(Royal Commission on the Pike River Coal Mine Tragedy, 2012: 10, 12–15)

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2010

Royal Commission on the Pike River Coal Mine Tragedy

Te Komihana a te Karauna mō te Parekura Ana Waro o te Awa o Pike

Volume 1

+ Overview

2012

Letter of transmittal

Royal Commission on the Pike River Coal Mine Tragedy

Te Komihana a te Karauna mō te Parekura Ana Waro o te Awa o Pike

To His Excellency, Lieutenant-General The Right Honourable Sir Jerry Mateparae GNZM, QSO, Governor-General of New Zealand

Your Excellency

In accordance with the Letters Patent dated 14 December 2010, as amended on 7 February and 27 August 2012, we have the honour to present to you the report of the Royal Commission on the Pike River Coal Mine Tragedy.

It has been a privilege to undertake this work. We hope that our report will help to ensure that New Zealand does not see a repetition of the tragedy of 19 November 2010 when 29 men lost their lives in the Pike River mine.

Dated this 30th day of October 2012.

Graham Panckhurst

The Honourable Graham Panckhurst

Chairperson

Stewart Bell

Stewart Bell PSM

Commissioner

David Henry

David Henry CNZM

Commissioner

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Preface

The explosion at the Pike River mine on 19 November 2010 brought home to New Zealanders once again the risks of underground coal mining. The 29 men who died follow a long line of other people who have perished in New Zealand mines over the previous 130 years. This, sadly, is the 12th commission of inquiry into coal mining disasters in New Zealand. This suggests that as a country we fail to learn from the past.

The commission was established in December 2010 to report on what happened and what should be done to prevent future tragedies. The terms of reference are on pages 6–9.

In making our inquiries we have gathered voluminous evidence, both written and oral. We have necessarily had to be selective in determining how much can be included in our report. The commission has aimed to be fair to all concerned in the tragedy and has avoided criticising individuals, unless it was necessary to do so to properly explore what happened. The commission is not a court of law and its views and conclusions should not be interpreted as determining, or suggesting the determination of, criminal or civil liability of any person.

The commission has tried to uncover the systemic problems lying behind the tragedy so that recommendations can be made for the future.

One difficulty the commission faced in making its inquiries was that, at the same time, criminal investigations into the tragedy were being conducted by the New Zealand Police and the Department of Labour (DOL). The commission arranged its public hearings in four phases for efficiency and in an endeavour to minimise any conflict with the criminal investigations. The commission used the DOL investigation report and associated material, where it was appropriate to do so, to gain an understanding of what had happened.

The commission's report is organised into two volumes:

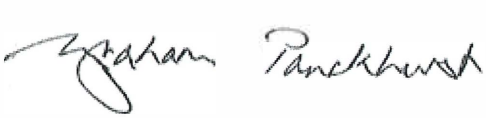
Volume 1 is an overview of what happened at Pike River and what should be done for the future to avoid such tragedies. Sixteen primary recommendations then follow.

Volume 2 is a more detailed and technical analysis of the tragedy, together with the reasoning that led to our recommendations. Volume 2 also contains appendices that further explain the conduct of the commission.

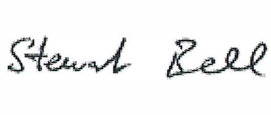
We wish to acknowledge and thank the many people who have assisted us with our inquiries, and our counsel, executive director and staff who have worked so hard. We wish to acknowledge the families of the deceased men. Many attended the commission's hearings and provided evidence. We were impressed with their fortitude and courage. The commission would also like to acknowledge John Haigh QC, who died during the course of the commission.

The lessons from the Pike River tragedy must not be forgotten. New Zealand needs to make urgent legislative, structural and attitudinal changes if future tragedies are to be avoided. Government, industry and workers need to work together.

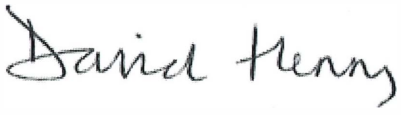
That would be the best way to show respect for the 29 men who never returned home on 19 November 2010, and for their loved ones who continue to suffer.



Hon. Justice Graham Panckhurst
(Chairperson)



Stewart Bell PSM



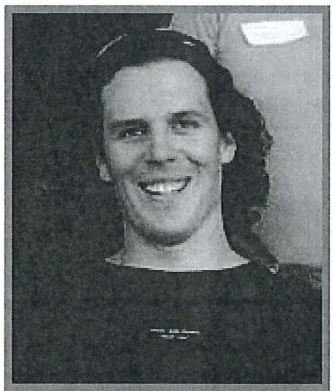
David Henry CNZM

Pike River Mine

Atarau, Greymouth, New Zealand

Conrad Adams
43, Greymouth

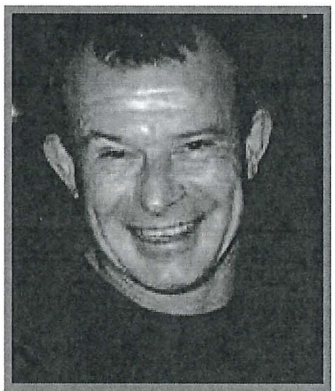
Daniel (Dan) Herk
36, Runanga



David (Dave) Hoggart
33, Greymouth

Richard (Rolls) Holling
41, Blackball

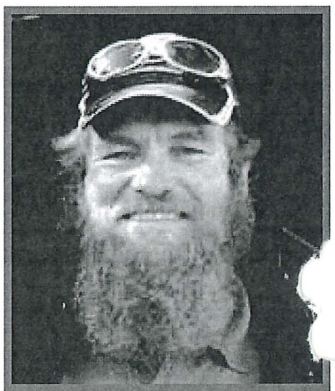
Koos Jonker
47, Limpopo, South Africa



Peter (Pete) Rodger
40, Perth, Scotland

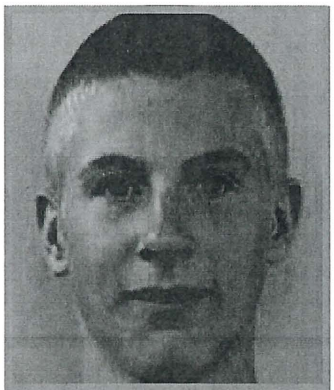
Blair Sims
28, Greymouth

Keith Valli
62, Nightcaps



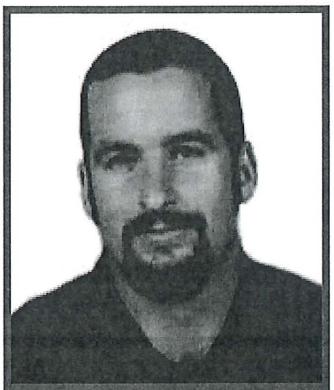
Terry Kitchin
41, Runanga

Joshua (Josh) Ufer
25, Charters Towers, QLD, Australia



Zen Drew (Verhoeven)
21, Greymouth

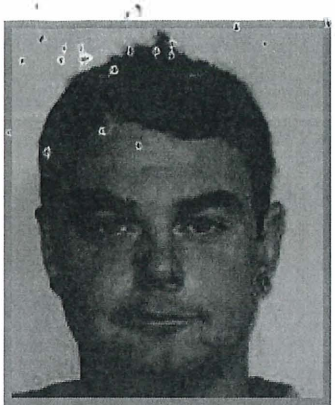
Kane Nieper
33, Greymouth



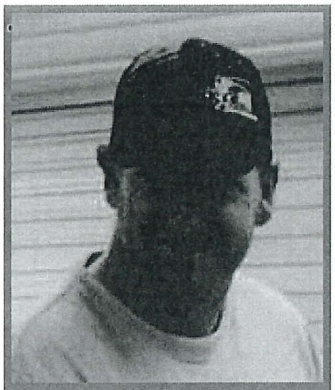
Riki (Rik) Keane
28, Greymouth

Pike River Coal

Subtech Services

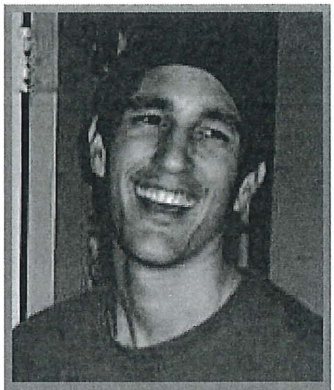


Malcolm Campbell
25, St. Andrews, Scotland



Glenn Cruse
35, Greymouth

Allan Dixon
59, Runanga

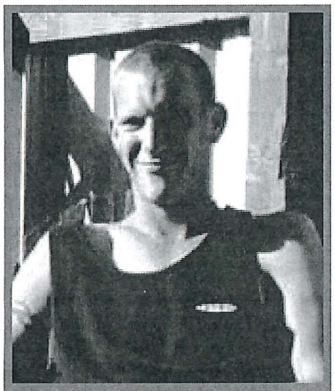


Christopher (Chris) Duggan
31, Dunollie

William (Willie) Joynson
49, Maryborough, QLD, Australia

Stuart (Stu) Mudge
31, Runanga

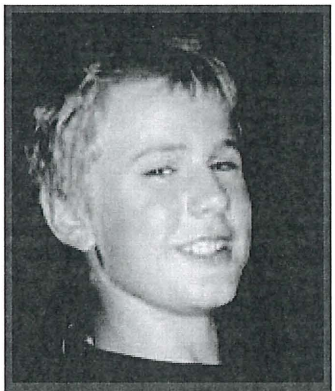
Peter O'Neill
55, Runanga



Brendon Palmer
27, Greymouth

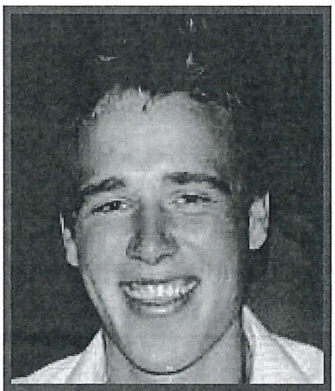
Samuel (Sam) Mackie
26, Christchurch

Milton (Milt) Osborne
54, Ngahere

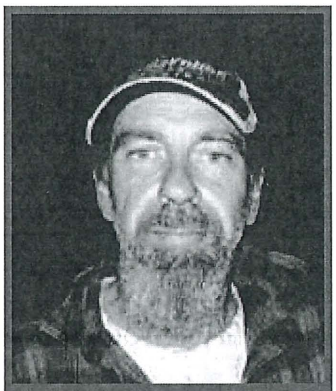


Joseph Dunbar
17, Christchurch

Benjamin (Ben) Rockhouse
21, Singleton, NSW, Australia



Michael Monk
23, Greymouth



John Hale
45, Hokitika

Andrew (Huck) Hurren
32, Hokitika

Francis Marden
41, Barrytown

VLI Drilling

Boyd Kilkelly Builder

Graeme Pizzato Contracting

CYB Construction

Terms of reference

Royal Commission on the Pike River Coal Mine Tragedy

Elizabeth the Second, by the Grace of God Queen of New Zealand and her Other Realms and Territories, Head of the Commonwealth, Defender of the Faith:

To The Honourable GRAHAM KEN PANCKHURST, of Christchurch, Judge of the High Court of New Zealand; DAVID ROBERT HENRY, CNZM, Consultant; and STEWART LYNN BELL, Commissioner for Mine Safety and Health for Queensland:

GREETING:

Recitals

WHEREAS on 19 November 2010, at the coal mine at Pike River, near Greymouth, operated by Pike River Coal Limited, there occurred a major explosion within the mine while 31 employees of, or contractors to, Pike River Coal Limited were underground. Two men escaped the mine; the rest were missing:

WHEREAS on 24 November 2010, before the mine was declared safe for search and rescue operations, a further explosion occurred that was of such severity that expert assessment was that none of those trapped underground could have survived:

Appointment and order of reference

KNOW YE that We, reposing trust and confidence in your integrity, knowledge, and ability, do, by this Our Commission, nominate, constitute, and appoint you, The Honourable GRAHAM KEN PANCKHURST, DAVID ROBERT HENRY, and STEWART LYNN BELL to be a Commission to inquire into and report upon (making any recommendations that you think fit upon) —

(a) the cause of the explosions in the Pike River Coal Mine (the **mine**) on, around, or after 19 November 2010; and

(b) the cause of the loss of life of the men working in the mine; and

(c) the practices used or other steps taken at the mine for, or related to, its operations and management, including, without limitation, their effectiveness in achieving —

  (i) compliance with the law or recognised practices; and

  (ii) a healthy and safe place of work; and

(d) the search, rescue, and recovery operations contemplated or undertaken after the explosion on 19 November 2010, including, without limitation, —

  (i) the practices used, other steps taken, and the equipment and the other resources available; and

  (ii) preparedness for those operations; and

(e) the requirements of the Acts, regulations, or other laws, or of any recognised practices, that govern each of the following:

  (i) underground coal mining and related operations;

(ii) health and safety in underground coal mining and related operations; and

(f) how the requirements in paragraph (e) interact with other requirements that apply to the mine or to the land in which it is situated, including, without limitation, those for conservation or environmental purposes; and

(g) resourcing for, and all other aspects of, the administration and implementation of the laws or recognised practices that apply to the mine or to the land in which it is situated; and

(h) how the matters referred to in paragraphs (e) to (g) compare with any similar matters in other countries; and

(i) any other matters arising out of, or relating to, the foregoing that come to the Commission's notice in the course of its inquiries and that it considers it should investigate:

Matters upon or for which recommendations required

And, without limiting the order of reference set out above, We declare and direct that this Our Commission also requires you to make recommendations upon or for —

(a) the prevention, as far as possible, of similar disasters, and the safe working in future of the mine and other mines; and

(b) what ought to be done, if the mine is not reopened, to ensure the safety of the mine and the surrounding area; and

(c) practices or other steps for the purposes of search, rescue, and recovery operations in similar disasters; and

(d) whether any changes or additions should be made to relevant laws and practices:

Exclusions from inquiry and scope of recommendations

But, We declare that you are not, under this Our Commission, to inquire into and report upon the wider social, economic, or environmental issues, such as the following:

(a) the social consequences, for Greymouth and the West Coast, of the tragedy; and

(b) the economic impact, on Greymouth and the West Coast, of the tragedy and of coal mining, or any other mining, and related operations; and

(c) the merits of coal mining, or any other mining, and related operations in New Zealand (including, without limitation, in respect of land, or an interest in land, held under, or held under an Act or Acts listed in Schedule 1 of, the Conservation Act 1987):

"Practices" defined

And We declare that, in this Our Commission, unless the context otherwise requires, **practices** includes, without limitation, each of the following (however described):

(a) decision making:

(b) procedures:

(c) processes:

(d) services:

(e) systems:

Appointment of chairperson

And We appoint you, The Honourable GRAHAM KEN PANCKHURST, to be the chairperson of the Commission:

Power to adjourn

And for better enabling you to carry this Our Commission into effect, you are authorised and empowered, subject to the provisions of this Our Commission, to make and conduct any inquiry or investigation under this Our Commission in the manner and at any time and place that you think expedient, with power to adjourn from time to time and from place to place as you think fit, and so that this Our Commission will continue in force and that inquiry may at any time and place be resumed although not regularly adjourned from time to time or from place to place:

Information and views, relevant expertise, and research

And you are directed, in carrying this Our Commission into effect, to consider whether to do, and to do if you think fit, the following:

(a) adopt procedures that facilitate the provision of information or views related to any of the matters referred to in the order of reference above; and

(b) use relevant expertise, including consultancy services and secretarial services; and

(c) conduct, where appropriate, your own research:

General provisions

And, without limiting any of your other powers to hear proceedings in private or to exclude any person from any of your proceedings, you are empowered to exclude any person from any hearing, including a hearing at which evidence is being taken, if you think it proper to do so:

And you are strictly charged and directed that you may not at any time publish or otherwise disclose, except to His Excellency the Governor-General of New Zealand in pursuance of this Our Commission or by His Excellency's direction, the contents or purport of any report so made or to be made by you:

And it is declared that the powers conferred by this Our Commission are exercisable despite the absence at any time of any one member appointed by this Our Commission, so long as the Chairperson, or a member deputed by the Chairperson to act in the place of the Chairperson, and at least one other member, are present and concur in the exercise of the powers:

And We do further declare that you have liberty to report your proceedings and interim findings under this Our Commission from time to time if you judge it expedient to do so:

Reporting date

And, you are required to report to His Excellency the Governor-General of New Zealand in writing under your hands, as soon as is reasonably practicable but in any event not later than 31 March 2012*, your findings and opinions under this Our Commission, together with the recommendations, required and otherwise, that you think fit to make in respect of them:

And, lastly, it is declared that these presents are issued under the authority of the Letters Patent of Her Majesty Queen Elizabeth the Second Constituting the Office of Governor-General of New Zealand, dated 28 October 1983,* and under the authority of and subject to the provisions of the Commissions of Inquiry Act 1908, and with the advice and consent of the Executive Council of New Zealand.

* Extended to 28 September 2012 on 7 February 2012 (CAB Min (12) 3/1); further extended to 30 November 2012 on 27 August (CAB Min (12) 30/7).

In witness whereof We have caused this Our Commission to be issued and the Seal of New Zealand to be hereunto affixed at Wellington this 14th day of December 2010.

Witness Our Trusty and Well-beloved The Right Honourable Sir Anand Satyanand, Chancellor and Principal Knight Grand Companion of Our New Zealand Order of Merit, Principal Companion of Our Service Order, Governor-General and Commander-in-Chief in and over Our Realm of New Zealand.

Governor-General

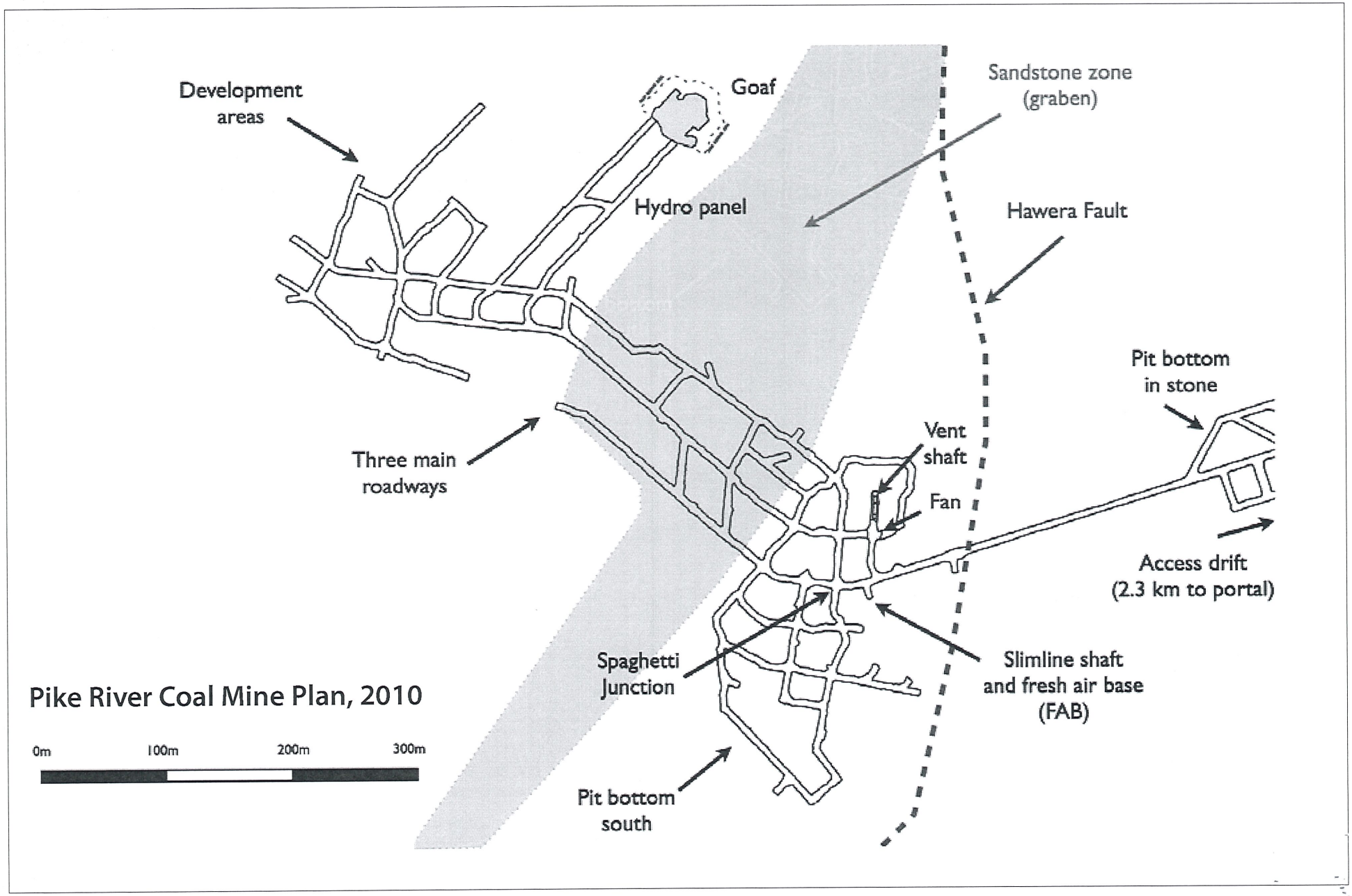
By His Excellency's Command —

Prime Minister

Approved in Council —

Clerk of the Executive Council

* SR 1983/225


Development areas
Goaf
Sandstone zone (graben)
Hydro panel
Hawera Fault
Pit bottom in stone
Three main roadways
Vent shaft
Fan
Access drift (2.3 km to portal)
Spaghetti Junction
Slimline shaft and fresh air base (FAB)
Pit bottom south
Pike River Coal Mine Plan, 2010
0m
100m
200m
300m

Overview

This overview is in three parts.

First there is a snapshot of the report, identifying some main points. The second part, which is essentially factual, sets out the commission's views on what happened at Pike River and why. The third part takes a broader view, identifying the lessons learnt from the tragedy and the significant changes required to avoid future tragedies. Recommendations are then made.

Readers requiring more detail should consult the main report (Volume 2).

Snapshot

The Pike River underground coal mine lies high in the rugged Paparoa Range on the West Coast of the South Island. Access to the mine workings was through a single 2.3km stone drift, or tunnel, which ran upwards through complex geological faulting to intersect the Brunner coal seam.

On Friday 19 November 2010, at 3:45pm, the mine exploded. Twenty-nine men underground died immediately, or shortly afterwards, from the blast or from the toxic atmosphere. Two men in the stone drift, some distance from the mine workings, managed to escape.

Over the next nine days the mine exploded three more times before it was sealed. There is currently no access to the mine.

The commission is satisfied that the immediate cause of the first explosion was the ignition of a substantial volume of methane gas. The commission's report identifies a number of possible explanations for the source of that accumulation of methane, and the circumstances in which it was ignited.

Methane gas, which is found naturally in coal, is explosive when it comprises 5 to 15% in volume of air. In that range it is easily ignited. Methane control is therefore a crucial requirement in all underground coal mines. Control is maintained by effective ventilation, draining methane from the coal seam before mining if necessary, and by constant monitoring of the mine's atmosphere.

The mine was new and the owner, Pike River Coal Ltd (Pike), had not completed the systems and infrastructure necessary to safely produce coal. Its health and safety systems were inadequate. Pike's ventilation and methane drainage systems could not cope with everything the company was trying to do: driving roadways through coal, drilling ahead into the coal seam and extracting coal by hydro mining, a method known to produce large quantities of methane.

There were numerous warnings of a potential catastrophe at Pike River. One source of these was the reports made by the underground deputies and workers. For months they had reported incidents of excess methane (and many other health and safety problems). In the last 48 days before the explosion there were 21 reports of methane levels reaching explosive volumes, and 27 reports of lesser, but potentially dangerous, volumes. The reports of excess methane continued up to the very morning of the tragedy. The warnings were not heeded.

The drive for coal production before the mine was ready created the circumstances within which the tragedy occurred.

A drive for production is a normal feature of coal mining but Pike was in a particularly difficult situation. It had only one mine, which was its sole source of revenue. The company was continuing to borrow to keep operations going. Development of the mine had been difficult from the start and the company's original prediction that it would produce more than a million tonnes of coal a year by 2008 had proved illusory. The company had shipped only 42,000 tonnes of coal in total. It was having some success in extracting coal as it drove roadways but it was pinning its hopes on hydro mining as the main production method and revenue earner. Hydro mining started in September 2010 but was proving difficult to manage and output was poor.

P It is the commission's view that even though the company was operating in a known high-hazard industry, the board of directors did not ensure that health and safety was being properly managed and the executive managers did not properly assess the health and safety risks that the workers were facing. In the drive towards coal production the directors and executive managers paid insufficient attention to health and safety and exposed the company's workers to unacceptable risks. Mining should have stopped until the risks could be properly managed.

The Department of Labour did not have the focus, capacity or strategies to ensure that Pike was meeting its legal responsibilities under health and safety laws. The department assumed that Pike was complying with the law, even though there was ample evidence to the contrary. The department should have prohibited Pike from operating the mine until its health and safety systems were adequate.

After the explosion a major search and rescue effort was launched. There was no predictable window of opportunity within which the Mines Rescue Service (MRS) could have safely entered the mine. Pike had no system for sampling the mine atmosphere after an explosion and without that information it was impossible to assess the risks of entry. The placement of the main fan underground and the damage caused to the back-up fan on the surface meant that the mine could not be reventilated quickly.

The New Zealand Police led the emergency response and made the major decisions in Wellington. There had been no combined testing of an emergency response of this nature involving Pike, mining specialists, the MRS, the police and emergency services.

For the first few days the families were given an over optimistic view of their men's chances of survival, but this was inadvertent. When the second explosion occurred five days later any remaining hope disappeared.

The new owner of the mine, Solid Energy New Zealand Ltd, has agreed that it will take all reasonable steps to recover the bodies provided this 'can be achieved safely, is technically feasible and is financially credible'.[1] Any recovery will hinge on a resumption of commercial mining operations.

The mine is sealed and its atmosphere is inert. Solid Energy is ensuring the safety of the mine, including physical security, monitoring of the underground atmosphere, checking of seals and contingency planning.

New Zealand has a poor health and safety record compared with other advanced countries. The government has set up an independent ministerial task force to determine if New Zealand's health and safety system is fit for purpose. The task force will no doubt examine on a broader scale some of the matters that the commission has considered.

To reduce the risks of future tragedies, the commission makes 16 principal recommendations, set out at the end of this volume. Some recommendations have implications beyond the underground coal mining industry.

The commission recommends that there should be a new regulator with a sole focus on health and safety. The new regulator should be a Crown entity with an expert board accountable to the minister and working closely with the Ministry of Business, Innovation and Employment, employers and workers.

Based on the commission's inquiries, the Health and Safety in Employment Act 1992 is generally fit for purpose but many changes are required to update the mining regulations. The commission recommends that the changes be progressed by an expert mining task force separate from the ministerial task force. The Queensland and New South Wales regulations provide good precedents.

More worker participation in managing health and safety is needed and will require legislative change and guidance from the regulator.

Major improvements to emergency management are required. The first step should be a joint review by the organisations that responded at Pike River, then amendments to the co-ordinated incident management system and finally a programme of testing and simulation of emergencies to iron out any problems.

The statutory responsibilities of directors for health and safety should be reviewed to reflect their governance responsibilities, including their responsibility to hold management to account.

Leaving aside regulatory change, the commission recommends that directors should rigorously review their organisation's compliance with health and safety laws and assure themselves that risks are being properly managed. Managers should access the best practice guidance available on leading health and safety in the workplace.

The changes recommended by the commission rest firmly on the principle that health and safety in New Zealand can be improved only by the combined efforts of government, employers and workers.

What Happened at Pike River

The tragedy

On Friday 19 November 2010 at 3:45pm there was an underground explosion at the Pike River coal mine. Twenty-nine men lost their lives, and their bodies have not been recovered. Their names and details appear on pages 4-5.

Two men survived the explosion. They were in the stone access tunnel (drift), a distance from the pit bottom area where the main workplaces were located. Although initially overcome, Daniel Rockhouse rescued himself and his colleague Russell Smith.

The New Zealand Police led the emergency response that involved emergency services, and mines rescue crews from New Zealand, New South Wales and Queensland. Despite strenuous efforts by everyone involved, a lack of information concerning the conditions underground prevented a rescue attempt.

A second explosion on Wednesday 24 November extinguished any hope of the men's survival. The emergency focus changed to recovery of the bodies.

The commission

On 29 November 2010 the prime minister announced the government's intention to establish a royal commission. In December 2010 the commission's terms of reference and the appointment of three commissioners, the Hon. Graham Panckhurst, David Henry CNZM, and Stewart Bell PSM, the Commissioner of Mine Safety and Health for Queensland, were announced. The terms of reference are on pages 6-9. In broad terms the commission was required to report on:

- the cause of the explosions and the loss of life;
- why the tragedy at Pike River occurred;
- the effectiveness of the search, rescue and recovery operation;
- the adequacy of New Zealand mining law and practice and the effectiveness of its administration; and
- how New Zealand mining, and associated conservation and environmental, law and practice and its administration compares with that in other countries.

The commission was also asked to make recommendations about the prevention of mine disasters, the improvement of search, rescue and recovery operations, any necessary changes to mining law and practice and how to make the Pike River mine safe should it not be reopened.

The immediate cause

The immediate cause of the tragedy was a large methane explosion. Methane is found naturally in coal. It is released during mining and also accumulates in mined out areas. A group of mining experts assembled by the police and the Department of Labour (DOL) concluded that a substantial volume of methane fuelled the explosion. The area most likely to contain a large volume of methane was a void (goaf) formed during mining of the first coal extraction panel in the mine. A roof fall in the goaf could have expelled sufficient methane into the mine roadways to fuel a major explosion. It is also possible that methane which had accumulated in the working areas of the mine fuelled the explosion, or at least contributed to it.

Methane is explosive only when diluted to within the range of 5 to 15% in volume of air. Following a roof fall methane would be diluted as it was carried through the mine by the ventilation system. It is not possible to be definitive, but

potential ignition sources include arcing in the mine electrical system, a diesel engine overheating, contraband taken into the mine, electric motors in the non-restricted part of the mine and frictional sparking caused by work activities.

Effective methane management is essential in an underground coal mine. Undoubtedly there was a failure to control methane at Pike River on 19 November 2010.

The underlying causes

The commission has endeavoured to establish both the operational factors and the systemic reasons that contributed to the tragedy. The inquiry was not limited to events at the mine, but extended to the actions of the regulators and the effectiveness of mining regulation and practice in New Zealand.

Some major themes became evident in the course of the inquiry:

- This was a process safety accident, being an unintended escape of methane followed by an explosion in the mine. It occurred during a drive to achieve coal production in a mine with leadership, operational systems and cultural problems.
- Such problems coincided with inadequate oversight of the mine by a health and safety regulator that lacked focus, resourcing and inspection capacity.
- The legal framework for health and safety in underground mining is deficient.
- Those involved in the search and rescue were very committed, but the operation suffered from an absence of advance planning for a coal mine emergency and from a failure to properly implement the principles of the New Zealand co-ordinated incident management system (CIMS).
- The families of the 29 men received generous community support, but would have benefited from better communications during the search, rescue and recovery phases.

The New Zealand mining industry

Background

Coal has been mined in New Zealand since about 1850. It was initially mined almost exclusively underground, but open cast mining is now predominant, producing over 80% of total production. New Zealand mining conditions are typically complex and characterised by faulted and dipping coal seams. Comprehensive geological exploration is essential to define the coal reserve and facilitate the planning and development of a successful mine. Mining methods such as hydro mining, suited to the difficult conditions, are required.

The New Zealand coal mining industry is small. Annual production is about 5 million tonnes – approximately 2% of Australia's production. In 2010 fewer than 2000 people were working in 22 coal mines, only five of which were underground.

A failure to learn

New Zealand's health and safety record is inferior to that of other comparable countries. The rate of workplace fatalities is higher than in the United Kingdom, Australia and Canada, worse than the OECD average and has remained static in recent years.

New Zealand also has a history of underground coal mine tragedies including:

1879	Kaitangata mine	34 deaths
1896	Brunner mine	65 deaths
1914	Huntly, Ralph's colliery	43 deaths
1939	Huntly, Glen Afton No. 1 mine	11 deaths
1967	Strongman mine	19 deaths

Lessons from the past, learnt at the cost of lives, have not been retained.