Mine Safety – Audit Report
Burkes Creek Mine

1. Executive Summary

On 19 November 2010 the Pike River Coal Mine suffered the first of a series of catastrophic explosions that resulted in the death of 29 employees and contractors. In response to this disaster, on 29 November 2010, the New Zealand Cabinet required that the Department of Labour arrange a safety audit of all other coal mines, to be undertaken as a matter of urgency using an international expert.

Auditors were subsequently engaged to assure the Department of Labour and the Government that underground coal mines in New Zealand are operating safely and that they have robust and effective health and safety systems to ensure the safe operation of the mines.

This report outlines the findings of an independent audit of Burkes Creek mine conducted for the Department of Labour.

1.1. Summary of Audit Findings

This audit did not reveal that a dangerous situation was imminent at this mine. The audit did however identify areas for improvement to be addressed by the mine operator, including:

a. Establish a system for the management of change so that variations to the critical hazards and risks can be identified at an early stage and to the point where preventative measures can be established.

b. Ensure all relevant AS/NZ standards are followed and documents supporting the safety health management system are maintained to ensure regular audits are able to be done to ensure continuous improvement.

c. Implement an Internal Auditing function into the management tasks so that the company can ensure the controls identified to mitigate risk are in place and effective.

a. Address the "Areas for development" identified from this audit. (summarised in 1.4 below)

1.2 Key observations

During the period of this audit underground coal mining operations at the Burkes Creek mine had been suspended. This was the result of a voluntary agreement
between the mine operators and the Department of Labour. The auditors were advised of this situation by the mine operator during the onsite audit. The auditors have since reviewed the letter that outlines this agreement. The letter summarises a number of improvements to be made. The agreed date for the improvements was 31 January 2011, although they had not been implemented as at 28 February 2011. Work could only resume underground at such stage as the underground communications is installed.

The improvements required were:
- Updated and improved mine plans.
- Install an underground communications system.
- Implement a daily measurement and recording procedure for the surface fan.
- Obtain a test certificate for explosive storage.

The auditors agree that the improvements raised by the Department of Labour should be pursued. This report sets out further details on how systems and process might be improved at the Burkes Creek mine.

1.3 **Strengths**

Observations made identified that the coal mine workings appeared to be stable and relatively well ventilated. Both Richard Banks (Snr) and Richard Banks (Jnr) are very experienced and well qualified mine operators.

1.4 **Areas for Development**

It is recognised that a mine operating on a such a small scale as Burkes Creek does not require documented systems to the extent that is required by a large mining operation with numerous staff. There is scope, however, for Burkes Creek mine to develop a documented system that is appropriate to its size and the risks associated with its operations. This system should reflect the individual recommendation made within this report.
2. Audit Approach

2.1. Terms of Reference

2.1.1. Purpose

The purpose of the audit is to assure the Department of Labour and the Government that underground coal mines in New Zealand are operating safely and that they have robust and effective health and safety systems in regard to the major hazards that are inherent in underground coal mines.

2.1.2. Areas of Focus

The focus areas for the audit were:

a. Mine Gas management.
b. Ventilation Control.
c. Strata control.
d. Methane drainage.
e. Spontaneous combustion.
f. Mechanical and electrical (management of sources of ignition).
g. Emergency response/ preparedness.
h. Management of methane outbursts (if a potential for such exists).
i. Explosive management.

Other matters that came to the attention of the auditors can be discussed in the audit findings. With regard to the focus areas the audit team considered:

- Sufficiency of documented processes and systems
- Design and Planning
- Performance of plant
- Maintenance programs
- Work method and control
- Inspection monitoring and testing
- Handling and storage (hazardous products)

In the first instance the audit considered the risk/hazard identification and management processes that are used in the coal mining operation. The Mine management have conducted a risk assessment of the total operation and identified the principal hazards (those with the potential to cause multiple fatalities) and they have developed specific strategies through risk assessment to manage and mitigate the risks. The flow on from this is that the risks with a lesser risk are also identified and that there is a structured process in place for identification and the subsequent management and control of these risks also.

Given that the Risk Management Standard AS/NZ ISO 31000:2009 and the preceding standard AS/NZ 4360 are common across Australia and New Zealand the expectation is that the mines in NZ are applying the standard as a basic tool and that there is at least a basic Hazard Identification/Risk Assessment Process in place at the mine.
2.2. The Audit Approach

2.2.1. Familiarisation visit

An initial familiarisation visit to the mine was undertaken by Brett Garland (Auditor) accompanied by Alan Cooper (Department of Labour) and Johan Booyse, Senior Advisor, Extractives (Department of Labour). This involved a discussion with the mine manager regarding the approach to systems and risk management and an underground inspection.

2.2.2. Document Request

Before the onsite audit each mine was asked to provide the following documents:

a. Details of the system or process for identifying key risks/ significant hazards associated with the underground mining operation.

b. Details of the system or process for managing change of process or infrastructure in the underground mining operations.

c. A copy of the hazard/risk register relating to underground mining activities (this should include details of the controls that are in place to manage the individual risks/ hazards). In particular please provide detail with regard to the management of:
   - Spontaneous combustion
   - Strata control
   - Mine gas management
   - Methane drainage
   - Ventilation control
   - Outbursts management
   - Explosives management
   - Mechanical and Electrical (management of sources of ignition)

Note: If these hazards/ risks were not considered as relevant to the mining operation the mine operator was asked to explain the basis on which this has been determined.

d. A plan of the underground coal mine.

e. Copies of reports, data and information describing the geotechnical conditions at the mine.

f. A detailed ventilation plan (including ventilation infrastructure, mine volume and ventilation performance data).

g. Copies of emergency response plans (including details of refuge areas, self rescue caches, CABA re-fill stations etc).

Documents provided in advance of the onsite audit are listed at Appendix One.
2.2.3. Onsite audit

Audit tools were developed for the scope of the audit against the audit criteria and with current legislative requirements in New Zealand.

The Minex Health and Safety Council Industry Code of Practice was referred to by the auditors, but it was recognised that following this code of practice is not a mandatory requirement for New Zealand mines.

Given the background of the auditors it would be fair to say that comparisons with Queensland practice and legislation were made despite this was not being a specific requirement of the audit. The audit findings are based on objective evidence found and not reliant on hearsay.

An entry meeting was held at the start of the onsite audit process. This was to outline the scope and method to those in attendance. This discussion occurred with both Richard Banks senior and Richard Banks junior. It was also stressed that the audit report would be delivered to the Department of Labour and that any subsequent release would be at the Department’s discretion.

The underground mining operations were suspended at the time that both visits were conducted. The lack of documented procedures and the lack of documented records for the Burkes Creek mine operations meant that it was not possible to apply audit methodology. The auditors were reliant on the visual inspections carried out and the interviews with the mine operators. The inspection provided only a limited snapshot in time.

The onsite audit involved a mix of document reviews, interviews and observations. During this stage of the audit some additional documents were collected and reviewed by the auditors. The documents collected from onsite are listed in Appendix Two.

The Exit Meeting was held at the end of the onsite audit. At this meeting the purpose of the audit was restated and a provisional findings of the auditors regarding strengths and opportunities for improvement.

2.2.4. Feedback on provisional findings

Prior to this report being finalised a draft version of the report and its recommendations was forwarded to the mine operators to allow them an opportunity to comment or to provide further information to assist the auditors.

2.3. Audit Limitations

The onsite components of this audit were conducted over a total of two half days. During the period of this audit the underground coal mine was not being operated. No underground work was observed.
Auditing is a sampling process which aims to verify the adequacy of systems and processes that are in place and to verify the extent to which those systems and processes are put into practice. This is achieved by reviewing the documented processes and systems, interviewing staff to determine the degree to which systems are understood and followed. Observations of practice and conditions at the mine also occur to verify that the mine is actively applying its own systems.

As a sampling exercise an audit will not identify all weaknesses or non-conformance within a system. Equally, an audit will not identify all of the system and process strengths that exist at a mine. The findings are based on the documents provided, the information disclosed in interviews and the observations of the auditors during the period of the audit.

Underground coal mining is a complex industry within which there is a range of technical and professional disciplines. This includes specialists in disciplines such as ventilation engineering, electrical engineering and geotechnical services. This audit has been conducted to the best of the ability of the assigned auditors within the limit of their professional skills and experience. The experience and qualifications of the auditors is set out below.

Accordingly, it is recommended that the mine operator take this opportunity to review all of the systems that are in place rather than focusing only on the specific findings of this audit.

As auditors, Brett Garland and Tim Watson have no statutory authority to require any remedial action by a mine operator. Had any significant failure with a high potential for harm been identified, for which a mine operator failed to take immediate and appropriate remedial actions, the matter was to be referred to the Department’s representative for an appropriate regulatory intervention.

2.4. The audit team

2.4.1. Auditors

Mr Brett Garland BE (Mining) Hons, MBA, FAusIMM, CP (Mining), RPEQ. Mr Garland is employed as the Chief Operating Officer of Caledon Resources Pte and has been employed in the Australian Coal Industry for 34 years. He is the holder of a 1st Class Mine Managers Certificate. Mr Garland is currently a member of the Coal Mine Safety & Health Act Advisory Committee and a Director of Queensland Mines Rescue Pty Ltd.

Mr Tim Watson is currently employed as a Mines Inspector by the Queensland Government. Mr Watson has been employed in the Australian Coal Industry for 20 years and is the holder of a 1st Class Mine Managers Certificate. Mr Watson is currently a member of the Coal Mines safety and Health Act Advisory Committee and is a member of the Technical Advisory Committee for Queensland Mines Rescue Pty Ltd.
2.4.2. Audit Support

Mr Alan Cooper is currently employed by the Department of Labour in New Zealand as a Practice Leader - Health and Safety Practice Development. His role during the inspections was to co-ordinate the audits and the supply of documentation and to provide a working knowledge of New Zealand legislation. He holds a certificate of appointment as a Health and Safety Inspector.

2.5. Key Audit Dates

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Familiarisation Visit, Burkes Creek Mine</td>
<td>21st December 2010</td>
</tr>
<tr>
<td>Onsite Audit, Burkes Creek Mine</td>
<td>28th February 2011</td>
</tr>
<tr>
<td>Draft Report forwarded for comment</td>
<td>8th April 2011</td>
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3. Background to Burkes Creek Mine

The Burkes Creek Coal Party owns and operates the Burkes Creek Mine. It is a small mining operation that includes both a small open cut mine and an underground mine. These are operated as a family concern employing two members of the Banks family and several other personnel depending on the mode of mining and the demand for coal. The two members of the Banks family are certified mine officials. Richard Banks (Snr) holding a certificate of competency as a Deputy and Richard Banks (Jnr) being the holder of a certificate of competency as an Underviewer. Both individuals are experienced in Mines Rescue and are current members of the Mines Rescue Brigade.

The area has been worked by numerous underground operations in the same and other seams. Evidence of these workings is clearly visible in the surface workings located at the pit head.

Total production at the Burkes Creek operations was targeted for approximately 5,000 tonnes per year, this output being governed by the capacity of the coal processing plant and could come from the open cut or underground operations.

The underground operations are based around shotfiring operations to fragment the coal and then hydraulic operations to convey the coal from the mine.

It should be noted that the underground mine had not been worked since the time of the Pikes River Mine event. A point that does need to be clarified with the owners is a statement that was made during the February visit. It was stated that the mine had only been worked for two (2) days since Mr Garland had last been at the mine in December 2010. This is at odds with a letter sent to the mine by the Department of Labour on 23 December 2010. The letter indicated that following an inspection that occurred on 17 December 2010 it was agreed that the mine would not be worked until such time as certain improvements had been undertaken. The target date for the improvement was set as 31 January 2011 but they had not bee completed at the time of the audit.
4. Audit Findings

4.1. Risk/Hazard Identification and Management Processes

Based on the initial familiarisation visit conducted in December 2010 it was clear to the auditors that the Burkes Creek operations were not supported by administration and technical support functions that would be evident at large modern underground operations. The underground operations are based on a wealth of practical experience held by the two principal operators. It was evident that the personnel were well aware of the New Zealand legislative requirements and applied a working knowledge of the legislation to the operations carried out at the mine.

There are no documented systems in place for identifying hazards and analysing and assessing risks. As such it is extremely difficult to audit an operation such as this. Evidence of operating procedures can only be based on the visual inspection carried out on that day.

It was revealed during discussion that the Department of Labour’s inspector had previously asked for a basic hazard management system to be developed. There is now an opportunity for the mine operators to develop a system that reflects the findings of this audit.

4.1.1. Strengths

a. The small size of the operation allows for a high level of understanding and cooperation between the few personnel who work underground.

4.1.2. Areas for development

a. Document a hazard/ risk management system that is appropriate to the small scale of the mine and the risks associated with its operations. This should include audit and review components.

4.2. Ventilation Control

Ventilation at the Burkes Creek Mine is achieved by a combination of natural ventilation boosted by a small 2 cubic metre per second forcing fan. The fan is located on the surface adjacent to the main portal. 200 mm diameter ducting is used to distribute the air to the working area. The ducting being used does not have a Fire Resistant Anti Static (FRAS) rating.

The ventilation fan is powered by a diesel generator and is only operated when personnel are underground. At all other times the natural ventilation is deemed sufficient to keep the mine ventilated.

During the inspection of the underground workings the ventilation appeared adequate.
Please note; as stated earlier the mine was not being worked at the time of the audit and therefore the auditors were not in a position to observe the adequacy of the ventilation during the modes of extracting coal. Of particular relevance and interest would be the ability of the ventilation to clear the fumes from shotfiring.

The operators of the mine informed the auditors that there were plans in place to upgrade the ventilation infrastructure at the mine. A larger ventilation fan had recently been purchased and was located on the surface at the mine and the installation was being evaluated.

4.2.1. **Strengths**

a. The operators have a sound practical knowledge of mine ventilation.

b. Basic monitoring and records were observed.

4.2.2. **Areas for development**

a. The development of a documented ventilation management plan is warranted. This would allow for formal procedures to be developed based on Risk management associated with this operation.

b. Establish a basic ventilation model to determine the actual requirement needed for this operation and to establish an understanding of what the planned change in infrastructure will have.

c. Establish a document management system so that an auditable process exists.

4.3. **Strata Control**

Underground observations at the mine indicated that the strata control was being adequately managed. The roadways were observed to be well standing. It should be noted that the size of the underground roadways are driven to only facilitate the passage of the workers and the transport of coal and as such are only approximately 1.0 to 1.2 metres in width and 1.6 to 2.1 metres in height. Roof support is only installed where it is deemed necessary.

As the mine was not working at the time of the inspection it is difficult to comment on the performance of the support process during the extraction process. During the underground visits it was possible to observe the standing goaf and the process appeared to be maintaining good roof control.

There was no formal geological model available and knowledge of the workings were based on historical knowledge and some surface exploration undertaken to prove the extremities of the coal seam.
There were no formal design criteria for roadway dimensions or pillar design available to the auditors to review. It is understood that all such design is based on practical working knowledge by the operators.

There is no formal equipment or procedure in place to monitor strata movement or deterioration.

There was no formal evaluation of influence by old workings either in the same seam or other seams for the mine.

4.3.1. Strengths

a. The operators of the mine have an extremely high level of practical experience working coal seams in this area.

b. The underground workings appear to be stable, even after an extended period where the mine had not been worked.

4.3.2. Areas for development

a. Establish a geological model of the seam together surrounding strata and the existence of old workings.

b. Formalise the current development and extraction design criteria with an external agency and then commission a regular internal and external audit and review process.

c. In conjunction with the above statement, establish a strata control document based on risk management practices that is reflective of the size and complexity of this operation that details the development and extraction strata control practices utilised at the mine.

d. Establish a basic monitoring process that can indicate strata movement and deterioration. This would allow changes to be identified measured and evaluated. Strata movement initiating problems such as ‘Creep’ events may well be identified at an early stage and thus preventing a significant risk from going undetected.

4.4. Mine Gas Management

The Burkes Creek operation has no recorded history of coal seam methane being evident in the workings.

As stated throughout this report the mine is very basic and as such no Telemetric or tube bundle system was in place to monitor the mine atmosphere neither for the
constituent gases nor for the presence of mine gases. Hand held monitors were in use at the mine.

4.4.1. Strengths

a. Hand held gas monitors are in use at the mine.

4.4.2. Areas for development

a. There exists the chance to combine the opportunities suggested in the sections on Ventilation and Spontaneous Combustion to evaluate the need for a more sophisticated atmospheric monitoring system to be established with the upgraded ventilation infrastructure and spontaneous combustion testing.

4.5. Spontaneous Combustion

No testing had been done to determine the propensity of spontaneous combustion of the coal seam currently being mined. The knowledge of the owners of the mine suggested the seam being mined had never recorded a spontaneous combustion event. However, it is known seams in the same sequence have a known high propensity to spontaneous combustion. Operations that have mined the underlying No 4 seam have experienced numerous problems with the spontaneous combustion of this coal.

Monitoring for the early detection of spontaneous combustion was limited to hand held multi gas detectors and the ability of the operators to recognise the early physical signs of spontaneous combustion.

4.5.1. Strengths

a. No known history of spontaneous combustion in this seam.

b. Basic monitoring and records were observed.

4.5.2. Areas for development

a. Formal testing of the seam to establish the propensity to spontaneous combustion.

b. Increase the adequacy of the monitoring for spontaneous combustion.

c. The risk of spontaneous combustion at this operation needs evaluated through hazard and risk identification and to address the risk associated with the overlying and underlying strata and the potential for change in the characteristics.
4.6. *Emergency Response/Preparedness*

The Burkes Creek mine is a small mine that is easily evacuated in a matter of minutes. In identifying this fact the emergency response preparedness of the operation needs to be fully evaluated. No formal document exists that identifies protocols or procedures in the event of an emergency. It is understood that a mutual assistance scheme is established with New Zealand Mines Rescue but no documentation was available. At the time of the auditors' visit to the mine underground communications were being established.

4.6.1. **Strengths**

a. The small scale of the mine allows for rapid evacuation.

b. The mine operators are both experienced mine rescue members.

4.6.2. **Areas for development**

a. Establish an documented Emergency Response Plan that included the following features;
   i. Mutual assistance scheme details.
   ii. Coordination protocols and procedures established with local emergency services such as the Police, Fire department and Ambulance services.
   iii. This plan could be developed with the help of the DOL Inspectors.

4.7. **Explosive Management**

It is noted that the issue of appropriate certifications to meet the requirements of the Hazardous Substances and New Organisms Act 1996, was raised by the Department’s own inspector prior to this audit commencing. The auditors have no further observations with regard to the management of explosives.

_Brett Garland_  
Date: 3/5/2011

_Tim Watson_  
Date: 3/5/2011
APPENDIX ONE

List of documents reviewed prior to the onsite audit

APPENDIX TWO

Documents obtained onsite

<table>
<thead>
<tr>
<th>Burkes Creek Mine</th>
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<table>
<thead>
<tr>
<th>Document description</th>
<th>Mine (received)</th>
<th>Auditor (holding document)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Plan</td>
<td>Burkes Creek Mine</td>
<td>Tim Watson</td>
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