CHAPTER 3

The promise of Pike

Introduction

1. This chapter describes the physical characteristics of the Pike River coal field and the history of the mine's development over the 28 years between 1982 and the explosion in 2010. In broad terms there were three relevant periods: exploration of the coal field to 1995, mining feasibility studies to a final investment decision in 2005 and mine development to November 2010.

Physical characteristics of the coal field

Location of the coal field

2. The Pike River coal field is in a remote location on the eastern side of the Paparoa Range, about 45km north-east of Greymouth. It lies between Mount Hawera (1190m) to the north and Mount Anderson (1069m) to the south. The coal field occupies an area of about 7km^2.

Figure 3.1: Location of the Pike River coal mine

3. Access to the coal field is from the Taylorville–Blackball Road on the western side of the Grey River, then up the Big River Valley on Logburn Road, from where an 11.7km private road leads to the mine.

The land

4. The coal field lies under conservation land, and partially under the Paparoa National Park. Its western boundary is a sheer 200m escarpment that is marginally within the eastern perimeter of the park. From the escarpment the coal field dips to the east and terminates at a major fault line, the Hawera Fault. The mine portal, situated more than 2km to the east of the fault, is on the true right bank of the White Knight Stream, 120m upstream from its confluence with the Pike Stream.

5. The land area under which the coal field lies is administered by the Department of Conservation (DOC), the western margin and an area to the north under the National Parks Act 1980 and the balance under the Conservation Act 1987. DOC granted an access arrangement that authorised coal mining under the conservation estate. Easements granted by the Crown and a private landowner enabled construction of the mine access road. Pike River Coal Ltd owned an area of 87ha where its coal preparation plant (CPP) was built near the northern end of Logburn Road. Because of its remoteness the land above the coal field contains areas of virgin rainforest.

Geology

6. The geology of the coal field is complex, as can be seen from the simplified cross-sectional figure below. There are two coal measures, the Brunner seam, which was mined, and, approximately 200m below it, much older Paparoa seams. The Brunner seam consists of the main seam and above it a narrower rider seam, separated by interburden of variable thickness. The seams outcrop on the western escarpment. The Hawera Fault not only marks the eastern margin of the coal field, but has also deformed the seam upwards adjacent to the fault line.

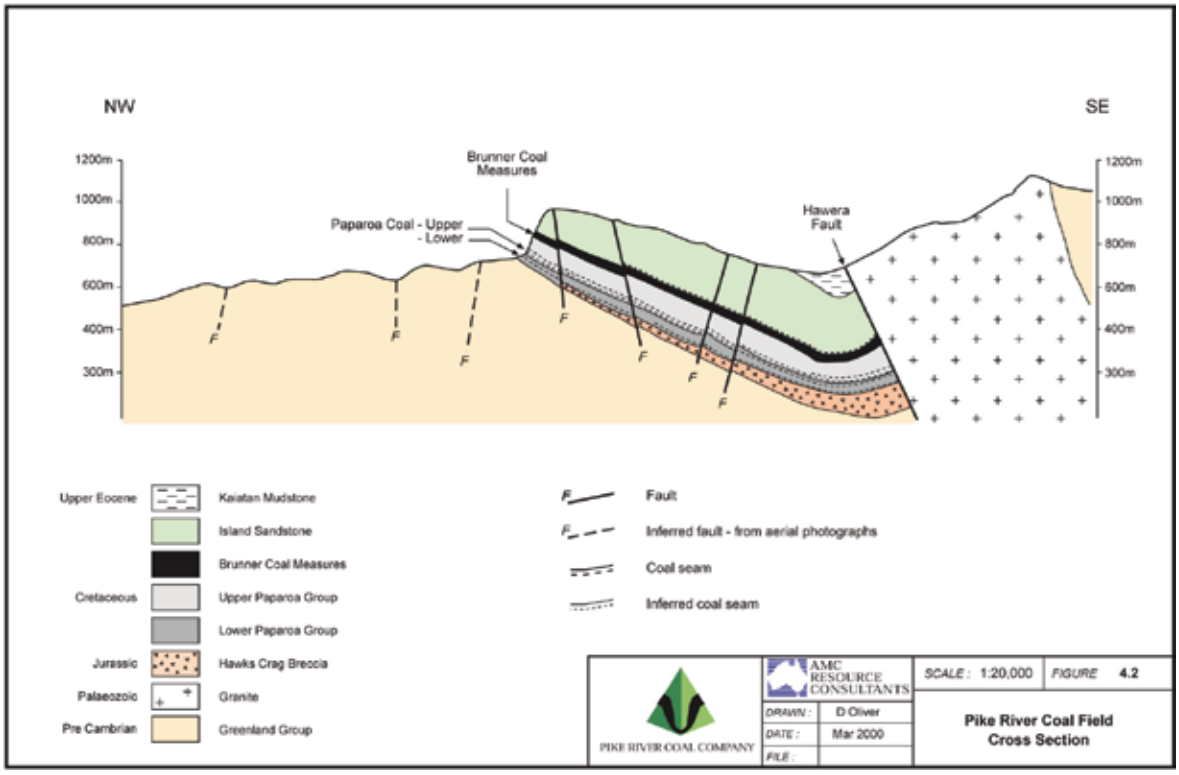

Figure 3.2: Pike River coal field cross-section[1]

7. Other faults intersect the Brunner seam, which dips at a gradient of between 10° and 20°. Island sandstone of varying depths overlies the coal field depending upon the surface contours. As can be seen in the simplified diagram of the west to east cross-section below, the surface contour is highly variable, this being rugged country intersected by gullies and streams.

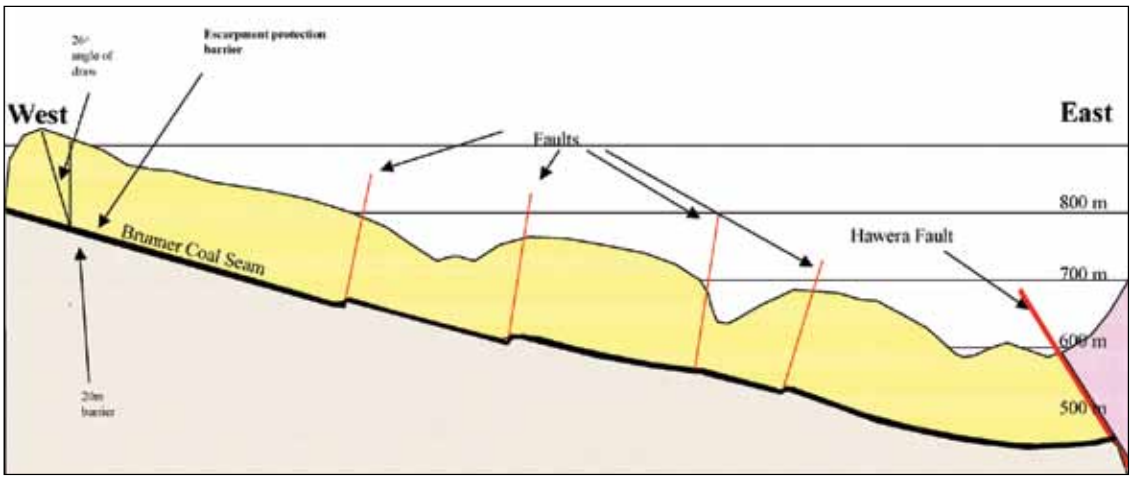

Figure 3.3: Pike River coal field west–east cross-section[2]

8. The Paparoa Range forms a barrier to the dominant westerly air flow from the Tasman Sea. As a result the coal field area has rainfall of up to 6m per annum. The altitude of the area makes it prone to snowfalls in winter; cloud and rain are the predominant climatic features for most of the year.

Exploration of the coal field

Outcrop sampling and drilling programmes

9. Although the existence of the two coal seams was well known, because of the outcrops on the western escarpment, exploration of the field did not begin until 1980. A mineral exploration company obtained prospecting licences and undertook geological mapping and the sampling of coal from the outcrops.

10. In 1982 the Pike River Coal Company Ltd (as it then was) was incorporated and took over the two prospecting licences by transfer from the previous holder. The following year the new company undertook a six-hole drilling programme (numbered PRDH1–6), using a drilling rig flown to each drill site by helicopter. Numerous core samples were obtained from the holes to a depth of between 130 and 270m.

11. In 1988 Pike became a wholly-owned subsidiary of New Zealand Oil & Gas Ltd (NZOG). Two years later, under a government-funded exploration scheme, one additional hole (PRDH7) was drilled to intersect both the Brunner and Paparoa seams. In 1993 the company obtained an exploration permit for a four-year term over an area of about 1782ha. In 1993 a further seven holes were drilled (M1–7) under a joint venture programme with Japanese firm, Mitsui Mining Engineering Co. Ltd.

12. On the strength of the testing of the cores obtained from these 14 drillholes, the company commissioned a pre-feasibility study in 1995, and the following year applied to the Ministry of Commerce for a coal mining permit. During mine construction, additional holes were drilled, but mainly in the area of the stone drift to the east of the coal measures, or in the area of the mine workings. Angled holes were sometimes drilled from a single site, to avoid moving the drilling rig. These holes provided geological information for the siting of underground infrastructure.

13. Dr Jane Newman gave evidence about the geology of the Pike River coal field. She first studied the area as a PhD student in 1980, was involved in some of the early drilling programmes and a geological modelling project in 2008. She subsequently offered the company informal advice during the construction of the mine. She said the coal field demonstrates both stratigraphic (strata) complexity and structural (faulting) complexity, and that one superimposed on the other does not simply double the complexity but increases it greatly. Given this complexity, it was not unusual for in-fill drilling to provide a grid at 100m spacings, given complex West Coast mining conditions.[3]

14. Dr Donald Elder, chief executive officer of Solid Energy, concurred, noting that detailed geological and coal information would have required boreholes at about 100m spacing.[4]

15. At Pike River boreholes were drilled on average from 400 to over 500m apart.[5]

Coal characteristics

16. Pike River contains one of New Zealand's largest deposits of hard coking coal. It has a low ash and phosphorus content, which gives it a competitive advantage over other coking coals. Early studies indicated a wide variation in the sulphur content of coal within the Brunner seam. Selective mining would be needed to ensure sulphur limits were not exceeded.

17. In 2007 Pike planned to extract and export high-quality, hard coking coal.[6]

From feasibility to final investment decision

Pre-feasibility study

18. A Christchurch mining consultant, CMS Ltd, undertook the 1995 pre-feasibility study. The key recommendations were that assessment of the coal field should continue to the feasibility stage, that seven more drillholes were required to confirm the coal reserve quality and to provide geotechnical assurance, and that access agreements should be obtained as early as possible. Development costs were estimated to be $29 million, including $13.65 million to develop the access road and establish the mine, $4.55 million for plant and equipment and $5.85 million as a 25% contingency allowance.[7]

19. NZOG commissioned a further pre-feasibility study in 1998 from Auckland-based Minserv International Ltd. The study included an assessment of the benefits of using hydro mining at Pike River. It described the 'significant dip' of the seam, allowing a water-assisted gravity flow of coal from the workings to pit bottom, from where it could be carried by a slurry pipeline to the CPP. Using this method, annual production of between 460,500 and 502,380 tonnes was estimated.[8] Minserv also completed a revised financial model, including hydro-mining costings, and arrived at a capital outlay of $43.26 million for the three initial development years.[9]

Mining permit

20. The company applied for a mining permit in March 1996. The application estimated the total recoverable coal reserves to be 26.7 million tonnes. Three years would be needed to develop the mine to the point of coal production, after which the life of the mine was estimated at 40 years.[10]

21. Mining permit number 41-453 for an underground coal mine was granted in September 1997. It was issued for a period of 40 years subject to mining beginning within five years and an average of 300,000 tonnes of coal being mined per annum. The total area covered by the permit was 1611ha, but this area was increased by 333ha in January 1998.[11]

An access arrangement

22. In June 1998 the company applied to DOC for an access arrangement so it could mine for coal beneath the conservation estate. No application for an open cast mine was made, nor was such a proposal discussed. A detailed six-year process followed before the terms of an agreement were resolved. DOC was concerned to safeguard and preserve the land as required of it under the Conservation Act 1987 and the National Parks Act 1980. Its concerns included land subsidence, fire control, protection of flora and fauna, mine water discharge, protection of the western escarpment and protection of breeding habitats.

23. Numerous environmental reports and risk assessments were obtained to assess the risk from surface activities and underground mining. DOC engaged its own experts and there were exchanges between consultants in an endeavour to find acceptable solutions. In October 2000 the access application was amended after the area of the mining permit had been enlarged to include the area required for the mine access road.[12]

24. In March 2004 the minister of conservation approved the arrangement, but subject to the drafting of conditions.[13] On 21 October 2004 a 25-year access arrangement was signed. The agreement conditions were extensive. Surface subsidence limits were prescribed, and the company agreed to develop 'trial mining panels' to demonstrate that any surface disturbance fell within the defined limits. A mining buffer zone prevented mining close to the western escarpment, and no 'untreated mine water' could be allowed into the tributaries of the Big River. Specific consent was required for any surface activity that could affect flora or fauna, such as establishment of drilling sites, roadworks or the construction of helicopter landing areas. The company also had to provide an annual work plan, fund a liaison person for the term of the agreement and arrange insurance and bonds for its obligations under the agreement.[14]

25. The rigour of the process and the detailed controls contained in the access agreement left no room for doubt concerning the high level of protection to be given to the surface environment of the mine. Pike understood and respected DOC's requirements. Regular liaison meetings occurred, mostly at the mine site. These worked well, so that for example every drillhole approval sought by Pike was approved by DOC.[15]

26. During the mine development seven variations to the access arrangement were negotiated to cover unanticipated environmental requirements and 144 work plan variations occurred.[16]

Resource consents

27. In mid-1998 the company applied for various resource consents from the Greymouth and Buller District Councils and the West Coast Regional Council. These were granted in June 1999. They covered a wide range of activities, including taking water from the Pike Stream; construction of the stone drive, ventilation shaft, access road, slurry pipeline, bridges, power and telecommunications lines, and the CPP; as well as consents required for a coal stockpile. However, in July 1999 interested parties lodged appeals to the Environment Court against the resource consent decisions.

28. In May 2002, to respond to concerns raised by the appellants, the company obtained a report on the environmental effects of the coal field development from consultant URS New Zealand Ltd. This outlined changes in the company's approach, including relocating the mine portal from beside the Pike Stream to its eventual location on the White Knight Stream. This increased the length of the stone drift by 400m, but avoided the need for road development beside the Pike Stream.[17]

29. In the end the Environment Court appeals were resolved by a consent order of the court, which approved numerous resource consents incorporating changes to those originally granted.[18]

The final investment decision

30. In June 2000 AMC Resource Consultants Pty Ltd provided the company with a final feasibility study. This assessed all aspects of the mine project from the extent of the resource to the proposed mine systems and required workforce. AMC was not paid a consultancy fee, but instead received a 25% shareholding in the company.

31. The study was not acted upon for some time. Instead the company focused on obtaining the access arrangement and resource consents, which were finally in place by late 2004. Minarco Asia Pacific Pty Ltd (previously AMC) then prepared an updated study, particularly of the capital costs to continue the project.

32. These were reflected in a mine plan and financial model ('the joint report') presented to the Pike board in July 2005 by Gordon Ward, the general manager, and Peter Whittall, the mine manager. Mr Ward was an NZOG appointee who, in 1998, assumed responsibility for the Pike River project. His background was in accountancy and auditing, not mining. Mr Whittall, who joined the company from Australia in February 2005, was a mining engineer and experienced in coal mine development and management.[19]

33. The joint report recommended that the board accept the proposed mine plan and development strategy, and authorise management to execute the plan including employing 'such staff as are required to complete the capital works within the approved budget'. On 20 July 2005 the board made a final investment decision in the terms recommended.

34. The capital development of the mine was costed at $124.1 million to September 2007, including the following amounts and completion dates:

Access road	$11.75 million	April 2006
Tunnel (drift) development	$21.3 million	September 2006
Hydro set-up	$28.4 million	October 2007
Full coal production	-	February 2008

Production capacity was estimated at 'up to 1.4Mtpa' (million tonnes per annum), comprising 20% from mine roadway development and 80% from hydro mining. A peak workforce of about 150 people was contemplated to enable a seven-day, three-shift operation; contractors would be used for 'specialist activities'.[20]

Optimism prevailed

35. The company embarked upon development of the mine with optimism and confidence. Mr Ward, speaking at the November 2008 annual general meeting, referred to Pike River as a 'special mine', with 'the largest and most valuable hard coking coal deposit in the country' and 'the lowest ash content in the world and a high fluidity level'. These properties would make the coal attractive to the international steel and coke industries. These qualities were complemented by investment in 'new modern machinery and equipment, and [a] recruited skilled mining staff to make sure we achieve that target … approximately one million tonnes of coal a year for each of the next 18 years'.[21]

36. At the 2009 annual general meeting Mr Ward told shareholders that 'Pike River's state-of-the-art hydro monitors will cut … around 2,200 tonnes per day; that's about 800,000 tonnes a year' while roadway development would 'add another 200,000 tonnes a year on average'. The mine enjoyed advantages because of 'mining uphill nearly all the time and being able to use gravity to flume and pipe coal out of the mine', and because it had 'much larger hydro-mining pumps' and was generally 'designed to be a bigger mine than all other New Zealand underground mines'.[22]

Mine development

37. The mine infrastructure includes the coal stockpile and loadout facility at Ikamatua, 22km from the CPP and bathhouse, and the mine amenities area, about 7km up the access road from the CPP. The amenities area includes offices, the operations control room, and workshop. The portal is a further kilometre up the access road from the amenities area.

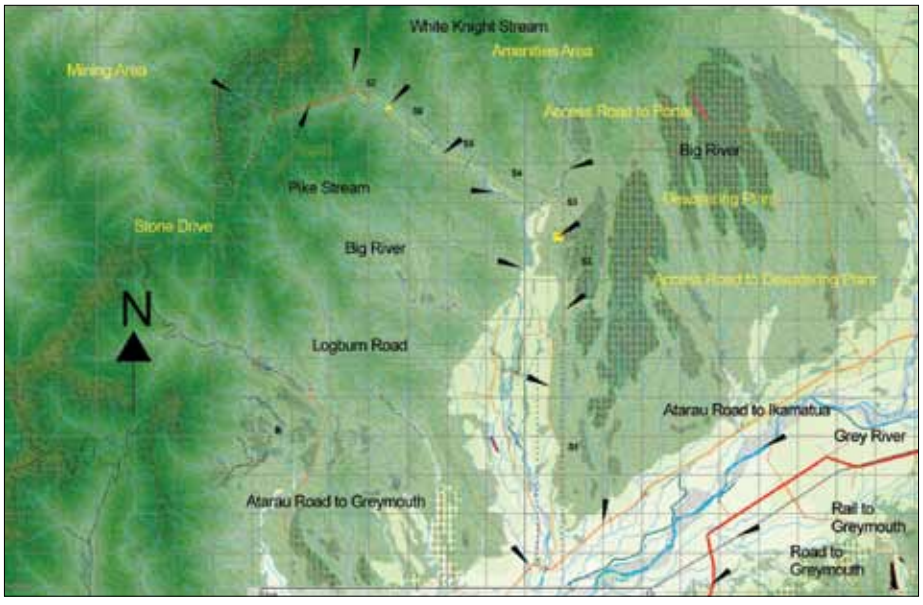

Figure 3.4: Pike River mine environs[23]

38. Underground, the stone drive, or drift, stretches about 2.3km from the portal to the coal seam. It provided intake air, transport for men, materials and coal, and provision for power, water and communications services. A vertical ventilation shaft, over 100m deep, provided return ventilation and a second means of egress. A second drive was to be established as the mine developed towards the north-west of the licence area.

Access road

39. Work on construction of the access road from the CPP to the mine portal began in December 2005. As well as establishing a single-lane roadway, with passing bays, Ferguson Brothers, the Greymouth contractor, was required to construct several bridges.[24] The road was completed in September 2006, five months after the completion date envisaged in the joint report to the board. In November Ferguson Brothers won the Canterbury Contractors Federation Environment Award and Contractor of the Year for projects over $1 million for its successful construction of the road through virgin native forest and conservation estate.

Pike River share offer

40. On 22 May 2007 Pike River Coal Ltd issued a prospectus offering 65 million $1 shares for public subscription.[25] The company was still a subsidiary of NZOG, which held a 54% stake. The next two biggest shareholders were Indian companies, Saurashtra World Holdings and Gujarat NRE Ltd. Their combined shareholding was about 32%, with smaller investors holding the balance of the shares.[26]

41. The prospectus included these financial details:

Total development costs: $207 million (exclusive of pre-development costs of $16 million) being:

$64 million	spent to May 2007
$99 million	to finish development
$11 million	contingency sum
$33 million	production working capital
$207 million	

The capital required, therefore, was $143 million, which was to be sourced from the share issue, some cash on hand and new borrowings. The prospectus anticipated coal production (in tonnes) of 243,000 in 2008, 1.039 million in 2009 and 968,000 in 2010.

A total production of 17.6 million tonnes over a 19-year mine lifespan was predicted, at an average annual extraction rate of 967,000 tonnes.[27]

42. The share offer was oversubscribed and 85 million shares were allotted to new investors. NZOG's shareholding reduced to 31%, so that the company ceased to be an NZOG subsidiary.[28] In July 2007 the company was listed on the New Zealand and Australian stock exchanges.[29]

Construction of the drift

43. McConnell Dowell Constructors Ltd developed the drift and the main ventilation shaft, as well as some surface facilities. Tunnelling work started in September 2006. The drift was to have a horseshoe profile, to form a roadway 5.5m wide and 4.5m high.[30] It was inclined upwards by about 5° over its length. This allowed the drift to intersect the Brunner seam near to its lowest point.

44. There were variations to the contract during the development of the mine. The most significant change was the inclusion of an area known as pit bottom in stone.[31] This comprised 500m of roadways, either side of the drift, at about 1900m inbye, as depicted below. This area was to house a coal crushing station and water pumps used to provide water to the working faces in the mine, and water to the slurry pipeline leading to the CPP. During construction methane was encountered and some frictional ignitions occurred. Until then the work was deemed

tunnel development, but the ignitions caused the Department of Labour (DOL) to designate the tunnel a 'gassy mine'.[32] This designation meant that project control also passed from McConnell Dowell to Pike.

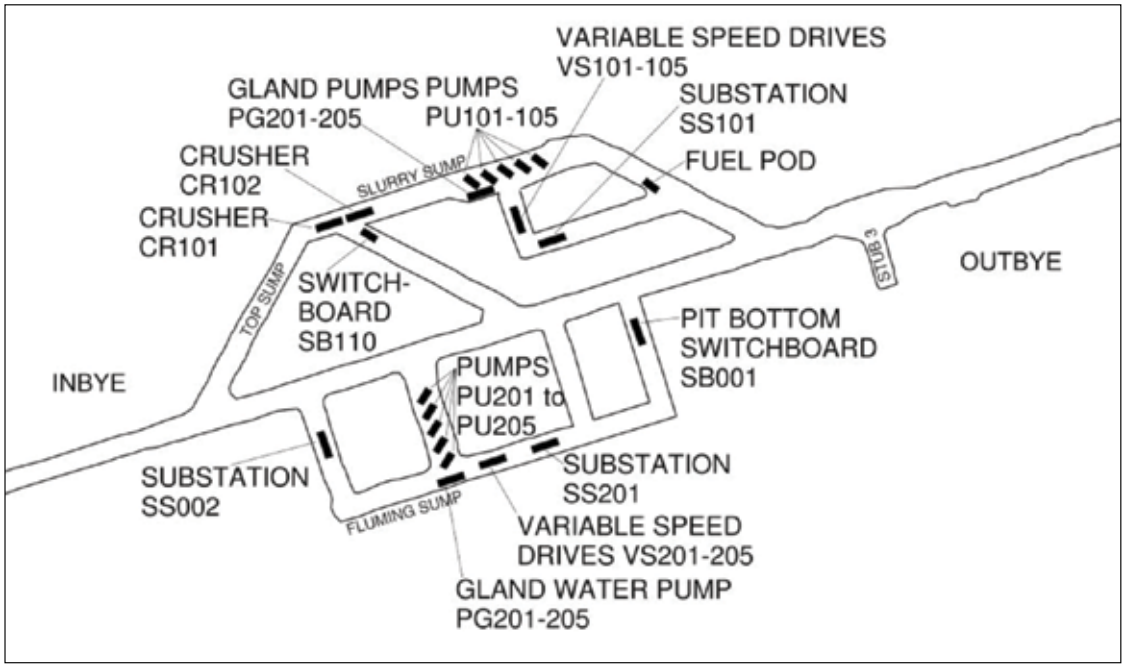

Figure 3.5: Plant location pit bottom in stone[33]

Originally this area was to be developed to the west of the Hawera Fault, but a decision was taken to develop it in the hard gneiss stone.

45. In December 2008 the drift and pit bottom in stone were completed. This was two years and three months after the completion date in the joint report, and five months after the estimated date in the prospectus. Even allowing for the additional work, there was considerable delay, caused largely by unfavourable ground conditions. The contract with McConnell Dowell included a per metre payment rate based on rock quality. Because most of the drift attracted the highest metre rate, the total cost was about 100% over budget.[34] In August McConnell Dowell won a New Zealand Contractors Federation award for its work on a 'technically and geologically complex project' in the over $20 million category.

46. On 27 November 2008 the mine was officially opened to mark 'the breakthrough to coal and achievement of operational status'.[35]

Figure 3.6: Minister of Energy and Resources, the Hon. Gerry Brownlee, Pike Chief Executive Gordon Ward, Chair John Dow and General Manager Peter Whittall at the opening of the Pike River mine

Development of the ventilation shaft

47. By late 2007 a final decision was required about the site of the ventilation shaft, so that McConnell Dowell could develop the surface collar to the shaft over summer. The company did not want it outbye of the Hawera Fault, in stone, because of cost and significant problems with land stability. The site of an existing drillhole (PRDH13) was investigated, and a new drillhole (PRDH31) was bored. In September a site inbye of the Hawera Fault was finalised and in late summer McConnell Dowell constructed and grouted the surface collar.[36]

48. But the shaft could not be completed until the drift was through the Hawera Fault and a roadway was driven to the ventilation shaft site. In December 2008 a bore began to ream out the shaft from the bottom up to the surface. This was completed in January 2009, but in early February 2009, before the 4.2m diameter shaft was fully lined, the bottom section collapsed, sealing any connection between it and the mine roadway.[37]

49. Following investigation the company decided to abandon the bottom 35m, cap it with concrete and construct a bypass to reconnect to the upper 70m of the shaft, as shown in the diagram.

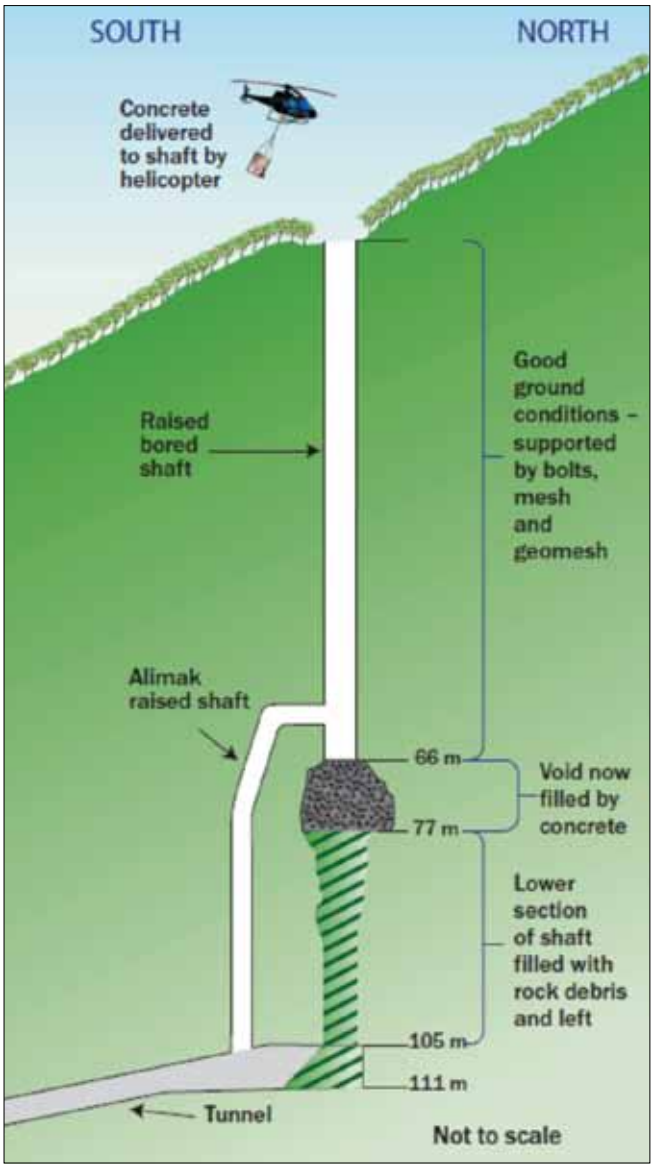

Figure 3.7: Ventilation shaft and Alimak raise[38]

The bypass, called the Alimak raise, was constructed between April and June 2009. The raise was only 2.5 by 2.5m, and connected to the 4.2m diameter shaft. Obviously, the cost of the Alimak raise was unexpected, as was the five-month delay.

50. During this period, Pike also drilled a 600mm 'slimline' shaft to improve air capacity. It was completed in May 2009. A fresh air base, so called, was later established at the bottom of the slimline shaft to provide air in the event of an emergency.

Mine roadway development

51. From November 2008, when the drift reached its 2.3km design length and was through the Hawera Fault, mine roadway development began. The first roadway was driven 75m north, to the base of the proposed ventilation shaft.[39] Further roadway development was planned to the south, where there would be more mine facility infrastructure, and to the west, where coal extraction was to be centred.

52. These roadways, 5.2m wide by 3.6m high, provided access for men and machines, and carried such services as ventilation ducting; water, compressed air and methane pipes; and a coal flume to transport coal and water from the working faces. The roadway walls (ribs) and roof were bolted and secured with mesh for strata support.

53. In anticipation of roadway development, horizontal in-seam drilling of the Brunner coal seam began, using a drilling rig. Exploratory boreholes were drilled hundreds of metres into the seam to define the seam limits and to obtain geological data. The boreholes also released methane from the seam, although this was secondary to seam exploration.

54. Holes drilled to the west revealed the existence of a graben, a downthrust zone between two fault lines, which in this instance had depressed the coal seam and substituted a zone of island sandstone. Situated close to the Hawera Fault, the graben was about 200m wide. Driving roadways through the sandstone 'took several months longer than initially expected' and delayed mine development.[40]

55. By April 2010 roadways through the graben were completed and the rate of development improved.

Mining machinery

56. The company purchased three mining machines for use in roadway development, two continuous miners and one roadheader at a total cost of $14 million.[41] The continuous miners were configured to cut the width of a roadway in two passes, bolting the roof and ribs at the same time. The roadheader was also suited for cutting stone.

57. The continuous miners proved unsatisfactory for the conditions. They were not fast enough and suffered heavy wear and tear while cutting through the graben. In the third quarter of 2010 one was withdrawn from service so it could be modified. This work was expected to take three months.

58. In August 2010 another brand of continuous miner, called the ABM20, was leased and began operating. It could cut a 5m roadway in a single pass and bolt at the same time. The ABM20 achieved improved daily advance rates. This led the company to buy another ABM20, to be delivered towards the end of the year.[42]

Hydro mining

59. Initially the mine plan and access arrangement required trial panels in the north-western corner of the coal field to assess whether coal extraction caused surface subsidence. Roadways were to be driven to this area and hydro-mining panels established. Mining would then retreat back in a south-easterly direction, so that the last coal taken would be from the pit bottom area. However, delays and cost overruns forced a rethink. Mr Whittall raised with DOC the concept of a 'commissioning panel' to allow initial coal extraction close to pit bottom. This would provide $15–$20 million of revenue, and the company would then revert to the original plan.[43] This proposal was agreed to. In early 2010 approval was given to develop a smaller 'bridging panel' nearer to pit bottom.

60. Hydro mining started in September 2010. A hydro monitor cut the coal, using a high-pressure water jet. The coal was then collected and flumed under gravity to the slurry pipeline. The monitor gradually retreated, leaving a void, or goaf, from which coal had been extracted.

61. Teething problems affected hydro extraction. Coal production was not at the desired rate, owing to equipment problems, the hardness of the coal, mining crew inexperience and methane control difficulties.[44]

Ventilation

62. Effective ventilation is essential in an underground coal mine. The ventilation system must deal with coal gases and dust, as well as supplying the miners with sufficient air at acceptable temperature and humidity levels. During the development of the drift a fan at the portal ventilated the mine. It was replaced in mid-2009 by a fan at the top of the ventilation shaft. In mid-2010 a new main ventilation fan was installed underground next to the main vent shaft. It was designed to draw air into the mine from the portal and expel polluted air up the shaft and out of the mine. The fan was commissioned in October 2010.

63. This is thought to be the first time a main fan had been located underground in a coal mine anywhere in the world. Some metalliferous mines have underground main fans, but they do not face a methane hazard. In locating the fan underground the company faced a number of challenges. The fan motor was not flameproof and had to be situated 'in fresh air' in an intake roadway, with the fan blades located in a return roadway to expel polluted air up the ventilation shaft. The fan was vulnerable in the event of an underground fire or explosion, dependent on a power supply cabled into the mine from the portal and inaccessible to electricians in the event of an underground emergency. It also experienced teething problems after it was installed.

Workforce

64. In October 2008 Pike River employed 82 full-time staff members.[45] Two years later the workforce numbered 174. Over the previous 12 months the company had been engaged in a 'significant offshore recruitment drive to build a top quality workforce'. The workforce included about 80 locals, other New Zealanders and a significant number from overseas.[46]

65. The company also employed between 20 and 60 contractors including 'significant use of local contracting companies'.[47] This exponential increase in numbers created a demand for training courses, particularly as many people were new to New Zealand conditions, or new to the industry.

66. There was also a staff retention problem. One example of this was the turnover of mine managers at Pike River. From September 2008 until the date of the explosion six men held the position on a permanent or acting basis. A seventh person, Stephen Ellis, was to assume the role, as soon as he obtained a first class mine manager's certificate of competence.

An environmental award

67. In September 2008 DOC recognised Pike River for 'the environmental consideration it had demonstrated in the establishment of [its] mining facilities'.[48] The surface footprint on conservation land was restricted to only the 13ha needed to establish the 10km access road and locate administration buildings. Predator control programmes, constructing the road to wind through ancient native trees and blending buildings into the native bush setting also won praise. Two months later, on a visit to the mine, Minister of Conservation Chris Carter added that it was a 'showcase development which had set a new environmental standard for coal mining'.[49]

Coal production and capital fundraising

68. In its 2007 prospectus Pike River anticipated that coal production would begin in the March 2008 quarter, with production of 243,000 tonnes for that calendar year, which would generate a cash flow of $38 million at an average sale price of $157 per tonne.[50] The first two coal shipments were not until February and September 2010, when 20,000 and 22,000 tonnes, respectively, were sold for around $9 million.[51] In October the company announced that its production forecast to June 2011 was downgraded from 620,000 to 320,000–360,000 tonnes.

69. The company therefore had to raise funds to meet operational and capital costs in each of its last three years of operation. In February 2010 Pike River announced a $90 million fundraising initiative. It raised $10 million from a share placement in April and $40 million from a rights issue in May. By October 2010 capital raised over the previous three years had increased the number of ordinary shares on issue from 200 million on listing in 2007 to over 405 million.

70. In May 2010 NZOG advanced the company US$28.9 million (NZ$41 million) upon the security of a convertible bond. This sum was required to repay a debt owed to a Goldman Sachs entity (Liberty Harbor), after Pike River breached a production covenant contained in the loan agreement. In September NZOG also granted a short-term loan facility of $25 million to meet a projected cash shortfall. In October Pike River drew down $13 million.[52]

71. On 18 November, the day before the explosion, the company was on the brink of raising a further $70 million capital involving a share placement to ordinary shareholders of $25 million and to institutional investors of $45 million, fully underwritten by a major international investment bank. John Dow, chair of the board, considered that this $70 million would have carried the company through to the third quarter of 2011 when 'we expected to be in fully steady state hydro-mining'.[53]

NZOG's review of its investment

72. NZOG reviewed its investment in Pike during 2010.[54] It obtained management and technical reviews of Pike from Behre Dolbear Australasia Pty Ltd (BDA). The reviews contained recommendations, including the need to address equipment matters, tighten reporting and project management, ramp up production and accelerate training programmes. BDA noted that 'the impression (correct or otherwise) is that there does seem to be more of a focus on the market than the project, and there is a lot of effort being expended on presenting the project to the broking community'. [55]

73. David Salisbury, the managing director of NZOG, says that, on 23 August 2010, he and Antony Radford, chairman of NZOG and a director of Pike, told Mr Dow that NZOG had lost confidence in both Pike's chief executive officer, Mr Ward and general manager, Mr Whittall,[56] but Mr Dow recalled that the criticism as confined to Mr Ward.[57] On 10 September Mr Ward's resignation was announced. On 13 September Pike's board announced the promotion of Mr Whittall to chief executive officer. Mr Dow commented in the board minutes that 'Pike River had in the past consistently overpromised and under delivered. This time it was important that we did a better job of forecasting the production schedule.'[58]

74. On 23 November 2010, four days after the explosion, the company sought to draw down the remaining $12 million under the short-term facility; NZOG agreed.[59] On 8 December Pike River was insolvent and was placed in voluntary receivership.

Challenges faced in 2010

75. The commission considers that Pike River faced several serious challenges during 2010:

- It was operating in an area where, as Dr Elder said, 'the geology, geography and climate of the West Coast [made] all the processes around coal mining, not just the mining extraction process itself, as hard or harder than most other locations in New Zealand and in the world'.[60]
- Development of the mine had been affected by uncertainty owing to insufficient geological investigation before construction work began. Problems in driving the drift, the collapse of the vent shaft and the discovery of the graben demonstrated the extent of the deficit, which was likely to cause further difficulties.
- Unsuitable machinery significantly hindered the mine's development, though good progress had been made towards addressing this issue.
- The mine was in start-up mode, with a recently recruited and inexperienced workforce, and faced retention problems, particularly in relation to those in statutory and management positions.
- A new main ventilation fan had been installed in an underground location, a first in the coal mining world, and was still being bedded down.
- Hydro mining had begun, but production was held back by a combination of inexperience, equipment limitations and a methane control problem.

- Delayed production weakened the company's financial situation, resulting in a need to focus on fundraising.
- Its failure to meet targets, increased borrowings and shareholder discontent meant that the company faced significant risks to its reputation and credibility.

76. Together, these issues represented a major challenge to the company. In her evidence, Dr Kathleen Callaghan highlighted many of these same factors and expressed the opinion that 'the information I have seen shows me recurring patterns of causal factors that I know are well established in the literature to increase the likelihood of a process safety event'.[61] The commission agrees with this assessment.

ENDNOTES

[1] AMC Resource Consultants Pty Ltd, Final Feasibility Study, Vol. 1, 23 June 2000, DOC0010030006/23. ('Hawera' corrected by the commission)
[2] Ibid., DOC0010030006/92. ('Hawera' corrected by the commission)
[3] Jane Newman, transcript, pp. 192, 200.
[4] Donald Elder, witness statement, 8 June 2011, SOL306956_1/26, para. 70.
[5] Donald Elder, transcript, p. 20; Jane Newman, witness statement, 30 March 2012, NEW0069/5, para. 11.
[6] Pike River Coal Ltd, New Zealand Prospectus: An Offer of Shares in a Major New Zealand Coal Company, 22 May 2007, DAO.012.02790/133, para. 4.1.
[7] CMS Ltd, Pike River Coal Mine Pre-feasibility Study, 25 May 1995, DAO.012.03289/33,42.
[8] Minserv International Ltd, Pre-feasibility of the Pike River Coal Mining Project, March 1998, DAO.012.03362/3.
[9] Minserv International Ltd, Pike River Coal Field Pre-feasibility Study, September 1998, DAO.012.03403/10.
[10] Pike River Coal Company Ltd, Application to the Ministry of Commerce for a Coal Mining Permit Covering the Pike River Coal Field, February 1996, MED0010070015/4, 12,15.
[11] Paul Carpinter, (Secretary of Commerce), Certificate of Extension of Permit Area, 21 January 1998, DAO.012.03587/2–5.
[12] Department of Conservation, Tier Two Paper, 3 June 2011, DOC0000010001/46–47.
[13] Ibid., DOC0000010001/51.
[14] Access Arrangement Under Crown Minerals Act 1991, Mining Permit 41-453 Pike River Coal Company Limited, 21 October 1994, DOC0010020044.
[15] Mark Smith, transcript, p. 487.
[16] Craig Jones, transcript, p. 461; Department of Conservation, Tier Two Paper, 3 June 2011, DOC000010001/63–66.
[17] URS New Zealand Ltd, Assessment of Environmental Effects for the Pike River Coalfield Development, 3 May 2002, DOC0010020043_24/22–23.
[18] John Dow, witness statement, 9 June 2011, DAO.001.0003/25–26, para. 146.
[19] New Zealand Oil & Gas Ltd, Paper Phase One – Context, 25 May 2011, NZOG0067/55, paras 6.88, 6.89.
[20] All preceding quotes and figures from Peter Whittall and Gordon Ward: Pike River Coal Company Ltd, Pike River Coal Company Final Mine Plan and Financial Model, 13 July 2005, DAO.012.03499.
[21] Pike River Coal Ltd, AGM Managing Directors Address, 28 November 2008, DAO.009.10795.
[22] Pike River Coal Ltd, 2009 AGM – Managing Directors Address, 23 November 2009, DAO.008.16781.
[23] Map, DAO.004.11082/1.
[24] New Zealand Oil & Gas Ltd, Paper Phase One, NZOG0067/57, paras 6.97, 6.99.
[25] The company name was changed from Pike River Coal Company Ltd on 13 March 2006.
[26] Pike River Coal Ltd, Prospectus, DAO.012.02790/156.
[27] Ibid., DAO.012.02790/12.
[28] New Zealand Oil & Gas Ltd, Paper Phase One, NZOG0067/8, para. 2.8.
[29] John Dow, witness statement, DAO.001.0003/5–20.
[30] Jonathan (Joe) Edwards, witness statement, 24 May 2011, MCD0001/12, paras 44–45.
[31] Pike chose to put pit bottom in stone so that large excavations could occur in a stable environment: Peter Whittall, transcript, p. 713.
[32] Health and Safety in Employment (Mining Underground) Regulations 1999, regs 2, 35–40, 55–59; Email, Kevin Poynter to Kobus Louw, 14 November 2008, DOL3000010087.
[33] Pike River Coal Ltd, Plant Location and Ventilation Plan: Rescue 101119_181, 22 March 2011, DAO.010.13140/1. (Extract of plan with typographical error corrected by the commission)
[34] Behre Dolbear Australasia Pty Ltd, Pike River Coal Project – Greymouth New Zealand Independent Technical Review, 20 May 2010, NZOG0065/8,10.
[35] Pike River Coal Ltd, Activities Report: Quarter Ended 31 December 2008*, DAO.008.04847/1.
[36] Jonathan (Joe) Edwards, witness statement, 24 May 2011, MCD0001/22–23, paras 90, 93.
[37] Don McFarlane, witness statement, 30 May 2011 RM.0002/14–15, paras 8.13–8.20.
[38] Pike River Coal Ltd, Activities Report: Quarter Ended 30 June 2009*, DAO.007.10907/2.
[39] Pike River Coal Ltd, Submission for Pike River Coal Limited (In Receivership) in Relation to Certain Topics for Consideration in Phase One of the Royal Commission of Inquiry, 27 May 2011, DAO.001.0002/36, para. 245.
[40] Pike River Coal Ltd, Annual Review 2010, 22 September 2010, DAO.008.05092/5.
[41] Pike River Coal Ltd, Activities Report: Quarter Ended 31 December 2008*, DAO.008.04847/2.
[42] Pike River Coal Ltd, Annual Review 2010, 22 September 2010, DAO.008.05092/6.
[43] Department of Conservation, Meeting Notes, 21 December 2007, DOC3000010003/2.
[44] Masaoki Nishioka, transcript, pp. 3488–544.
[45] Pike River Coal Ltd, Submission, DAO.001.0002/36, para. 244.
[46] Pike River Coal Ltd, Annual Review 2010, 22 September 2010, DAO.008.05092/11.
[47] Ibid., DAO.008.05092/12.
[48] Department of Conservation, certificate, 11 September 2008, DOC0010020097/1; Pike River Coal Ltd, Annual Review 2008: Breakthrough to Coal, DAO.007.04664/11.
[49] Pike River Coal Ltd, Activities Report: Quarter ended 31 December 2008*, DAO.008.04847/1.
[50] Pike River Coal Ltd, Prospectus, DAO.012.02790/7.
[51] Pike River Coal Ltd, Annual Review 2010, 22 September 2010, DAO.008.05092/12.
[52] David Salisbury, witness statement, 25 May 2011, NZOG0068/24, paras 95, 147, 151.
[53] John Dow, transcript, pp. 3931–32.

[54] NZOG remained the cornerstone shareholder, holding 29.37% of the shares.
[55] Behre Dolbear Australia Pty Ltd, Independent Management Review, 19 May 2010, NZOG0064/7; Behre Dolbear Australia Pty Ltd, Pike River Coal Project – Greymouth, New Zealand: Independent Technical Review, 20 May 2010, INV.03.28442.
[56] David Salisbury, witness statement, 25 May 2011, NZOG0068/35, para. 137.
[57] John Dow, witness statement, 21 July 2011, DAO.001.0005/2, para. 5.
[58] Pike River Coal Ltd, Minutes of a Meeting of Directors, 13 September 2010, DAO.007.05996/9.
[59] David Salisbury, witness statement, 25 May 2011, NZOG0068/39, para. 158.
[60] Donald Elder, witness statement, 8 June 2011, SOL306956_1/11, para. 21.1.
[61] Kathleen Callaghan, transcript, p. 3280.