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# TRANSCRIPT OF PROCEEDINGS

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**INDEPENDENT PLANNING COMMISSION**

**MEETING WITH INDEPENDENT MINING ENGINEERING EXPERTS AND DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT**

**RE: HUME COAL AND BERRIMA RAIL PROJECTS STAKEHOLDER MEETING (SSD7171 & SSD 7172)**

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|---|---|
| **PANEL:** | **PETER DUNCAN AM**<br>**PROF ALICE CLARK**<br>**CHRIS WILSON** |
| **ASSISTING PANEL:** | **STEPHEN BARRY**<br>**LINDSEY BLECHER**<br>**CASEY JOSHUA** |
| **EXPERTS:** | **EMERITUS PROF JIM GALVIN**<br>**DR ISMET CANBULAT** |
| **DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT:** | **STEPHEN O'DONOGHUE**<br>**PHIL JONES** |
| **LOCATION:** | **VIA VIDEO CONFERENCE** |
| **DATE:** | **11.00 AM, FRIDAY, 9 JULY 2021** |

MR P. DUNCAN: Good morning and welcome. Before we begin today I'd like to acknowledge the traditional owners of the land from which we variously meet which for me is the Darramuragal or Darug people. I'd like to pay my respects to their elders past, present and emerging. Welcome to the meeting today to discuss the Hume Coal Project and Berrima Rail Project which is currently before the Commissioners for determination. Hume Coal Limited is the applicant and is proposing to build a new underground coal mine in the Southern Highlands region of New South Wales and develop associated rail infrastructure to support the mining operations.

The two components are the subject of two separate development applications made to the Department of Planning, Infrastructure and Environment – sorry – Industry and Environment, for the purpose of this assessment form an integrated whole. The associated projects are located approximately 100 kilometres south-west of Sydney and seven kilometres north-west of Moss Vale in the Wingecarribee local government area. My name is Peter Duncan. I am the chair of this Commission panel. I'm joined by my fellow Commissioners, Professor Alice Clark and Chris Wilson. We're also joined by Stephen Barry, Lindsey Blecher and Casey Joshua from the Office of Independent Planning Commission.

In the interests of openness and transparency and to ensure the full capture of information, today's meeting is being recorded and a complete transcript will be provided and made available on the Commission's website. The meeting is one part of the Commission's consideration of this matter and will form one of several sources of information upon which the Commission will base its determination. It's important for the Commissioners to ask questions of attendees and to clarify issues whenever it is considered appropriate. If you're asked a question and are not in the position to answer it, please feel free to take the question on notice and provide any additional information in writing which we'll then put on our website.

Finally, I'd request all members here today introduce themselves before speaking for the first time if you can, please, and for all members to ensure they do not speak over the top of each other to ensure the accuracy of the transcript. We will now begin. Stephen, do you wish to introduce, or we move straight into the presentations?

MR S. O'DONOGHUE: Look, I'll – I'll just say a – so, Stephen O'Donoghue, director of resources here. I'm attending along – along with Phil Jones, who's a consultant planner. Jim – Jim Galvin – Professor Jim Galvin – Galvin and Ismet have both provided advice on the subsidence and – and mining and certain aspects of the project and are here today just to address the agenda items listed. I think, just speaking to Jim, I think he wanted to make a statement upfront as well before we get – I guess, get into the agenda items. I'll – I'll pass it on to – to Jim in the first instance.

MR DUNCAN: Thank you. Jim, over to you.

PROF J. GALVIN: Good morning, Peter. Jim Galvin. I read your agenda and then I went away and read the various documents that had been produced over the last two years and thought I'll put them – put the issues down in some sort of logical order to suggest to you that perhaps we follow that order. And then I came back this morning to the questions you asked and you basically had them in exactly that order - - -

MR DUNCAN: Right.

PROF GALVIN: - - - except that my starting point is one earlier step than you, and that is the actual underground equipment. Now, to me that – that sort of order told a logical story and I think it goes to answering some – many of the questions that you're asking and we can answer them as we work through it. So I – I don't know whether you would like to go that way or you've got your own plan for the day.

MR DUNCAN: No. Please proceed that way, Jim. I – I'm really happy to – to follow that process and it's – it's good that we're fairly well-aligned in our questions as well. So over to you.

PROF GALVIN: Okay. So I think the first thing is I probably need to share my screen with you, but I did send out a presentation during the night with four slides on it and I – it would help if you had that in front of you perhaps or you can just follow my screen sharing.

MR DUNCAN: We did receive it, so we'll do both, if – if you - - -

PROF GALVIN: Okay. Now, you have to bear with me because I'm interrupting a trip to Central Australia and I'm in my daughter's office in Brisbane.

MR DUNCAN: Right.

PROF GALVIN: I've got no idea how to work her technology just for the moment, but we'll – we'll get there. Okay. So let me throw that over there. Okay. So can you – have I shared my screen with you?

MR DUNCAN: We're just waiting for it, I think.

PROF A. CLARK: Not yet.

PROF GALVIN: Yes. I'll get rid of that. Okay. Do you have the presentations in front of you?

MR DUNCAN: We have them. I haven't got a – I've just got to – I'm like you. I've got to go between different advice – devices but I have looked at it, so – so please proceed, if – what about you, Alice, and - - -

MS C. JOSHUA: I – I can share the screen if you would like and you can just - - -

PROF GALVIN: Yes, yes. Please, if you - - -

MS JOSHUA: - - - let me know when to click it through.

PROF GALVIN: Yes.

MR DUNCAN: Why don't you do that, Casey.

PROF GALVIN: If you could do that, that would be - - -

MR DUNCAN: Thank you.

PROF GALVIN: That would be helpful. I probably need to use my mouse. Just give me one – one moment to see if I can – to see if I can beat this thing.

MR DUNCAN: Casey's got the presentation there now.

PROF GALVIN: Yes, yes. Okay. Can you see that now?

MR DUNCAN: Yes.

PROF GALVIN: Are you able to – to see that?

MR DUNCAN: Yes.

PROF CLARK: Yes, Jim.

MR DUNCAN: Yes. All – all good.

PROF GALVIN: Okay.

PROF CLARK: Jim, will you need to use your mouse to walk us through certain parts of the slides?

PROF GALVIN: It would appear that you can't hear me. Can you hear me now?

PROF CLARK: Yes. We can hear you.

PROF GALVIN: Okay. All right. Look, we'll just work off yours for the moment. That's the best we can do. So starting with the equipment, what the proposal is is to – is to take a continuous miner, which is the top right-hand piece of equipment, and that – that piece of equipment's used already in highwall mining. And then behind it to put a flexible conveyer train of a type that is used underground – and that's the – the piece of equipment on the left. Connect those together, and then to mine to the mining pattern that you see on the lower left-hand side and the last box on the – on the right-hand side. The last box on the lower left-hand side is the close up of – of that flexible conveyer train.

Now, it's either – that type of – that particular brand train or something similar that I think is being proposed. It's – at this stage it's still fairly – there's not a lot of information on – on the equipment. I'm going to have to try and share this presentation. I – I don't think it's going to – it's going to be quite difficult to – to explain what I need to. So you can't see my screen at all at the moment?

MR C. WILSON: When - - -

MR DUNCAN: We can see you but not the presentation.

DR I. CANBULAT: Do you want me to help you out, Jim?

PROF GALVIN: No. We're nearly there, I think. It's not what's done, Ismet. It's opening the right file. So you – can you see that one?

MR DUNCAN: It's coming now.

PROF CLARK: It's coming up now.

PROF GALVIN: Yes. Okay. That's the one. Okay. So, now, that's got to you.

PROF CLARK: Right.

PROF GALVIN: Right. So, quickly, continuous miner, similar used already on the surface for highwall mining, a different type of conveyor that's flexible follows the machine. The mining pattern is the one shown on the bottom corner, and one of the features of that is that a – that a lot of the roadways are driven at an angle of 70 degrees to the main headings, and then a close up of the conveyor and – and the way it flexes. So we're talking continuous miner, FCT at 70 degrees, and the other significant point for – for reference is that these run out distances with the miner and the conveyor are 120 metres. Now, that arrangement has – as far as I know, and I think the company's confirmed it – has not been done anywhere else in the world to date.

And Russell Howarth's review basically confirms that as well in that in that he's saying it's an – an engineering challenge to Hume Coal will be the interactive process to mix and max – max – match. So we're talking about trying to integrate components – difficult components of equipment to – to make this work. We're – if I move to the second – second slide, that combination of a continuous miner and an FCT – and, indeed, if you look at the – the two mining layouts I've shown – showing you at the moment, they're almost identical. And the one on the right is from Mooney Mooney Colliery which closed not so long ago, but that was at – near Caves Beach or Budgewoi in New South Wales, so it's a New South Wales operation.

And if you look at the – the hatched area is where they've totally removed all the coal. And if you look at the scale on the bottom you'll see that those hatched areas are also around 120 metres wide, which is similar to the distance that Hume Coal

want to – to run out with their miner and FCT. But the difference is that the continuous miner itself – the roadways out to the continuous miner are supported. The conveyor follows it and it's cutting in about 12 metres and then pulling out. Now, that type of combination of equipment typically works in those – those distances. There's a number of incidences – cases where it cuts out to 15 metres. I'm aware of trials to try and cut out 30 metres and they were unsuccessful.

The – the point to note though is that the – those trials and the figures I'm showing you at the moment are based on the roadways being around five and a half metres wide whereas Hume Coal intend to mine only four metre wide roadways and so the likelihood of roof fails or the potential for roof fails decreases significantly with roadway width. So you would expect a more stable roof with a four metre wide miner; however, as we'll talk a little bit about later, one of their differences being that with the use of these web pillars that that is a very soft support system for the roof and it compresses – it yields under a lower load than big – big pillars. And so in driving their roadways at – at Hume, the gain of the four metres could be offset to a degree by the yielding if – if the – if the pillars were to yield.

PROF CLARK: Jim, do you mind if we ask questions as we go through or would you prefer to wait to the end?

PROF GALVIN: No. I – I would – I'm happy to ask – ask questions. I was going to stop after each major heading, but I can stop any – any – yes. Interrupt me whenever you like.

PROF CLARK: No, no. I'll wait. I'll wait till you stop. My – my question that came up when you talked about that was are they mining those run outs flat, or is there an inclination?

PROF GALVIN: In this case there was a slight inclination. The one on the right is a slight inclination. I'm going to come back to that - - -

PROF CLARK: Thanks.

PROF GALVIN: - - - Professor Clark. I – I – I - - -

PROF CLARK: That was - - -

PROF GALVIN: - - - just wanted to tidy up the equipment. So I'll – I now want to put a slide up which I didn't send you because I don't have copyright for it, but this is my point with the equipment, is that if I go back now to highwall mining based on this technique and show you the equipment, it's quite different in that in this top left-hand picture there is the continuous miner. In this case it's white. There's the cutter head, followed behind by these rigid steel conveyor sections and they – they pin into the back of the continuous miner. The continuous – the – this launching frame is pushed up against the highwall and the miner is launched off at the – the angle that it's required to cut, which is typically close to 90 degrees to the highwall.

And as the miner advances – and if we go down to the example underneath it's the same except the colour scheme's reversed. So the miner is now orange and the – and the conveyor cars are white. But as the miner works in and a – a forklift will bring another conveyor car in, drop it in here, connect them together and – and those cars themselves are pushed and pulled in and out of the – of the hole, they're – they're heavy, steel, robust construction and – and part of that is that if there are roof falls these things are – are more capable of mining the roof fallout, certainly not being damaged. The – the – the cable – the power supply is – comes off reels, such as this, and they're in steel armoured cable, and then, as you can see, the – the – the – the punches are all – in this case – 90 degrees to the wall.

They don't have to be 90 degrees but they're generally pretty close. So to say that – you'd have to be careful if you say, "Well, this has been done many times before". The concept exists, but its application to an underground setting, particularly when we're talking of mining 120 metre long run outs, that – that, in – in – as far as I'm concerned is – is novel. It's a novel concept, and – and that carries with it two sets of risks. And this is – to me, standing back from the whole project, the common theme throughout the project in respect of what Dr Canbulat – Professor Canbulat and I have been asked to comment on, which is more the mining and the – and the geotechnical area, the risks keep falling back into a risk to safety and commercial risk.

Now, safety to me is an interesting one because in my time at – providing advice to both proponents and to the government and being on the Planning Assessment Commission, safety was never – has never been included in our terms of reference before. It's always been focused on environmental. So I think that has, sort of, thrown a bit of a – that – that's part of the source of the – the debate in this case is that we're dealing with safety. The other – the other one which really feeds off that partly – and among other things it feeds off – is commercial risk. Because this – this equipment is yet to be integrated for reasons we discussed later and Russell Howarth has discussed, it – it – it would be desirable to automate breakaways so that we have better control on keeping the – the web pillars at the right width.

And then the fact that if this equipment becomes entrapped and this equipment – in these circumstances, that is not unknown. Equipment does become entrapped. Then there's the commercial risk of, you know, how do we get it out and that in – that in – that in itself carries safety implications but, more importantly, why did it get trapped and could that be an impediment to the success of the system? So that – that, sort of, goes to your first question. I dare not change screens again now that we've got it working. I'll do it from memory. But I think your first question was about dealing with the use of the technology and – perhaps. So I'll – I'll stop there and – and I'm happy to take questions perhaps. It might be wise if – if Professor Canbulat wants to add anything to that and we can – and do two birds with one stone, perhaps.

DR CANBULAT: Thanks, Jim. Yes. That was a good introduction with the photographs of the equipment. I agree with what Jim – that – as everybody else, that the equipment has been used extensively in highwall mining, and I think that's the

argument that the Hume Coal is coming from. There are certain critical issues with this equipment, and that – as – as Jim highlighted, the fact that breakaways – Jim, could you please go one slide up where this plan is – is bigger?

PROF GALVIN: Ismet, I'm going - - -

DR CANBULAT: No. It's not that - - -

PROF GALVIN: I – I said I would – I would go to mining methods next, and that's where I'll talk a bit more about breakaways. Is that the one you're wanting.

DR CANBULAT: Okay. All right. Yes. No, no.

PROF CLARK: No - - -

DR CANBULAT: Yes. This is fine. This is fine. So what – what Jim is referring when he says "breakaways", provided that these pillars are not extracted, breakaways is those corners – yes. Thanks, Jim – where the equipment is to turn into. And every time they turn into a – a cut out or they're entering, they're going to have to have somewhat wider intersections. And then when you look at the pillars stability, the pillars are the least stable where those equipment or where that equipment is going to turn off into the entries. And that, again, is – is another issue of – of safety. If – if these pillars do fail while they are – they were lopping the pillars through the entries, then the – it is highly likely that failure is going to occur in a corner. We fully understand and expect the fact that - - -

PROF GALVIN: Yes. I – that - - -

DR CANBULAT: - - - there will be no one - - -

PROF GALVIN: Ismet, I don't want to interrupt you. My third point is geotechnical and maybe - - -

DR CANBULAT: Yes. Okay. All right.

PROF GALVIN: - - - you're getting a little bit ahead there.

DR CANBULAT: Okay.

PROF GALVIN: I'm going to deal with that a little bit later, perhaps.

DR CANBULAT: Okay. So you go first.

PROF CLARK: Professor Galvin, I – I – I had a – I had a question relating to the equipment before we move off that, if we could come back to that, but just let me know when that's appropriate.

PROF GALVIN: I'm – I'm – that's – equipment is fine. This is where – I'm – I'm finished what I had to say on equipment, so - - -

PROF CLARK: So – so my question was I understand the novel approach and the, you know – the untested angle of it. I was wondering if there was any comment that you could make on the automation side of it as well. I'm – I'm not as familiar with – with coal mining as with other mining methods, but to my understanding, having all of these joined up together being away, out of line of sight – and it gets back to my question about the inclination. It – is there any place where this sort of equipment is used in this way and is fully automated out of line of sight in - - -

PROF GALVIN: Not - - -

PROF CLARK: - - - such narrow – narrow mining headings?

PROF GALVIN: Not – not – not in an underground setting. This is - - -

PROF CLARK: And so that – that offline issue would – were you looking at making any comments on that as well?

PROF GALVIN: No. Two – two aspects. The company is saying – and Russell Howarth is confirming – that basically once this machine is put on a certain direction that it will pretty much stick to that direction and not wander. The – the point that – that Ismet is raising and – and is critical to both our thinking is it – the challenge here is to breakaway that - - -

PROF CLARK: At that angle.

PROF GALVIN: - - - drive in the right direction to start with, and going back to – this is why I showed you this slide. When this is practiced on the surface, this launching frame – people can clearly go out – there's a lot of trouble to exactly get the position of the machine and the direction of the machine. Now, when you go underground – and I used to drive these continuous miners years ago when they were still an onboard driver, so I understand a little bit more about how they work than perhaps some people do. Today they're remote controlled, but this – this machine when you're doing a breakaway, because it's so long it just can't be turned at right angles.

In this particular case they do have a benefit again. Because the miner is four metres wide, working in a five and a half metre roadway, they do have a little bit more room, but they can't turn it – just turn it at right angles or get away with just continuing to – so they've got to turn the machine around the corner. And that – how good you do that determines ultimately how wide the pillar is between your new roadway and your old roadway, and it also determines the direction that you're turning it away from. Now, I think once you turn the corner, I would expect technology today that you can get your direction right again pretty quickly, but the

challenge will be controlling the width of the pillar that you ended up when you turned the corner.

And part of – part of that challenge is that whilst people may claim that, well, there's no one at the working face, people stand back from the face, it could require operators to be up there to be – to be watching that, measuring it and so forth. In the response to one of my reports, it would seem the company is saying, "Well, we'll put – we can put extra support up". It's not clear from that response whether they are saying, "We will put extra support up before we turn the roadway around", or whether as we currently do conventionally we – we start to cut the roadway and then we pull back and put more support in.

So it – at – at this point in time, unless this technology of – of being able to turn breakaways away accurately automatically comes to fruition, it's still – it's still likely that people will need to work close to the face. Now, having said all that, the – the thing can become quite complex if you're working on a slippery floor or a cross-grade and then they will have to do that. The – the cross-grade is inevitable because of the dip of the coal seams and the different directions they're mining. If the floor is wet and muddy that's a bigger challenge because these machines slide. They're – they're caterpillar tracks, steel on floor, and they slide. So, you know, it requires a lot of operator skill and supervision in – in some circumstances like that to get these – to keep these machines online. Now, I'll - - -

MR DUNCAN: Jim, it's – it's Peter Duncan. Can I – can I ask a quick question.

PROF GALVIN: Yes.

MR DUNCAN: The level of automation, is it through remote control, through a signal, or through a pre-programmed plan?

PROF GALVIN: Peter, I – I'm not – wouldn't claim to be an expert on it but my general knowledge of it, it's a combination of – of all of that. The machine has sensors on it.

MR DUNCAN: Okay.

PROF GALVIN: It can sense some – some parameters. How much – how far it is off the floor or what – how far it is and it can self-adjust and then there are others where the information goes back to a control tab and – and the operator may intervene. Ismet, you – you've worked at mines with highwall mining. Do you have anything to add to that or correct?

DR CANBULAT: Generally speaking, it – what you said is – is correct, Jim. But coming back to Alice's questions with regards to, sort of, make – you know, steering the machine in entries is – I think the company is betting on a new technology that is being developed by CSIRO. And it's a precise technology. I'm not sure where the development is at this stage, but it is my understanding that the company has spoken

to CSIRO and it will be available to them when they start mining to precisely steer the continuous miner. As you will imagine, having so many entries, and if you go offline cutting in those entries, those pillars might be smaller, larger, intersecting on each other. So there – there might be a lot of issues with that. So - - -

PROF CLARK: That – that was the reason I asked the question. What was the then, yes, impact on potential for pillar integrity given the lack on geological continuities? So this is interesting, this technology. Thank you. So – yes.

PROF GALVIN: I think the other thing while that slide's up – and, as I said, I – I'm – I – I'm not sure what flexible conveyor train the company's proposing to use, but the one that's up there is the one that's – is – is utilised probably most extensively and certainly in Australia, is that if you look at the robustness of the structure of that flexible conveyor train compared to those very – to those conveyor cars that I showed you in the – in the surface, the – these – these conveyors here are quite vulnerable to damage by a fall of ground - - -

PROF CLARK: So - - -

PROF GALVIN: - - - or just getting stuck. They don't have the smooth – and then you don't have the robustness of these rigid sections that you can hydraulically put a lot of force on to push in or pull out and so forth. So – and that's, to me – that's really the commercial risk. It's probably, you know – and, frankly, it's probably not related to the – to the issues you need to look at for an EIS other than if – at the end of the day, when you're making an economic assessment, you could argue, well, if there's – the – the risk of whether the method will work or not should come into the economic assessment.

MR WILSON: But, Jim - - -

PROF GALVIN: If – if it doesn't work then you don't have any environmental issues to consider and you're back to reassessment of what other option – yes. Chris.

MR WILSON: Sorry to interrupt, but don't – so if – if there's an – just for instance, it was jammed or – or – or mechanically it seized, do they have to pull it all the way out to fix it? Because you can't send people up there.

MR WILSON: Yes, yes. See, yes. There are circumstances that I've been involved with where people will support their way in. They'll have to go in and put roof support in and – and make it safe. In this case, the – the dilemma from my point of view and experience is that we've got, on one side, a series of – of narrow pillars, but particularly at shallow depth, that we've got to be sure don't – don't yield. It's a narrow roadway. It's – because it's four metres wide you haven't got a lot of room to work. If it got – if – what happens in practice is if it got really well stuck and you're trying to recover your continuous miner for sure, then what you would do is you would go out – out five.

You know, you'd move further back and drive a new roadway and leave a very wide pillar or a wide pillar, drive a new roadway up to where you knew the continuous miner was, and then turn around and drive in and try and – and – and recover your continuous miner. And that – that's something that has been done many, many times, not only in this circumstance but in other circumstances underground. The conveyor you may sacrifice or even on the surface you may just give it a good pull and see what you get out and what you leave behind.

MR WILSON: Thanks.

PROF GALVIN: Yes.

PROF CLARK: But there isn't a lot of room there between that equipment size and the size of the drive that you're mining to reduce the roof support requirement to do work alongside it.

PROF GALVIN: Yes. There would definitely - - -

PROF CLARK: I think that's your point, isn't it?

PROF GALVIN: There's room beside the – the FCT – the – the flexible conveyor train either side. But probably it would be manually getting in there, manually putting equipment – bolts up. It's not – it - - -

PROF CLARK: Because it's unsupported ground.

PROF GALVIN: It's unsupported ground, yes.

DR CANBULAT: Without – it is my understanding without taking out the flexible conveyor system it is very difficult to get in there and support your way in. Firstly, the support needs to be highly likely to be spread over the excavation, including maybe in the centre of the roadway. So if you have the belt it would be difficult to install the support. So, therefore, perhaps the best way is, as – as Jim was saying, establish another roadway that's supported and then intersect where the continuous miner is and then salvage the continuous miner from the new roadway. But obviously that is not an easy task, but that is up to the company to decide whether they can do it or they can't do it.

Perhaps they don't have the right risk assessments and then the procedures to salvage or to recover the continuous miners if and when it gets stuck. But, having said that, if the continuous miner is stuck with the conveyor belt behind it, well, it will be pretty difficult to – to support that – that – that entry and then the, you know – salvage the continuous miner. I'm not sure how they're going to do it. That's a - - -

PROF GALVIN: Yes.

DR CANBULAT: That's a good question.

PROF GALVIN: I mean, if it's been stuck by a fall of ground it could, you know – it could just be a skim – a fall – a – a shallow fall but it's enough to reach the machine and if it's a more substantial fall then you've still got the challenge then and you have to clear the support – have to clear the floor and resupport the ground before you can – can carry on as well. So – so to me, you know, to wrap that bit up, it – these are commercial risks that, I guess, you know, going back to my days on – in operations, that I – I would be – I would be – have to consider really seriously in – in – in making the – the final decision to – to invest in it.

Maybe perhaps we move on to the mining method, because that, I think, will pick up a few more of the issues where we're heading. So if I move to this slide, the – as I said, the plan on the right, it's Mooney Mooney Colliery, and that – that was when – that was working at about 1995, I think, when I visited there. So the only real difference in principle between that and the one on the left, the – the Hume, is that at Mooney they were taking everything, whereas Hume is doing what we would call or I would call partial pillar extraction where they leave – leave a solid barrier, take coal, leave a solid barrier, take coal. Now, when the EIS – when we first – or I was first involved, this – the Hume proposal is referred to as first workings, and I – I found that difficult to accept.

To me it – it's a form of pillar extraction because we're basically taking a large pillar between those unmined areas and we're partially extracting it. And as time has moved on, the regulator has seen it that way and in reading the latest Russell Howarth reports and so forth it seems now that it's genuinely accepted as a means – as a form of secondary extraction, the difference now being when I look at those two plans – well, I'll come back to that in a minute. Now, when I say "partial extraction", this is Myuna Colliery, and I have to fess up here. Russell Howarth was the manager of Myuna Colliery and I was his mining engineer and deputy mine manager there for many years and I was there before he arrived there and he introduced place changing after I left there.

So it's – this – we have a – a common understanding on a lot of this. This is what we'd call partial extraction and this is under Lake Macquarie and this is simply referred to take a row, leave a row, take a row, leave a row. And that – that is in one of my reports to – to the department. This is another version which is also in one of my reports and it's one of the department also has relied upon and this is Clarence Colliery near Lithgow that's still operating. The mining method's probably been fine-tuned a bit to this, but, again, you can see the idea of the spine roadways driven at 70 degree angles, and that – the reason for that is because that's about the tightest that a flexible conveyor can turn through. It can't turn any tighter.

So everything's laid out at 70 degrees and what they do is mine out but then on the retreat they partially extract this row of pillars, they leave a row, they – then they partially extract two more, and then the barriers they partially extract as well. But the concept, you know, is basically the same as – as leave – take a row, leave substantial row and substantial rows, take a row, leave a row of substantial pillars. Now, when you come back and look at Hume, you'll notice that the excavations are

relatively wide compared to the pillars in between. And I've – again, in one of my reviews, one of the reports you have, I've done some analysis on how do the width of these solid pillars compare to partial extraction systems.

And in this case they're on the – they're on the narrow side and that's partly because there is some reliance placed on the web pillars carrying some of the load. So, therefore, they're – those pillars are narrow. I – in my assessment, I – I think, in any case those pillars – the width of those pillars is fairly marginal. I – if I was designing that method I would certainly have wider pillars. But cutting to the chase, if you did not leave any of those web pillars you would get more surface subsidence, but I think it would – the impacts are readily manageable in that environment and I don't think that if those web pillars were not left or fail completely would – would you have a serious problem trying to manage subsidence.

So the question then becomes, well, why do it that way which Hume Coal are – are proposing? Why leave the coal? And the reason for that in – is simply this, that this is a very cheap way of mining because these roadways which now, instead of being 12 metres and unsupported roadway, these are 120 metre long roadways, all unsupported. There is a – a – a cost saving there. There's a big productivity improvement because you're not stopping to drive intersections and support intersections all the time and there are a number of safety advantages as well because once you're away you've got no one up there. So while it's working successfully you – you – you don't have the workforce right up at the – at the face.

So, you know, the company's identified some of those benefits, and rightly so. So – but then we come to what we've already discussed and that is, well, the method then depends on these long drives that no one has – has attempted yet, and because of the dimensions and – look, again, with – I've been in this game and pillar – particular pillar work since I graduated and went to work for Shell in South Africa, so that's over – that's nearly – I don't know – too long. 45 years ago. And – and I can say without even running a number on this – I mean, I look at this. I would say no one can – can just say those pillars will never fail either when they're mining or in time to come, but particularly the – at – at the shallow depth.

Once they get down deeper and they're wider, you'd have a little bit more confidence that they may stay there for a long time, but, you know, I – you'd – I think you'd be very foolish to say that they're permanently stable. So that's – that's why they're going that option, and it really explains why they're proposing that this is first workings to start with, because they were just – it was just – they were claiming, "Well, this is more than pillars", but the fact that those – those spans are so wide, the pillars are open to yielding, and the fact that a very small change in pillar width can have serious consequences, I think it leads people now to concede that it's secondary extraction. Now – and – and this, by the way, is Myuna Colliery.

This is conventional, bord and pillar or first workings, where all of those roadways have to be supported and every intersection takes time to drive through and extra support. So you can see why the 120 metre long run outs with no support are quite

attractive from an economic perspective. So to tidy – to – to wrap that up, it's interesting that in doing it the way they're proposing they're actually getting marginally less percentage extraction than if they did it the conventional way, but presumably they're getting substantial cost savings. In terms of flexibility – and I note Professor Hebblewhite's evidence on this – I think this is a double – this is a – a – a double-sided sword. This is Myuna Colliery and you can see the flexibility you get from broader pillar workings. I know that there's a geological fault running through there. I – I worked - - -

MR DUNCAN: Right.

PROF GALVIN: - - - in that panel when we hit it. We were able to drive a limited number of headings through here and there's the fault there. There's only three headings driven through it and then one, and then we gave up. And when we've come down here we've mined until we've hit it and then we've just pulled out. The main headings here we had to persevere to get through because that's the life of the mine. You can see here where we've gone through it. So very flexible, very quick to – to change your mine plan. Now, with this method that the Hume one – it's also pretty quick if they hit some geology in a, you know – in a – in a plunge and they – and they recognise it in time and they don't get into trouble.

They – they can pull out. I think one of the differences, however, is that when they pull out they're probably – they're – they're not going through. They're losing the opportunity to go through the feature and get back on the other side of it. It's going to – it's going to require at least a significant change to – to the – the – that mine planning in that area. And this is one of the issues that has – the department has pressed me a – a fair bit on and you need to appreciate it's different to longwall mining and most other forms of secondary extraction. It – there's really no way that you can lay down at this stage or even during the operating life of the mine a definite mine plan.

It's – it's going to change as time goes on, and I – and I – I would suspect that because of that it will produce even less – a – a lower percentage extraction than – than what it's already predicted to do. You know, that's only a coal recovery issue and, again, that – that needs to be carefully thought through and traded off against some of the other benefits that the method may – may offer. That's probably a point to stop again, and then throw it open to the geotechnical, which is the last point that was on my list. Again, Ismet, is there anything that you want to add so that we – we knock it over together?

DR CANBULAT: No.

PROF GALVIN: I have to confess, we haven't collaborated on this at all. Our reports are completely independent. It's just it's – sorry. Go on.

DR CANBULAT: No. Not at this stage, Jim. Yes. What you're saying is – is correct in terms of support and the mining method selection. I mean, that's

obviously beneficial for the – for the company and, you know, it's acceptable and in – in open cut mines highwall mining is – is a very similar layout but there are some geotechnical issues that I will like to comment more, Jim, if you want to – want to – geotechnical issues – and if there are no other questions from the panel.

MR WILSON: I've got – I've got one maybe – but it may be related to geotechnical. Is it – so what you're saying, Jim, is that there's a dearth of data that would enable them to come up with a conceptual mine plan that would avoid things like faults and so forth and, yes, they'd be, sort of, more reliant on reactive management; is that correct? Is that what you're saying? Sorry. I'm – it's simplistic, I know, Jim, but - - -

PROF GALVIN: My understanding at this time is that there – that there is a lack of detailed data. I have to say for a first workings mine, a bord and pillar mine, that's probably not unusual because people know in the back of their mind that they've got the flexibility. Also, the – the capital investment is nothing like a longwall and it's much less. And longwalls, once you've got them laid out and started, they're very – you can't do anything. You're committed to it. You're locked in. So – and then they've got issues, I think, with gaining access anyway to do some of the exploration work. So the geology that – and – and Russell Howarth has come back and – and others and said, "No. Look, I've had a look, and they've done a lot of exploration", and – and that's – so that's good.

What I'm – I'm saying is it would – I haven't seen it actually plotted in – on to a – a geological plan or a geological model where you can see some of this – this in more detail. So – and then – and then – then no matter how good you do this, including longwall mining, you will always get a fort when you don't expect one or a bad roof that you didn't predict or you misinterpreted a change in dip as it falls or vice versa. So there's – that unknown is always going to – to be there.

MR WILSON: Okay. So basically what you're saying is that you're, sort of – we're – this mining method's somewhere between bord and pillar and longwall or highwall mining, whereas you have some flexibility but not – not flexibility of bord and pillar and you're not – you're not – you're not set by – the same as longwall mining in the sense that, you – you know, it's pretty - - -

PROF GALVIN: It – it's got flexibility but I don't think it's anywhere near as flexible as the traditional bord and pillar layout with – with square or rectangular or diamond pillars, the chequerboard is – gives you a lot more flexibility and particularly, you know, in – in this case in – again, you know, if they're relying on detecting changes in ground conditions while they're mining – now, you know, I've been on a continuous miner where we're mining and – and, you know, those things change subtlety and you don't really detect it until conditions are, you know, starting to get fairly severe. Now, whether – whether they can predict it that sensitively will remain – I – I – it remains for – for me to find out.

I – I don't – I find it difficult to think that if you're 80 metres up a blind entry that – you will pick major changes if you hit – start hitting stone, you'll know it. But some of the other features that could affect the stability of the web pillars – and don't forget, it's not just the web pillars or all the web pillars. It could just simply be the roof or the floor in their own right or – and their additional effect they have on the stability of the – of – of the coal pillars. So, you know, I – I think the life of the mine, you'd have – I – I would be saying that some – there has to be occasions when they're going to miss something or get into a changed condition so quickly that they don't – maybe not respond in – in – in a timely manner.

MR WILSON: Okay. Thank you.

PROF GALVIN: Should I move to geotechnical? Okay. So a lot of the geotechnical we've covered, frankly. The control is – is – is simply – the control is that – that they have available to them is that the sizes of the pillars can be changed during the life of the mine and in terms of pillar stability, it's to make the pillars wider if necessary. In terms of the roof stability within a – in a – a long drive, you know, four metres is about as narrow as you can go. So if it turned out that they had trouble holding the roof up and it's four metres wide then they've probably got a – a life of mine problem in – in that regard or in that area anyway.

But with pillar width and pillar stability, rib – rib stability, they – they can make the pillars wider and – and they – they are saying – my understanding is they're now saying, "Well, look, you know, we know that. We've – we've never said we wouldn't do that". Oh, you know, the penalty for that is obviously – again, it's reduced resource recovery, and – and that has an impact as well on your – on your bottom line financially. But that – that – that is certainly a control for a lot of the geotechnical risk. The biggest risk is if the web pillars were to fail suddenly. And if that – their – their control – one of their main controls against that is saying, "Well, we're restricting the width of the web pillar compartments so that we don't put full dead weight loading on them".

If they do – if the strength of the pillar is exceeded – and that could happen, for example, because some ribs fall – some – there's some side walls falling out or roof falls that extend the height of the pillar. They're saying, well, the pillar will – should yield gradually. I – I would subscribe to that. I think the likelihood of a sudden web pillar failure is pretty remote, but I would say over the life of the mine, the likely – it's the likelihood that you will get web pillar yielding from time to time, which could be when you're actually actively mining, or it could be when you are doing the secondary operations of backfilling and placing water, or it could even be after the panel's sealed.

But at some stage I'd have to say that, I think, those – those web – web pillars in general are probably not going to be long term stable. If yielding takes place when they're working, the – the two issues there are, firstly, where the continuous mine enters the – the long drive. Ismet suggested in one of his reports based on the modelling by Professor Heasley – I – I know it by just looking at the plan that the

highest load on those web pillars or – and/or the – the highest likelihood of the roof fall is where you turn – where you do the breakaway because you're increasing the span. You're relying on the previous narrow web pillar for roof support when – because it's so narrow, it's quite a soft – soft support to hold the roof up, so it will yield.

So – and then if the web pillars themselves start to yield that's where the greatest exposure to – to operators being hurt is – is in that corner. And that's – that is well documented in a feature of pillar extraction, that when your stressors go up it's the intersections that have the highest propensity to – to fail. Now, years ago, again, in the nineties, I did an industry wide survey on this. Admittedly, it was a different type of mining methods that were being used, but 66 per cent of incidences where the actual machines got buried occurred at intersections. So that's the one geotechnical risk.

The other one is, again, if the pillars do start to yield or the roof any – cannot support itself or – or because they're mining from so many different directions it's almost inevitable that at some stage the natural jointing in the coal, which we've referred to as cleat – it's almost inevitable that at some time the – the cleat is going to be parallel to the roadways or near parallel, and that's conducive to large slabs sliding off the pillars. And – and that in turn can – can affect – can entrap the equipment but it can also – well – well, not "can", will – will weaken the pillar that – the web pillars.

So the other – the other due technical risk to me is the entrapment, again, of – of the equipment, and that is not without safety implications because you have to – in – in good risk assessment you've got to look at the whole life cycle and the question you need to be asking is what risk are we putting people at in attempting to – to recover that equipment? Now, the company has said from the beginning that if it's a serious burial that they're prepared to walk away from the equipment. You know, that – that – that needs pretty strong commitment, and – and in honouring it it has pretty serious financial implications as well – commercial implications.

The subsidence, as I've said already, to me is not a – not an issue. And the point I should have made right at the beginning of the presentation is that I have not turned my mind at all to groundwater, you know. In the way that the panel – the independent panel operates these days, we invariably have groundwater people with us but in this occasion this was done purely in a – a private – a private basis and the – the reason for leaving web pillars, the impact on groundwater – it's not something I've turned my mind to, other than I – I've noted that the company does place some reliance on the influence of leaving web pillars on – on groundwater. So the bottom – really, the bottom line with all of this – and I'll – I'll sum it up.

I think safety should be able to be managed, provided you have an open mine that the web pillars can yield. The subsidence should be manageable. But in saying that, if we're not confident of permanent stability then if the project were to be approved the approval conditions should be turning – should be giving some consideration to closure planning and how do we – what – how can we make provision for any

impacts that develop after the mine has been completed, the operator has gone and then we find that we – that we have some subsidence issues associated with – with the pillars yielding? I know you have a question there about the size of the pillar under the highway. We – I haven't addressed that in any of my reports, but that's a very easy one to address for you. I won't do it at the moment. I'll just stop there and – and hand it over completely to you, Peter, from now on.

MR DUNCAN: Yes. I – I was interested in – in that question of the infrastructure, if you like, particularly – not – not only the highway but the – well, the – the gas pipeline as well, and just having an understanding. Well, firstly, when you talk about subsidence – subsidence, what – what are you talking about and how does that relate to the surface?

PROF GALVIN: Okay. So I'll – I'll flick presentations in a minute and get you a picture, but in the scale of things, there – in the Southern Coalfields in New South Wales there's a lot of experience in undermining the Hume Highway, mining up to bridges, mining under the high speed rail line from Sydney to – to Melbourne, mining under gas lines and – and subsiding the – using longwall mining. The thing – the covenant you have to put on that is that the longwall mines are generally deep, and even though they may be getting a lot more subsidence or as much as what the worst case could be in the case of Hume, because they're deep the subsidence trough by the time it gets to the surface extends over a very large area.

And it – and it – the changes in tilt and slope are quite gradual. The subsidence develops relatively slowly. You get plenty of warning. You can monitor. Your predictions in any case these days are pretty reasonable. So as history would show, those subsidence impacts are being fairly well managed. Yes, there's times when we've got to put contraflows in place on the Hume Highway and we've got to reduce the speed limit to 60 kilometres an hour. The goal with the high speed – with the Sydney/Melbourne train was not to slow those trains down below 100 kilometres an hour but commonsense says, well, you still do it and we've done it and there – there hasn't been any impacts.

Now, when it comes to this – this operation, you have two extremes. You have the extreme that I'm used to in my days in – in South Africa in the 1970s, early eighties, where we would just take a structure and draw a line, go to the edge of the area we wanted to protect, draw a line for the vertical, draw it out at 35 degrees, take it down to the coal seam and say, "No one – no one enters that envelope". In – in New South Wales we've come to convince ourselves that, well, twenty five and a half degrees is not a bad angle to work with. And if you've got any mathematics in you, you'll soon realise that's a nice number to work with because that – that envelope is actually half depth.

If you said, "Jimmy, we're 400 metres deep", I'll say, "Keep away – keep 200 metres away from it". But that – that's, sort of, saying, well, you could get 20 millimetres of movement. Now, the highway's not going to really know whether it's got 20 millimetres of movement or not. Things like – where you've got to be very careful is

things like the – the coax cables from Melbourne to Canberra and to Sydney that carry all the internet traffic, you know. It – it's a matter of – of two things. It's classic risk – what's the likelihood they'll be damaged? Well, they're more likely because they're rigid and so forth. And what's the consequences? Well, they're pretty horrendous though.

Now, if you're going to go near anything like any telecommunications today, to me you'd leave big – you make damn sure you're not going to disturb it at all. And that's – that has far higher consequences than in disrupting the train traffic or road traffic. So from there there – there are well established processes in place for at the time – closer to the time of mining deciding, you know, what are the – what are the structures, natural and man built, that are at risk? What's the impacts and specific – really carefully, what are the consequences? And then because of the flexibility in this method, I think you should be able to adapt it to deal with that. And that comes as usual, again, cost of percentage extraction of coal recovery.

DR CANBULAT: If I may also add to that, Jim. I think it is a staged approach. The mine will need to – will need to implement – hopefully they're not going to go under the highway immediately and start mining under the highway or gas pipelines. They need to understand the associated subsidence – subsidence levels first and establish a – a base line subsidence and then – and then they can – they can, sort of, design the barrier pillars under those critical service structures to be able to manage them, but I agree with Jim that that there are well established methods that can be used in looking at the amount of subsidence and associated tilts and strains and all that, that can be done. And in my opinion – and I think Jim also said the same thing – subsidence is a – is not really a major issue from a, sort of, damage point of view because the levels of subsidence we're talking about will be pretty low, even if the pillars fail.

MR DUNCAN: Alice, do you - - -

DR CANBULAT: Thank you.

MR DUNCAN: Thank you. Alice, do you have further questions at this stage?

PROF CLARK: I – I did have one, and – and please forgive me. It's – it's a question going back to the – the – the rock mechanics or the geomechanics as – as reminding me – these long drives. And it relates to, you know, the potential for roof failure, and the question is if we look at the ash contents through the Wongawilli, the upper zones from the things that I've said seem to indicate the ash contents are higher. And is there a potential for, I guess, dilution of – of – of – of – from – from roof failure through this – this mining method and going incline so the micro beds are, presumably, going to disappear? With – with your experience there and using this equipment, is there a – is there a concern around that? And it links back into the economics of – the proposed economics of the deposit. Thanks.

PROF GALVIN: No. I guess that – that – that issue is one that's common to any underground mining and it's really horses for courses. You need a – a sound geotechnical assessment, a geological assessment, geotechnical because, you know, if your ash is going higher because you've got more stone in the coal, it can be that – that that in turn's giving you a – a much more competent roof and you've got less likelihood of it falling. So that – that's – that's one. On the other hand, it could be that it – it's going up because you've got lots of little dirt bands, mud bands, and stuff is laminated and it's more prone to fallout. So, yes, your – your ash content suffers, your coal quality suffers, and your pillar height goes up because you – and – and, therefore, your pillar system becomes – becomes weaker.

In the – the earlier first work that I reviewed there was some fairly strong statements, reliance placed on the fact that – that the nature of the immediate roof and it – and it is – well, the – from memory, and I – I'll need to stand corrected on this, but I think from memory they were working backwards saying, "Well, it's high ash content, therefore it's more stony, therefore, it should be – it should be competent roof or more component". It's something to that line. I have to read my first report again. But I – I, sort of, expressed a little bit of concern about putting so much reliance on that at – at this stage of the project or at least based on the information presented in the – in the – in the report that we were asked to review. I thought it was a bit of a – a brave call. I've put something - - -

PROF CLARK: Thank you, Mr - - -

PROF GALVIN: - - - on my screen. Can you see what's on the screen at the moment?

PROF CLARK: Yes. The substance - - -

MR DUNCAN: Yes.

PROF GALVIN: And these are – these are gas lines in the Southern Coalfield plus a – and I think that's – that's a water aqueduct on the left there and these were buried. Now, when the longwall's gone through and the valleys close up – they move in and they close up and things buckle. This is an example where they've come in and they've stripped everything back again to get to it and everything's made so that it can slide and move and be adjusted as the subsidence is taking place. So they – they decouple the – the pipeline. This is a case where they wanted to mine near a – a pond in a creek and wanted to protect it, so deliberately a series of holes drilled to – to determine where it would crack.

This is the main Sydney water supply from – to Prospect and in – in the aqueduct – the aqueduct was 130 years old and it was being subsided and where it crossed over the creek these bellows were – were put in to put flexibility into – into the system. This is your main Melbourne to Sydney railway line where the railway – the lines have been replaced with what we call switchblades. So as the ground moves these blades slide past each other and the train continues to run on the track. And then

these cables, everything is very heavily instrumented – okay – and – and remote and real-time, so all set up with bells, whistles, alarms.

So you – you can monitor it very thoroughly. So the point being this sort of stuff is pretty advanced. Australia's the world leaders in it. We're very good at it. It doesn't cause me to lay awake at night but it's a matter that you do – it's – it's the things like – that people miss are things like the consequences of losing telecommunications even for a few seconds, let alone days between cities. Like, it's just – so – yes. The risk assessment.

MR DUNCAN: Okay. Chris, have you got any more questions?

MR WILSON: No. I'm fine. Thanks, Peter.

MR DUNCAN: And, Alice.

PROF CLARK: Nothing from me. Thanks, Peter.

MR DUNCAN: Look, I think that's probably been really helpful, actually, and it – it – but it brings us to – to the end of the time we've got and at this stage no further questions. We've got our public meetings next Monday and Tuesday. If – if they raise any more we might reserve the right to come back and maybe ask questions in writing if that's okay, Stephen.

MR O'DONOGHUE: Yes. That's – that's fine, Peter. Yes. If there's – if there's any follow up just, yes, come back through me and I can contact Jim and Ismet.

MR DUNCAN: Okay. Professor Galvin and Dr Canbulat, thank you very much for your presentations and your time today. We really appreciate it.

MR WILSON: Yes.

PROF GALVIN: Thank you.

PROF CLARK: Thank you.

DR CANBULAT: Thank you.

MR DUNCAN: We'll – we'll close the meeting at that point. Thanks very much. Thanks, Stephen and Phil, for being here as well. Thank you.

**RECORDING CONCLUDED** **[12.10 pm]**