components is recorded by the measuring equipment and automatically downloaded each day. This data is stored on the KCGM computer network and can be readily retrieved if required.

Face Survey Information

To date analysis of face survey information of the blast design has not been required as no issues have arisen in relation to face blasts. All possible shots are buffered to minimise ore dilution which eliminates non pit edge face burst. Should KCGM ever either move away from buffering shots, or have face burst incidents, analysing face hole survey information may become a requirement.

Weather Conditions

Weather monitoring equipment at KCGM's weather station MEX (Figure 6) and Mt Charlotte (MTC) is used to measure wind speed and direction, which is used to determine favourable blasting conditions.

The MEX and MTC weather stations have MET ONE model 50.5 sonic anemometers installed which measures real time (5-minute averaged) wind speed and direction data. The anemometers are calibrated on a two yearly basis, or as required by the manufacturer.

Monitoring data are stored in the Process Information (PI) system, which is a process historian. The processed data are transferred to the operational control systems where it can be viewed live by operators as part of the air quality management programme.

Weather data can also be obtained from the Bureau of Meteorology site located at the Kalgoorlie-Boulder airport if required.

Video Footage

Video footage is taken of each blast and is available for review if required.

Subjective Information

Subjective information from the shotfirer is recorded in KCGM's Accident Incident Reporting System (AIRS) if a problem occurred during blasting. Any feedback received from any persons affected by the blast is recorded in KCGM's PIL database (Section 8.2).

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7.1 Blast Overpressure and Vibration Monitoring

There are six blast overpressure and vibration monitors permanently installed at sites between the Fimiston Open Pit and the City of Kalgoorlie-Boulder (Figure 10).



Figure 10 Blast Monitoring Network Location Plan

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Blast overpressure and vibration is monitored using Advanced Texcel Monitors (ATM) monitors, or similar, which meet the requirements of Regulation 21 of the *Environmental Protection (Noise) Regulations 1997* and Section J3.2.2 of Australian Standard 2187.2-2006.

Monitors are permanently installed at outdoor sites at least 5 meters away from any substantial sound reflecting surfaces. The positions of the monitoring locations were established in 1993. A blast monitoring and modelling review was undertaken completed as part of the Fimiston Operations PER by Terrock Consulting Engineers in 2005.

7.1.1 Monitoring Equipment

Blast overpressure and vibration levels are measured using ATM monitors. The vibration trigger levels for the ATM blast monitor geophones are set at 0.2 mm/sec. If this level is exceeded then a result is recorded for the blast event.

The Advanced Texcel Monitors (ATM) comply with Schedule 4 of the *Environmental Protection (Noise) Regulations 1997* and Section J3.1.2 and J3.2.1 of Australian Standard 2187.2-2006.

Bandwidth

The ATM monitors include linear weighted microphones and the microphone bandwidth is 2.0 – 500 Hz (-3dB).

Particle Velocity

Peak particle velocity (PPV) is recorded in mm/s and stored in the MMRS database.

Vibration Transducer

The vibration transducer records signals from three mutually orthogonal axes. This data is automatically downloaded. The Peak Component Particle Velocity is recorded by the measuring equipment and automatically downloaded each day. The geophone will record a vertical, radial and transverse vibration signal, using these three signals to calculate a peak particle velocity.

Monitor Recording

The monitors record continuously and will report a trigger above 0.2mm/sec for a period spanning 0.5 seconds prior to triggering, 0.8 seconds post triggering. Blasts at Fimiston Open Pit Operations average approximately 3 seconds with long blasts averaging 5 – 6 seconds. No blasts have ever been detonated that lasted longer than 8 seconds.

Waveforms

Full waveforms are recorded and available for download if further analysis is required.

Peak Component Particle Velocity

The Easylink software will display waveform data and peak readings for each component channel for every trigger event.

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Vector Peak Particle Velocity

The monitor will report peak component readings for the vertical, radial and transverse channels, and will calculate a peak particle velocity using $\sqrt{\sum 2}$ method.

Instrumentation Noise

Instrument calibration testing performed annually restricts instrumentation background interference to $\pm 2.0\%$ of maximum PPV.

Frequency Range

Geophones used for monitoring are within the range 2Hz to 250Hz.

Sampling Frequency

The sampling frequency for monitoring is 1KHz.

7.1.2 Monitoring Equipment Calibration

The blast monitoring equipment are returned to Texcel (manufacturer and supplier) on an annual basis for calibration. Texcel calibrations are undertaken in accordance with ISEE Performance Requirements and the calibration process is traceable to the Australian National Measurements Institute.

Calibration of the equipment meets the requirements of Schedule 4 of the Environmental Protection (Noise) Regulations 1997, the manufacturers specifications and section J3.1.2 of Australian Standard 2187.2-2006.

7.2 Reporting of Blast Overpressure and Vibration Monitoring

7.2.1 Quarterly Noise and Blast Monitoring Report

Since 1993 a Quarterly Noise and Blast Monitoring Report has been submitted to the DEC. This report contains the following information in relation to blast overpressure and vibration monitoring:

- Number of shots fired during the quarter;
- Number of trigger events (vibration of greater than 0.2mm/sec and overpressure generated from vibration levels greater than 0.2mm/s);
- Details of each blast which triggered an event including overpressure and vibration levels;
- Histogram of measured overpressure and vibration levels at each site; and
- Particulars of any blast/s that occurred on Sunday during the reporting period and efforts taken to avoid the blast/s.

A summary of blast monitoring results is also included in the Annual Environmental Report (Section 6.5.4).

7.2.2 Blasting Outside Daylight Hours 36 Hour Report

If blasting occurs outside of the hours 0700 to 1800, KCGM will submit a report outlining why the blast was necessary to the Chief Executive Officer of the Department of Environment and Conservation (DEC) within 36 hours (Ministerial Condition 9.2).

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8 COMMUNITY CONSULTATION AND COMPLAINT MANAGEMENT

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

- Community Reference Group (CRG);
- Public Interaction Line (PIL); and
- KCGM Super Pit Shop and Website.

KCGM also uses its noise monitoring results as an indicator for potential concern for residential areas (even if no complaints are received). Where the noise monitoring results show that mining noise is causing significant number of recorded trigger events these are investigated to determine the source of the noise. When the source is identified, reasonable, practicable and safe action is taken to reduce the noise where possible.

KCGM is committed to ongoing consultation with our key stakeholders to determine the success of the noise and vibration management practices and where required investigate and implement additional control measures to address any community concerns.

8.1 Community Reference Group

To compliment many of the community relations activities that KCGM undertakes on a regular basis, the company established a Community Reference Group (CRG) in late 1999. There are normally around 12 CRG members. In addition, KCGM has a permanent invitation to representatives from the DEC, DMP, Department of Health and Department of Indigenous Affairs to attend.

The CRG meets monthly to discuss issues that are of importance to both the community and KCGM, and all minutes from the meeting are posted on the KCGM website: www.superpit.com.au.

Contact details for all CRG Members are available on this website, as well as at the Super Pit Lookout and on all project approval documentation that is in the public arena. The local community is encouraged to contact CRG members to discuss their issues if they do not wish to contact KCGM directly.

Presentations regarding KCGM operations are discussed with the CRG including the following agenda items:

- General Manager Update;
- Environment Update;
 - Monitoring results and reports;
 - Changes to plans or programmes;
 - Projects, approvals or other issues;

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- Community Update;
 - Sponsorships;
 - Public interactions and action taken;
 - Shop visitors and activities;
 - Media and advertisements; and
- General Business.

With particular reference to noise, updates to the CRG may include (but not limited to) the results of quarterly compliance monitoring, any projects or plans which have to potential to change noise emissions, public complaints and actions taken, updates regarding findings from modelling and noise control activities.

In consideration of availability of relevant noise monitoring information to the public, KCGM proposes a change to the quarterly noise monitoring advertisement. KCGM will propose an alternative advertisement format to be approved by KCGM's Community Reference Group at the November or December 2010 meeting (Section 6.5.2).

8.2 Public Interaction Line

KCGM has a 24-hour Public Interaction Line (Ph. 9022 1100) that can be contacted for a wide range of issues including emergencies, complaints, inquiries and feedback. Both the public and employees (including contractors) are encouraged to use the Interaction Line on any matter relating to the operations. It is a particularly important avenue for capturing those issues which require follow up and action.

The Public Interaction Line is backed up by an electronic database (PIL) which enables automatic email notification, the categorisation of queries and the automation of subsequent action allocation and follow-up mechanisms. This feedback from the Interaction Line system is very effective in helping to make KCGM aware of issues that are concerning the community such as noise, dust and blasting. Being aware of problems allows KCGM to investigate and implement control measures to address any community concerns.

PIL access and training is available to all frontline employees who either deal extensively with the community such as the Community Relations, Environment, Human Resources and Mining Departments, Secretaries and frontline Security. There are also some discipline specific professionals who have access in order to fill out the actions required of them.

When a PIL is logged, PIL automatically sends out a notification email to key people involved in community relations across Departments. These include the Community Relations Manager, EHS Manager and senior people in the Environment team. The Manager of the area which is the source of the interaction (for example Open Pits for noise) will also be electronically notified.

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During business hours PIL reports are referred immediately via email to the relevant department supervisor to undertake an assessment and identify if an investigation or specific actions are required (Figure 11). Incoming calls received outside office business hours will be forwarded to the shift supervisor for immediate action or where appropriate will be followed up the next work day.

KCGM has made a commitment to respond to complaints within 24 hours (or the next working day). There are many different scenarios, and sometimes it is recognised that the appropriate information may not be available within 24 hours. In such cases a progress report will be made back to the complainant and a new timeframe for feedback established.

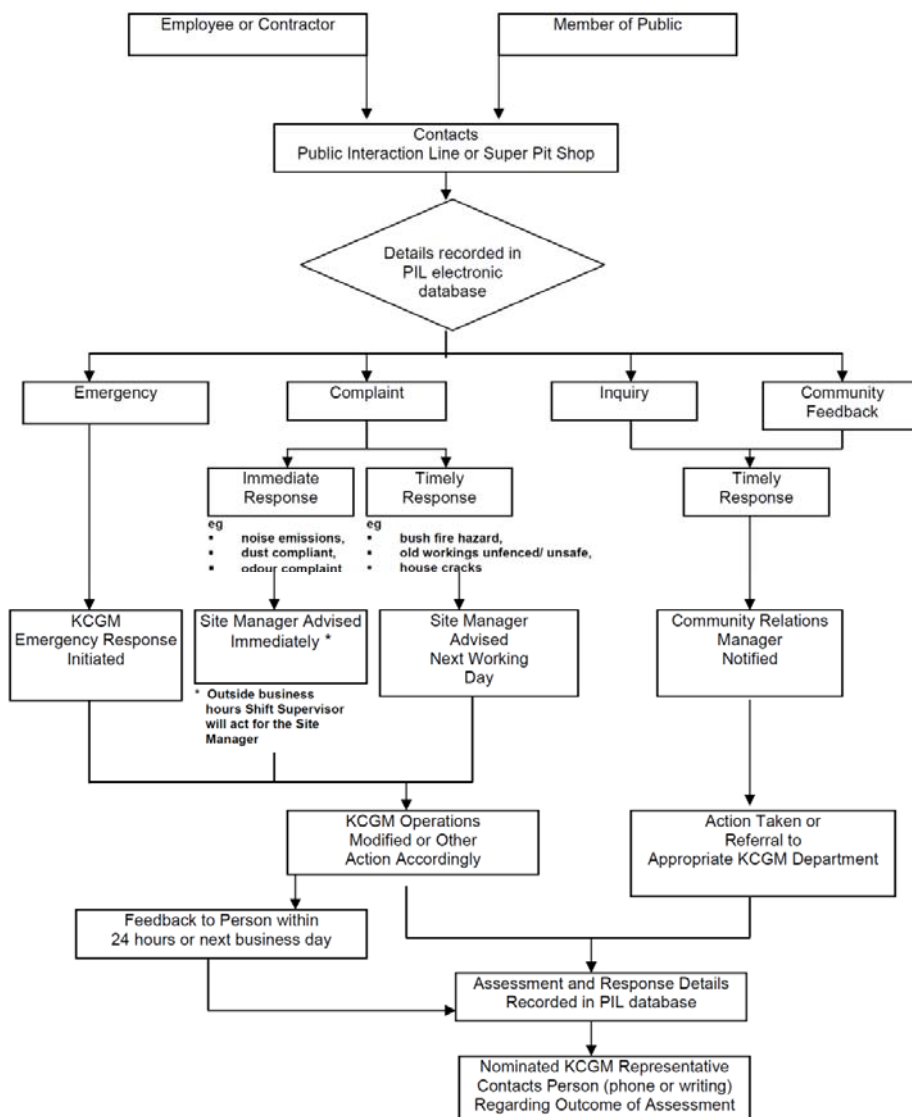


Figure 11 KCGM Public Inquiry Line Flowchart

PIL's are discussed on a daily basis at the KCGM Manager's meeting. 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.

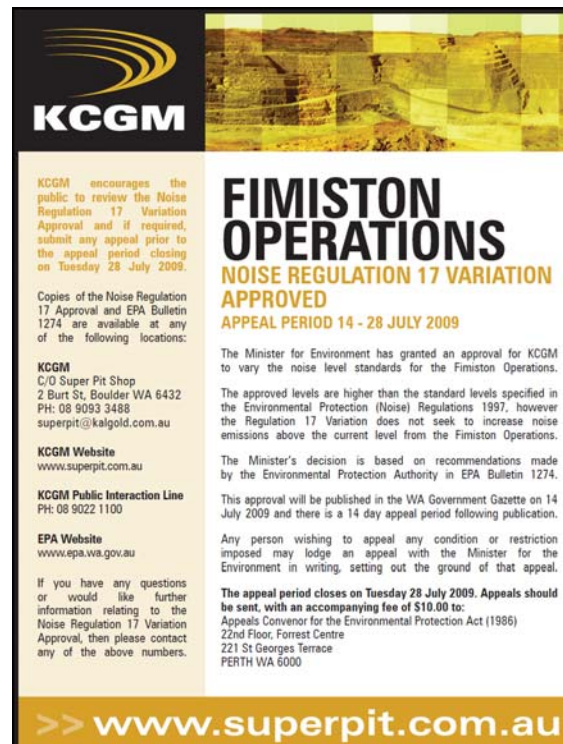
A summary of any noise complaints and KCGM's response is also included in the quarterly and annual noise reports (Section 6.5).

8.3 KCGM Super Pit Shop and Website

Officially opened in July 2005 the Super Pit Shop provides a face to face environment for members of the public to ask questions directly about our operations. The KCGM Super Pit Shop is situated in Burt Street, Boulder and provides easy access for the community to review documents. The Super Pit Shop has around 30,000 visitors each year.

The Shop hosts a 1:2,000 scale model of the Super Pit as it would look in 2018, based on the Life of Mine plans. The model is complete with its own fleet of miniature 793C mining truck's and a shovel and is a centerpiece that has generated public inquiries on the post closure options.

KCGM actively engages the media to promote discussion on planning and project issues and makes reports available at the Super Pit Shop and on the website (Figure 12)). Other available information includes the Super Pit brochure and the KCGM News and Views community newsletter. Access to an archive of all media articles related to KCGM operations since 1989 is also available.



KCGM

KCGM encourages the public to review the Noise Regulation 17 Variation Approval and if required, submit any appeal prior to the appeal period closing on Tuesday 28 July 2009.

Copies of the Noise Regulation 17 Approval and EPA Bulletin 1274 are available at any of the following locations:

KCGM
 C/O Super Pit Shop
 2 Burt St, Boulder WA 6432
 PH: 08 9093 3488
 superpit@kalgold.com.au

KCGM Website
 www.superpit.com.au

KCGM Public Interaction Line
 PH: 08 9022 1100

EPA Website
 www.epa.wa.gov.au

If you have any questions or would like further information relating to the Noise Regulation 17 Variation Approval, then please contact any of the above numbers.

FIMISTON OPERATIONS
NOISE REGULATION 17 VARIATION APPROVED
APPEAL PERIOD 14 - 28 JULY 2009

The Minister for Environment has granted an approval for KCGM to vary the noise level standards for the Fimiston Operations.

The approved levels are higher than the standard levels specified in the Environmental Protection (Noise) Regulations 1997, however the Regulation 17 Variation does not seek to increase noise emissions above the current level from the Fimiston Operations.

The Minister's decision is based on recommendations made by the Environmental Protection Authority in EPA Bulletin 1274.

This approval will be published in the WA Government Gazette on 14 July 2009 and there is a 14 day appeal period following publication.

Any person wishing to appeal any condition or restriction imposed may lodge an appeal with the Minister for the Environment in writing, setting out the ground of that appeal.

The appeal period closes on Tuesday 28 July 2009. Appeals should be sent, with an accompanying fee of \$10.00 to:
 Appeals Convener for the Environmental Protection Act (1986)
 22nd Floor, Forrest Centre
 221 St Georges Terrace
 PERTH WA 6000

>> www.superpit.com.au

Figure 12 Advertisement Noise Information Available at Super Pit Shop and Website

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Boulder Market Day Super Pit Tours are available on the 3rd Sunday of every month. The very popular one hour Super Pit tours depart from the Shop and are mostly attended to capacity, which is around 220 people. These tours enable the community to get a first hand look at KCGM's mining operations. Public feedback has indicated that the tours continue to be well regarded as a good source of information on the KCGM operations and provide a great opportunity to indicate the location of current projects.

Free screenings of the Super Pit DVD run regularly. This DVD allows the community to go behind the scenes and find out about the mining processes, equipment and history of The Golden Mile. There is also footage from blasting. In addition a Live Pit Cam enables visitors to view the pit in action on the LCD television, showing four different camera angles of the Super Pit live.

KCGM has a range of merchandise at the Shop and any profits are invested back into KCGM's local community investment program.

The KCGM website www.superpit.com.au is another significant resource for the community to access information about the KCGM operations. This includes an overview of the noise and blasting management programme, noise monitoring results, project plans and modeling reports and the final NVMMP will also be available on the website. The website will also be used to provide public access to real-time noise monitoring data (Section 6.4).

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9 COMMUNITY NOISE AMELIORATION PROGRAMME

One appeal against the NR17V approval was received and an Appeals Committee was appointed by the Minister. The Appeals Committee Report was subsequently reviewed by the Minister and while the appeal was dismissed in March 2010, two recommendations made by the committee require implementation. One of the recommendations relates to a noise amelioration programme specifically to;

- Outline the steps required to develop and implement a noise amelioration program that will benefit the community most affected by noise from KCGM operations and that this would be over and above the commitments that KCGM have already made to other community projects.

9.1 NR17V Appeals Committee Recommendation Details

The Appeals Committee did not recommend the provision of ameliorative measures for each privately-owned residence affected, but that a noise amelioration programme should be developed that will benefit the community most affected by noise from the KCGM operations and that this would be over and above the commitments that KCGM have already made to other community projects.

The noise amelioration programme shall be implemented by a working group consisting of representatives of KCGM; the City of Kalgoorlie-Boulder; the Department of Environment and Conservation; a community representative; or as approved by the Director of the Environmental Regulation Division, Department of Environment and Conservation. The steps required to develop and implement the noise amelioration program shall be reported in the Noise and Vibration Management Plan under Clause 8 (2)(i).

9.2 Implementation Plan

A Working Group has been established to discuss and reach consensus on how best to implement the Committee's recommendations. During preliminary meetings a number of potential noise amelioration programme options were identified.

KCGM has developed a preliminary implementation plan (Table 6) for the noise amelioration programme. This plan will be discussed in detail with the Working Group, many projects are still in the early phase and so it is difficult to establish timelines at this stage.

Outcomes from the Working Group meetings including the progress on implementation of the noise amelioration programme are documented in *KCGM's Proposal to Meet Fimiston Operations Noise Regulation 17 Variation Appeal Committee Recommendations, Noise Amelioration Programme and Real Time Noise Monitoring*.

Updates regarding the implementation of the community noise amelioration programmes will also be provided to the DEC in the quarterly and annual noise reports (Section 6.5).

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Table 6 KCGM Community Noise Amelioration Preliminary Implementation Plan

Action	Comments	Estimated Timing
Set up a "Working Group"	The Working Group includes KCGM personnel, and representatives from the City of Kalgoorlie-Boulder, DEC, Kalgoorlie-Boulder Community and the Main Roads Department.	July 2010 (completed)
Hold regular meetings with the Working Group	The Working Group has been established to determine, discuss and reach consensus on how best to implement appropriate noise amelioration projects.	3-Monthly (ongoing)
Soundproofing a Community Building	YMCA have plans to expand their centre and construct a low budget youth accommodation building. KCGM have offered assistance.	Long term strategic project 3-5 years
Goldfields Highway Bund Extension	Further investigation regarding whether changes to the bunds would provide additional noise reduction benefits is required for this project. KCGM have engaged noise consultants Herring Storer Acoustics to undertake noise modelling and report on the findings.	Modelling report by December 2010 Further actions to be based on findings
Noise Control Inside Residences	Opportunity for involvement in a Research and Development Project through Centre of Acoustics and Dynamics of UWA. Contact UWA regarding feasibility.	March 2011 Further actions to be based on discussions with UWA
Assist Other Noise Sources	BMX Club PA system a good project where action could readily be taken before the next racing season (winter each year). KCGM has contacted the BMX Club and investigations are underway.	March 2011 Further actions to be based on identification of other noise sources where assistance can be provided
Research Project	This is a medium to long term strategy to evaluate projects and assist with public projects or beneficial research with universities (eg noise control inside residences).	Further actions to be based on working group discussion

10 GLOSSARY OF TERMS

Airblast level: A noise level resulting from blasting.

Airblast overpressure: The sudden increase in air pressure, generated by a shock wave, produced when an explosive is detonated.

A-weighting: A frequency-dependent scaling of a sound wave that mimics the response of human hearing.

Annual: A twelve (12) month period.

Blasthole: A hole that has been drilled or prepared for the purpose of being charged with explosives, or has been charged with explosives.

Blasting: The use of explosive material to fracture:

- a) rock, coal and other minerals for later recovery; or
- b) structural components or other items to facilitate removal from a site or for reuse.

Competent person: A person who has acquired through training, qualification or experience, or a combination of these, the knowledge and skills to carry out the required task.

Component velocity: One of the orthogonal particle velocities; typically one of radial, transverse, or vertical velocity.

Ground vibration: Mechanical energy (vibration) produced by a blast and transmitted through the ground.

DEC: Department of Environment and Conservation.

$L_{A 10}$ approved level: An assigned level which, measured as a $L_{A \text{ Slow}}$ value, is not to be exceeded to more than 10% of any period of one hour.

$L_{A \text{ max}}$ approved level: An assigned level which, measured as a $L_{A \text{ Slow}}$ value, is not to be exceeded at any time.

$L_{A \text{ Slow}}$: The reading in decibels (dB) obtained using the “A” frequency-weighting characteristic and the “S” time-weighting characteristic as specified in AS 1259.1-1990 with sound level monitoring equipment that complies with the requirements of Schedule 4 of the *Environmental Protection (Noise) Regulations 1997*.

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L_{Linear peak}: The maximum reading in decibels (dB) obtained using the “P” time-weighting characteristic as specified in AS 1259.1-1990 with all frequency-weighting networks inoperative and with sound level measuring equipment that complies with the requirements of Schedule 4 of the *Environmental Protection (Noise) Regulations 1997*.

Measured: In relation to the measurement of a noise emission, means measured and adjusted in accordance with the *Environmental Protection (Noise) Regulations 1997*.

Monitoring: Is the process of sampling and measuring certain parameters.

NATA: National Association of Testing Authorities.

Particle velocity: The time history of the velocity of particles within the ground.

Peak component particle velocity: The peak level of the particle velocity for an individual component.

Quarterly: A three (3) month period.

Reference location: A location specified in the terms in Environmental Protection (Fimiston Gold Mine Noise Emissions Approval) 2009 for the assessment of noise emissions.

Significantly contribute to: A noise emission is taken to “significantly contribute to” a level of noise if the noise emission exceeds a value which is 5dB below the assigned level at the point of reception. As defined in the *Environmental Protection (Noise) Regulations 1997*, Regulation 7(2).

Sound level meter: A measuring device that measures the level of sound, and may provide dBL, dBA or dBC values.

Sound pressure level (dB): A logarithmic scale of pressure with a reference pressure of 20µPa.

Vector peak particle velocity: The peak level of the particle velocity calculated from the vector formed by the magnitude of the three orthogonal components of the particle velocity over their measured time history.

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