



Royal Commission on the Pike River Coal Mine Tragedy
Te Komihana a te Karauna mōte Parekura Ana Waro o te Awa o Pike

3UNDER

THE COMMISSIONS OF INQUIRY ACT 1908

IN THE MATTER OF

**THE ROYAL COMMISSION ON THE PIKE RIVER COAL
MINE TRAGEDY**

Before: The Honourable Justice G K Panckhurst
Judge of the High Court of New Zealand
Commissioner D R Henry
Commissioner S L Bell
Commissioner for Mine Safety and Health, Queensland

Appearances: K Beaton, S Mount and J Wilding as Counsel Assisting
S Moore SC, K Anderson and K Lummis for the New Zealand Police
N Davidson QC, R Raymond and J Mills for the Families of the Deceased
S Shortall, D MacKenzie, R Schmidt-McCleave and P Radich for certain
managers, directors and officers of Pike River Coal Limited (in
receivership)
C Stevens and A Holloway for Solid Energy New Zealand
K McDonald QC, C Mander, A Williams and A Boadita-Cormican for the
Department of Labour, Department of Conservation, Ministry of Economic
Development and Ministry for the Environment
G Nicholson and S Stead for McConnell Dowell Constructors
G Gallaway, J Forsey and E Whiteside for NZ Mines Rescue Service
N Hampton QC and R Anderson for Amalgamated Engineering, Printing
and Manufacturing Union Inc
J Haigh QC and B Smith for Douglas White
J Rapley for Neville Rockhouse

**TRANSCRIPT OF PHASE THREE HEARING
HELD ON 18 NOVEMBER 2011 AT GREYMOUTH**

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COMMISSION RESUMES ON FRIDAY 18 NOVEMBER 2011 AT 9.00 AM**THE COMMISSION MAKES A SUPPRESSION ORDER**

5 In relation to Dr Callaghan's witness statement and also her supplementary
statement with reference to excerpts of evidence from witnesses who are either not
to be called or who are yet to be called at Phase Three. Those excerpts have been
identified in the written copy of the order that has been supplied to the media. Those
excerpts are suppressed until further order of the Commission. This is to meet the
10 fact that the evidence is yet to be formally heard and cross-examined upon, so it may
prove to be an interim order, but that will await next week.

MR DAVIDSON CALLS**KATHLEEN SUZANNE NOELLE CALLAGHAN (SWORN)**

Q. Now Dr Callaghan, your full name is Kathleen Suzanne Noelle Callaghan?

A. That's right.

5 Q. And you are at the University of Auckland?

A. Yes, I am.

Q. Would you just give to the Commission a very brief resume of your current positions?

10 A. I'm the director of the human factors group, which is a group that, as it says, is there to look at human factors, do research teaching and we do some contract work as well through the private arm of the university.

Q. You hold degrees in medicine and in psychology?

15 A. Yes, I do. I've got specialist qualifications as an occupational and environmental medical specialist and I hold a first class masters degree in psychology and a PhD in medicine and psychology.

0903

Q. And that's known as a conjoint degree, conjoint doctorate?

A. It was awarded conjointly, that's right.

Q. Now I've asked Ms Basher to bring up FAM00042.01/3

20 **WITNESS REFERRED TO DOCUMENT FAM00042.01/3**

Q. And this is part of your CV, it refers to a diploma in aviation medicine and following that diploma you've had an extensive involvement in aviation work, first I think in the Royal New Zealand Air Force?

A. Yes.

25 Q. Where you were for four years enlisted?

A. Yes, I worked solely, I was the flying personnel medical officer so I was responsible solely for aviation pilot related, so pilot health and all the safety systems on aircraft and teaching of those in aviation.

30 Q. You were a flight lieutenant and you have also worked in some specialist areas of research to do with the military in particular, I think one was the fast jet ejector seats and pilot reaction?

A. That was until I got my Master's thesis, so I was looking at decision making and stress and how to look at the areas of where error could occur and how to

combat that, so my Master's thesis was on decision making for pilots ejecting from fast jets.

5 Q. Now in other related fields, firstly you're here today not as a paid or professional person coming to give evidence but you have offered your evidence to this Commission and you made that offer as opposed to being sought for this purpose?

A. That's correct.

10 Q. And you've done so on the basis that you consider that as you understand the Pike River disaster, it is a reflection of issues of the organisational accident which you'll define shortly?

A. That's correct.

Q. And that what you study and what you teach in human factors is at the heart of, at least part of the heart of this Commission's work.

A. I believe that's right.

15 Q. I think the policy of the University of Auckland is that people in your position are encouraged to do about 20 or 30% of their time outside industry, in the workplace, elsewhere for the public good?

20 A. Yes, the University of Auckland is very clear that in, and very much emphasises public good service so that if scientists like myself has information that might contribute to the public good, we are obligated to make that information available on behalf of New Zealanders.

0906

25 Q. Now in the, if you like, the working world outside the academic areas you work, you also consult and that's part of the university's consultative arm, professional engagement?

A. That's right.

Q. And for example, you work in that area with the dairy industry?

A. Yes I do.

Q. With steel and building?

30 A. Yes I do.

Q. With ACC?

A. Yes, with oil and gas, in health care and a number of industrial areas.

- Q. And I think as to this Commission's work one of the roles that you've undertaken has been as an auditor and one of those audits was in respect of the suitability of medical practitioners to conduct certifications of pilots or approvals of pilots?
- 5 A. That's right, that was one of my first roles as principal medical officer at the Civil Aviation Authority to look at medical practitioners that were holding delegations from the director of Civil Aviation in regard to pilot certification.
- Q. And that role extended in order to making a decision as to whether someone was suitable or unsuitable in practice?
- 10 A. Ultimately yes it was.
- Q. And you had to make that call?
- A. I did have to make that call once.
- Q. You've been trained in audit as well and in your evidence you have said that you were, I think, at least on two occasions sent or went to specialist audit
- 15 courses?
- A. Yes, the Civil Aviation Authority before they, because they wanted us to start auditing medical practitioners, to say they were holding delegations from the director, so they sent me on two courses, two one week 40 hours, I had to pass an examination and then when I went on all my audits I was mentored by
- 20 a lead auditor.
- Q. Now with that background you'd been following the Commission's processes from the outset and then watching the live-streaming?
- A. Yes I have.
- Q. And reading from the website and you've had access through counsel and the
- 25 families to the secure website?
- A. Yes I have.
- Q. And you observed the last I think two days of evidence?
- A. Most of the last two days, yes.
- Q. There's an issue raised in some of the papers concerning your position, your
- 30 evidence as to whether in fact you are an expert in risk per se. What's your answer to that?
- A. Well I don't consider myself to be an expert in risk per se. For example, I wouldn't apply for a position as a risk manager at a big company. Risk

management in those sorts of areas covers a huge range of areas so I wouldn't be able to do a risk assessment for example, of the carriage of dangerous materials. However I deal and I do risk assessment and risk management in the area of human factors, each and every day.

5 0909

Q. And just to be clear, in giving evidence called by, for the families or counsel for the families, you consider and have made it plain to us and to the Commission now that you consider it irrelevant by whom you are called. You are here simply to give evidence for the Commission.

10 A. Definitely, I would help anyone who asked for that help.

Q. And finally in these preliminary matters, would you acknowledge that you have said in your evidence and repeat now, that you're working from records and you have always understood as an expert that some matters you have read may be challenged as to fact, and may be determined to be other than as you read and you've only worked from material you have seen?

15

A. Yes

Q. And it is a qualification to that on the facts you would reflect on that and perhaps revise your view?

20

A. Of course, I've always got an open mind as information comes in that might change my opinion, that, definitely.

Q. Now before we turn to human factors, you have an expression which I must confess eludes me as I am standing here, it's the null something?

25

A. The null hypothesis. That's a scientific term. I was talking with Mr Davidson about it. As a scientist, when you're doing experimentation work you start with the null hypothesis which means that nothing is going on here essentially, so that tends to be the way in which I work. I start off from the point of view that there's nothing going on here and then as the evidence comes in, that may confirm the null hypothesis or take me away from the null hypothesis.

30

Q. Now we'll come to, now, the study or the science of human factors. Firstly, it's an expression that won't be known to everyone in this room by any means but you're head of The Human Factors Department Group?

A. Yes.

Q. In the Faculty of Medicine at the University of Auckland. And is it correct to refer to it as the study of, or the science of human factors?

A. Human factors is definitely a science. It's based in psychology, the discipline of psychology largely.

5 Q. And without going to your brief, but now to give it some life, what is it?

A. Well human factors, we start in human factors as considering the person at the centre of everything, so what we're looking at is people's interaction with everything and everyone they encounter and what we're trying to do is make those interactions as positive as possible, so that's, by positive we're meaning
10 those interactions need to be efficient and effective and safe, so we're using our understanding of human beings' strengths and weaknesses to minimise human weaknesses and maximise our strengths in those interactions.

0912

Q. Now in your evidence and I'm not going to ask you to read this except
15 occasionally, you referred to human factors in practice and I will ask Ms Basher, could you bring up FAM00042/7 please?

WITNESS REFERRED TO DOCUMENT FAM00042/7

Q. There's a passage at paragraph 12 there, "As to all major high risk industries," and it can either be read by everyone in this room, but the point you're referring
20 to or making is that all major high risk industries have or should have a strong human factor's quarterly safety programmes and you've quoted Jonathon Ling from Fletcher Building in this regard in fact this year?

A. That's right. I think that's beyond doubt now around the world for human factors placing a very strong role in safety management programmes.

25 Q. So across the areas you consult human factors as you've described it, now at the core of safety?

A. I think in New Zealand it would be fair to say that it's starting to be at the core of safety. So, for example, Jonathon Ling has indicated as I say there that he's moving very much toward human factors, safety programme as is like the oil
30 and gas industries that I work with. The industries that I work with certainly have a very strong human factors component.

Q. Now to pre-empt or make clear where we're heading with this evidence, I'm going to ask Ms Basher to bring up FAM00042/58

WITNESS REFERRED TO DOCUMENT FAM00042/58

- Q. And this is the conclusions of your entire evidence and the reason it's there as you know is to demonstrate firstly, under paragraph 213(a) that you are recognising there are two distinct components of the safety analysis which you're making here, one this Commission makes. The first is the issues under (a), "Technical to the industry." So you used the examples you've learned of stoppings, gas detections systems and so forth and then secondly, this is the human factors, "The interactions of human task, environmental and organisational connection practices."
- 5
- A. Yes, I think that that's very important that safety is a multi-disciplinary field actually. There is – you cannot have lack of technical expertise, but equally I guess that I'm saying that you equally need human factors expertise. It requires a raft of different specialities working together for a workplace to improve its safety position.
- 10
- Q. Now in your evidence you say and look at the accidents that you know of and read and they're part of your study and practice at Chernobyl, Piper Alfa, Exxon Valdez, BP Texas City which we'll come back to, Cave Creek and so forth. Your evidence is that human failure lies at the heart of almost all of those adverse events?
- 15
- A. Yes it is and that's been well established in scientific literature.
- Q. And am I right that when we look at and you're asking the Commission to take this evidence from you, when we look at the cause of the explosion at Pike River, the thing that actually triggered the explosion on the 19th of November, what you're asking the Commission to recognise both for these purposes and in terms of safety in this industry, is that it's just not the what happened but why it happened, it's the why?
- 20
- A. The why is extraordinarily important. Unless we understand the why, then we won't be able to implement effective improvements.
- Q. And by that you mean we could establish what happened in terms of the interaction of a gas mix and ignition on the 19th of November and that could lead to a trail of technical considerations around that, and they're all, why did that happen and so on in that area. But you are pointing the Commission to
- 25
- 30

saying, why did these things occur at all in respect of the relationships, the human component of what happened?

5 A. That's right, and I guess as an example I mean we'd all be familiar with it. If we just left Erebus as Captain Collins' descended below the minimum decent altitude and flew an aircraft into the side of Mt Erebus, nothing would have changed. It's what happened, we needed to understand why that happened to improve aviation safety in New Zealand and internationally.

0917

10 Q. Now your evidence is the focus has to be both an analysis of what occurred here and generally in safety. There has to be identification of what are the error producing conditions. You have to know what they are. Correct?

A. Yes.

Q. And in terms of safety generally, you then have to eliminate that condition if you can and if you can't you've got to contain it, mitigate it in some way?

15 A. That's right, and mitigate the circumstances, yes.

Q. And as an example of what you're talking about, you have, in discussion with me, given the example of a nurse for example medicating incorrectly?

20 A. That's right, so I mean, again anyone who reads the front page of the New Zealand Herald knows that sometimes health professionals give the wrong medication, so if you just left it at for example, "Nurse gave the wrong medication" that would not enable us to make any change to healthcare safety, so you would be asking yourself why did the nurse do that? And it might have – there's a number of different possibilities, isn't there? It might be that the nurse was distracted. It might be that the nurse was fatigued. It might be the
25 doctor's handwriting was illegible. Each one of those different reasons why, requires a very, very different intervention and what we know in safety and then we ask ourselves, you know, like, "Why was the doctor's writing was illegible? Why was the nurse fatigued?" for example. And it might be then we trace back to a nursing roster. So again the higher – the further back we go
30 and if we implement our interventions there, the more likely that the interventions are going to be effective and efficient. If we just deal with the individual nurse, that's not going to prevent other nurses, other fatigued nurses making the same mistake again at a future date.

- Q. And it's your evidence that the failure to identify the factors which are associated with adverse events, means there will be a failure to take all practicable steps in terms of the legislation under which health and safety is governed in New Zealand?
- 5 A. Yes I believe that.
- Q. And now coming to how the language of human factors works, what I've just put to you, the things that can go wrong, the factors that may lead to these adverse events, whatever they are, are what you call, "holes in the system?"
- A. Yes I mean that's a - definitely a way in which we explain things. We call them
- 10 holes in the Swiss cheese as I'll be talking to you about later.
- Q. Can you hear all right?
- A. Yes I can.
- 0920
- Q. Now before we move onto the context in which this accident occurred?
- 15 A. Mhm.
- Q. I just want to flesh out the last answer you gave about the nurse and in the sequence of considerations that you have discussed with us, you have said, "A nurse wrongly medicates, fatigued, lack of training" whatever, there's an identification of why?
- 20 A. Yes.
- Q. It could be as to fatigued that the reason is a roster has been prepared to put the nurse under too much physical and mental pressure?
- A. Mhm.
- Q. Why did the roster get prepared like that, it could be a lack of skill in rostering
- 25 which is a high end skill as I understand your evidence, it could be that there was no money, there was a shortage of nurses and you've got to track back till you find, if you like, the principle and founding element of the problem?
- A. That's right and in fact the most basic investigative technique taught into
- 30 human factors to people in New Zealand, a lot of workers are familiar with that, it's called the five whys. So what they are asked to do is ask why five times in a sequence leading back and they can only stop the investigation when they've asked why five times.
- Q. Ms Basher would you bring up FAM00042/8 please?

WITNESS REFERRED TO DOCUMENT FAM00042/8

Q. Now this is, as part of your Part 1 evidence, and I'll indicate to those who are listening here that Part 1 deals with the human factors as a science, Part 2 examines Pike River records, as you've seen them and heard them?

5 A. Mhm.

Q. And Part 3 deals with Gunningham and Neal, we're still in Part 1 here. Now I'd like you to speak to or perhaps read, please read your paragraphs 19, 20, 21 and 22.

10 A. "My assessment is that the Pike River tragedy with the loss of 29 lives may have been a process safety event and what is termed an organisational accident. Organisational factors may be identified at the level of the company but more importantly from my perspective, reflected the level of the regulator and also Government decision making about the regulator's function. Sadly, but of crucial relevance for future safety Pike River proves that we have failed
15 to learn from previous accidents. Multiple factors that are very well established as causally related to accidents were present and identified at Pike River well before the onset of any recognisable accident sequence. In crude terms the evidence I have seen indicates that Pike River Mine was an accident waiting to happen. In the sense that "an accident" not necessarily this accident was
20 probable. Pike River was a workplace accident that occurred in a mine that should not be categorised simply as a mining accident. Pike River has implications for the wider health and safety environment in New Zealand. To ignore these implications flies in the face of international best practice. This paper, my brief how I have reached these assessments."

25 Q. Stop there, thank you. Now you've emphasised that you're not, by this evidence, you're at pains to make sure you're not suggesting this catastrophic accident was going to happen at Pike River?

A. No.

30 Q. But, that the evidence leads you to the conclusion that "an" accident would occur?

A. Very much so.

Q. However you add the qualifier which professionally you must to that and the example you give is that you may calculate in the population a person say has

a 75% chance of a heart attack in the next two years based on weight, family history and so on. But in actuality you'll either have a heart attack or you won't?

5 A. That's right. That's the difference between, we can only calculate it at a statistical likelihood in comparison. We have no way of determining who's going to have the heart attack as such and who's not. A person will have a heart attack, one, or won't, zero. But what we can say is when we look at all those factors together you have a higher or lower statistical likelihood of an event.

10 0925

Q. Now we're now going to come to the background to the issue of hazard in New Zealand, both in law and practice and your evidence and please add to this as you wish and it appears at your brief at paragraph 23, is that the legislation of New Zealand requires employers to identify, categorise and manage hazards, which are defined very broadly. And your point, part of evidence here today is that there was an enormous number of hazards to be addressed in any workplace?

15 A. That's right, and as science advances, as technology advances, as society changes, those hazards are increasing. You know, for example, we're dealing, you know, I'm asked for things like nanoparticles. As science changes, hazards change and they are, the number of hazards we're being requested to deal with is enormous now and increasing.

20 Q. And your evidence is that because of this, and because the science is developing, it's very hard for any one person to hold all the tools to address, to identify, address and deal with hazards?

25 A. Yes. I firmly believe that. I think that the extent of the hazards, their understanding, simply the knowledge you are required over such a depth, to such a depth and over such a breadth of hazards, it is not possible for one individual to be able to identify and address such breadth of hazards.

30 Q. And this has led on your evidence of paragraph 26 to the fact that we now have a vast range of subject matter experts to do with health and safety?

A. Yes.

Q. There are refined areas of medicine, nursing, chemistry, toxicology, we have a whole suite of experts now involved. In your view, as I understand your evidence, this is necessary to deal with the way the science is starting to understand the risks or hazards that exist?

5 A. That's right. We're tasked with, you know, health and safety. I mean health in itself is huge and even I guess, and there's an example I've put there at (h) you know, tasked technical experts for each industry and what I've learnt through this experience, through the Commission, listening to people, that even mining has subcategories within it of expertise that is necessary. You know, the
10 necessary, you have to understand electricity. You need to understand ventilation. They are specific areas of expertise within the context of mining technical aspects itself.

Q. Now, part of your evidence is that you are saying that the Commission should examine this not just as a mining disaster but that mining is the context in
15 which this disaster, this catastrophe took place, this accident took place?

A. Yes, I think the factors that we're going to talk about today are generic across safety in New Zealand.

Q. And I know it's a very crude example, but I'm going to put it to you because it appeals to me, at least I understand it. You have discussed with me the two
20 sides of this equation, the technical side and the human factors side, in the context, for example, it could have been anything, of a very highly qualified surgeon who has great expertise and a record, but has a human factor in practice, in his practice or his life which could cut across that expertise and lead to a surgical error of consequence. Is that a fair representation? Please
25 qualify if it's not. It's the human factor?

A. What we were talking about hopefully, I was describing, for example, you know a surgeon. You can have a brilliantly technical surgeon and that certainly has one aspect of safety but if he or she is in the operating room and they are
30 unable to communicate with the nurses, they're throwing the scalpel around which is on the decrease, but still occurs, if that side is working then that surgeon may be, as I say, technically brilliant but there would be problems with safety. You need both aspects, the human factors side as well as technical expertise.

Q. Is there such a thing as absolute safety?

A. No. There's not in my understanding of the literature.

0930

5 Q. How should we view that concept then? I mean, you put safety in the context of the workplace in business or Government activity which has certain goals, how do these two things relate, the reality?

A. Well, I have quoted here, Professor James Reason, who is one of the guru's in safety in international, he's now Professor Emeritus, but he defines safety and I quote here as, "The ability of individuals and organisations to deal with risks and hazards so to avoid damage or losses and yet still achieve their goal." And I think that's very important, because we need to understand that business does, there is still the goal of the business, so safety, and again what he's talking about here, is safety. It's not about morals, it's not about altruism. It's safety as part of the real business world. I think we need to recognise that, that safety is good business and good business and safety go hand-in-hand.

10 Q. Now Professor Reason is clearly in your evidence referred to a lot of papers that he's written are part of your attachments –

A. Well, he changed about 20, 25, 30 years ago, Jim Reason changed the face. He didn't – he changed the face in which we look at safety, so his work has a monumental influence all around the world on how we look at these things.

20 Q. And we're going to come in that context very shortly to what you call HFACS, H-F-A-C-S, and the study of mining accidents in Queensland. It's a paper published in 2011. I'll bring that up in a moment, but you mentioned say 20, 25 years ago – Ms Basher would you bring up please FAM00042.12/1?

25 **WITNESS REFERRED TO DOCUMENT FAM00042.12/1**

Q. And that's the paper that he has written in 1991, or gave in Canberra and at page 2, Ms Basher, in the second paragraph there is reference there to a report made in 1986, "Mechanical failure preceded by faulty maintenance, the principle cause of air accidents."

30 A. Mhm.

Q. And then 1987, "Bad weather near airports cause 64% of major crashes. The Lufthansa survey found cockpit crew errors was the prime contributor, 76% of all causal factors." And then the next paragraph seems to encapsulate the

point you make, when Professor Reason said, “Whom should we believe? In my view, we should believe none of them.” Now you understand what he’s getting at there. Could you just encapsulate it please?

5 A. Well, I mean I would just use the words he said there. “We should believe none of them,” because these figures misunderstand, he says, the causal reality, because what we know now is there is no single cause of any event. So the word “cause” has actually come out of the safety literature. What we’re looking at is “multiple causal contributory factors.” There are always a number of strands that intercept on the day to bring about tragedy.

10 Q. As we now look at these causes, a very clear distinction you make in your evidence and as part of the literature and science, is that you say, “The Commission in workplace, must distinguish between the personal and process safety.”

A. Yes.

15 Q. And the example you give of a personal safety issue is what?

A. In the example of Pike River Mine, they would be things like, a person cuts himself with a Stanley knife, person trips over, you know, some rubble underground, somebody’s lifting something heavy and gets a back strain.

Q. And of process safety?

20 A. Process safety is something completely different in – and in my brief I’ve given quite a long, long definition but I think for the purposes of here today, process safety would be about the identification and management of the risks associated with explosive sources, and the risks and management associated with ignition sources.

25 0935

Q. Now, a major part of your evidence is that a system put in place to provide effective personal safety, for example guards on machines, that sort of thing, does not ensure protective process safety?

30 A. No. The reason why it is so important to differentiate between the two is because of a number of reasons. One is because the indicators, the early indicators that a problem is coming are very different for a personal versus a process safety event. And secondly, because the things that we need to do to try and prevent a personal safety event are very different from the things we

need to do to try and prevent a process safety event. They need to be clearly differentiated they are very different types of safety event.

Q. It's in your evidence but just for the record, the Baker Report which is published I think in 2007 makes a very clear distinction between the two?

5 A. Yes they do because –

Q. And as the result, it's your evidence that when we look at statistics about injury and fatalities and ill health, we don't get any info about process safety?

A. Not unless the event, not unless the injuries were due to a process safety event.

10 Q. Yes and it's your evidence please to confirm that what's called the National Action Agenda in New Zealand has emphasised issues of workplace illness, disease and ACC claims and not identified what you consider to be the major process safety factors in at work?

15 A. Well no the words that they use emphasise, are words that are reflective of personal safety. Now I'm not saying the personal safety is not important, it's as equally important as process safety but again, they are two different types of safety event, need to be addressed differently and how I see the national agenda has been formulated and the risks that they have calculated, are risks associated with personal safety events.

20 Q. Your evidence is and I'll just refer to it at paragraph 46 that, "The Department of Labour has addressed industry sectors with a statistical analysis based on fatal and major injury." That's what you say. "And mining have many years in which the level of fatalities and serious injuries were quite low." So what do you say about that judgment, because of that low incidents as to where mining
25 fitted in terms of risk?

A. Well where you have – process safety is – about another way of looking at process safety is low frequency, high severity events with the emphasis here being on low frequency. Where you have a low frequency and you're comparing that erroneously with what we call high frequency, relatively low
30 severity events which is personal safety, then process safety risks will drop out of the equation simply because they are of low frequency, so you need to calculate process safety event risks with different measures.

Q. And is that part of the work you do, calculating process safety risk specifically?

A. It is some of the stuff that we look at. We show people the difference between process and personal safety and the sorts of different lead and lagging measures they have to measure their personal safety performance and their process safety performance.

5 Q. Ms Basher could we bring up FAM42/14 please?

WITNESS REFERRED TO DOCUMENT FAM00042/14

10 Q. And while this comes up, this is the Gunningham/Neal report cited by you at paragraph 51, "That the Department adopts a risk spaced approach as indicated in chapter 5. The report is saying this, "Was the allocation of resources a reasonable one? We believe it was. The first of a low incidents of fatalities and serious injuries and there are competing demands for resources." And then comment is, "It's not much different in inspection from the rates in two Australia coalmining States." Ms Basher page 15, the next page. You challenge the understanding set out in that paragraph at paragraph 52, would you explain that please?

15 A. Well again, the factors that he is concentrating on there are personal safety events, they're not process safety events. It requires a different – the issue is not the calculation, the issue is not whether it's a risk based system, but is the data that is necessary to have an appropriate risk calculation.

20 Q. And you've picked up in your paragraph 53 from Mr Whittall's response in an interview transcript a question about consideration to the mine given to complete loss of communication to the mine and the possibility that an explosion may have occurred. Just explain what you – read that passage that follows please. "He responds?"

25 A. My response at 53?

0940

Q. Yes, and the four lines in, "He responds by reference to 911..."

30 A. He responds by reference to 911 and 747s flying into buildings. He goes on to say that the proposed scenario is extremely strange and unlikely. It's happened obviously. I guess my concern when I read that is he's been asked what consideration he gave to a well-known process safety event, ie a mine exploding and he says, it's unlikely. Well it is unlikely by definition of a process safety event is of low frequency, ie unlikely. That's the definition of a process

safety event. You can't use the definition to, as a justification for saying that you haven't given it consideration. In my way of looking at the world.

5 Q. And you seem - you then acknowledge that Professor Gunningham seems to have been on to this point in your paragraph 55 from a paper he wrote there which the EPMU has filed?

A. Mhm.

10 Q. And he talks about the lost time injury frequency rate and statistics provide no more than a crudest indication of actual injury rates and even if they did this might not be a helpful predictor of the likelihood of such low frequency and consequence event such as Moura or Gretley?

A. Exactly.

Q. It's exactly the point you make?

15 A. That's exactly the point. That those relatively poor indicators of personal safety do not provide us with an indication of the likelihood of a process safety event.

Q. Now all this in terms of process safety leads us to the concept of the organisational accident and Ms Basher could we have up FAM00042.22/1?

WITNESS REFERRED TO DOCUMENT FAM00042.22/1

Q. Now this needs a bit of explanation by you please?

20 A. Right, this is what James Reason, is a very well known model now. So this is what he called the Anatomy of an Organisational Accident. Sort of the basis of how I was trained to investigate adverse events in aviation, my role as an air safety investigator. It's what now the majority of New Zealand workplaces that are trained with the ICAM method is based on this model. So it's probably the
25 most common way of examining adverse events now in New Zealand and international workplaces. So what we have here, very simplistically we have an adverse event, an accident or an incident and in order to have had an adverse event, we need penetration of the system's defences. Normally when we think of defences we think of them as two kinds. So we think of them as
30 hard defences, hard defences being things like equipment, usually, equipment and technology. Then we have what we call soft defences and soft defences is everything else, that's policies, procedures, people, training system. They are all defences and as we touched on before defences needs to be of three

levels. So we try and eliminate the condition occurring but we also assume that that won't be realistically possible, so we try and contain an error as it occurs and then we also assume okay, that might not be possible, so we also put in a defence to mitigate the consequences of an event. So what I'm saying is, we need to have a breadth of defences and we also need to have a depth of defences. But in order to have had the adverse event, you need penetration of the defences. Then moving back we need to have had an individual or a group of individuals make an error or violate the rules in some way and that tends to have been where investigation stops. That would be the example I use where we say, right Captain Collins descended below the MDA, crashed into the mountain, full stop, end of story. But what we are now saying or what we have now been saying for 30 years is that in order to make effective intervention to improve safety, we need to go back, we need to ask ourselves what was there in the task and environment that led individuals to make errors. What was there in the task and environment that led individuals to break the rules and then we need to move even further back into the organisation and we need to look at management decisions and organisational processes that again, that influence the actions of individuals on the day.

0945

A. The only other thing that I'd say here is when he writes, "organisation," he's not necessarily talking about the organisation in terms of a company. We go back as far as necessary to retain a reasonable cause or nexus with the event, so in aviation, for example, we might stop at the level of an individual aviation company. Often we go back and we look at the decision of the regulator, the civil aviation authority and there have been events where we go further back and look at decisions at the level of the international civil aviation organisation. We need to go as far back as necessary to understand what happened on the day.

Q. And that's the same point, as far back as necessary to get the fix. You've got to know where those problems will lay?

A. Well the further we go back, the further back we put the fix, the most, the biggest, I hate to use the phrase in this context but the biggest bang we get for our buck, the more effective and efficient the fix is going to be, the more

holistic the fix is going to be. If we keep putting fixes back here, as Jim Reason said, individuals are the last and least manageable link in the organisational, the accident sequence. This is like swatting mosquitoes, going back here is like draining a swamp.

5 Q. Now, the representation that's used by you which I understand is from teaching, is it Ms Basher, 42/16, where we have Professor Reason's Swiss cheese model. I think you've explained it now sufficiently, now it's up. Could that be blown up please, the model? Now you can probably speak through this very quickly, the organisational factors, unsafe supervision, just quickly talk us
10 through that?

A. Well this is a slightly different way, what Reason was trying to talk about here is that if this is a system, and I'm not talking here about a system, meaning policies. I'm talking about that whole system that we saw in the last picture, so
15 everything from the defence is going back into the organisation, are organisations because we are, that whole system because we are human, will have holes in it of some description and is obligated on us in the health and safety field to identify those holes and either try and eliminate the holes or try
20 and make the holes smaller. What he's trying to show us here is, and this is this, going through here, is that accidents have, a chance is involved in an accident, so chance lined the holes up, enabling that arrow to come through and give us an accident. That's what its showing. So in terms of health and safety, as I say, if we, our role to avoid the likelihood of chance driving the arrow through, the fewer the holes, the smaller the holes, the less statistically likely that the holes will line up and chance drives the arrow through.

25 Q. And part of your thesis is that chance does not take sides?

A. Unfortunately, chance does not take sides.

Q. And we see this in, Ms Basher, page 18, 42/18. So in the top representation there are very few holes?

A. That's right.

30 Q. But the arrow's gone through the holes in each sector?

A. Yes, and very occasionally that happens and again if we go back to that example that we gave initially of the heart attack, we all know, we've heard of the, you know, the thin person that eats well, that exercises regularly and

drops dead of a heart attack when they're out jogging at age 35. That would be the medical equivalent of this.

0950

5 Q. Now, we now move to the, start to move towards what you've learned or read at Pike River but before we get there, identification of the holes, the various ways you'll describe is critical, but using civil aviation or aviation as an example, we have in your, Ms Basher, 42/20, we start to move into causal factors of the kinds that you are going to describe. Now, in the aviation industry and this comes from the Aviation Safety Summary Report for 2011, 10 three-month period in New Zealand and just now start to point to just a few of the things which we're going to be looking at in the next 20 minutes or so.

A. Right, well what they've done here in civil aviation, are civil aviation industry, is that they're looking for patterns in those causal factors, so you can see here, they're looking – I can hardly see here though. Okay, for example here they're 15 looking at - they've calculating the number of times where there was poor supervision and checking. Look here, they've calculated in times where there was inadequate procedures. Yes, they're looking here at lack of knowledge.

Q. Could you just move to the mic a bit more, I think we may be missing.

A. Lack of knowledge.

20 Q. Yes, thank you.

A. So they are, what they have done, is they're calculating on a constant basis those levels, the number of error producing conditions, the number of violation producing conditions, the number of organisational factors, the times that all those factors were involved in an adverse event.

25 Q. Now, you've heard, or read, I'm sorry, read some evidence, you may have seen it on the streaming from Dr Elder who talked about mining in the West Coast, or establishing a mine on the West Coast and I think you picked up a few things which are in the categories that we're now going to start talking about. Can you just mention them to us?

30 A. Well, for example – and I mean I go back to sort of what we know about error producing conditions. Dr Elder, he described, you know, that every coal mine is different. There's no absolute rule for what happens. For all these reasons, coalmining will often increase or (inaudible 09:52:10) innovative and often

internationally unproven techniques. My point that I was talking about here is very clear in cognitive science. When we are required to think things through on the spot, when we have to live with uncertainty, that creates an error producing condition. It dramatically increases the likelihood that we're going to make error. As, you know, in a simplistic way there's, if you can contrast the difference between tried and true, versus sort of tried but not quite sure, versus trial and error. As the higher the level of uncertainty, the more we're moving towards trial and error. It's called trial and error for a reason. It increases the likelihood of error, so that's one factor was there, that was just there right from the start. Pike River, as I've said, was in a start-up mode. Start-up mode is a time of an organisation's life that is where the risks are increased. There's a number of things going on in there and normally defences are at a relatively low stage of development. It's not any – it's not Pike River Mine being a start-up company. It's any start-up company is more vulnerable at that period of the organisation's life. Also it said things like, realistically the mine is a harsh environment. Harsh environments are associated with increased error and the mine is certainly a hostile environment. And then the last thing is we know, you know, mining is an industry that is associated with low frequency, high consequent events with process safety events. So all I was trying to emphasise is right from the start there are a number of very obvious error producing conditions that needed to be identified and addressed.

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Q. Now we're about to come now into applying this, what you've described in the Pike River setting and you've set out in your brief, in your supplementary brief the material you've had access to, which really is being supplemented almost day-by-day for you, isn't it?

A. That's right.

Q. You've seen the near hit register. You've seen the deputies' report summarised, put in by counsel assisting and so on, and so you're gaining factual knowledge of what internally within Pike River the record was.

30 A. That's right.

Q. But you're not here today to comment on something mining specific at all, are you?

A. No. I wouldn't have the ability to be able to discuss the technical ins and outs of mining.

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5 Q. So as we move into what is part two of your evidence, you have in your paragraph 87 at Ms Basher 42/23, "Referred to some evidence that Mr Whittall has given."

A. Mhm.

10 Q. Which you are identifying as of some relevance in terms of the factors that you say we should be looking for here and in essence relevant to stressors and risk or hazard. At paragraph 87 if you could just read from that please so that everyone can grasp it.

15 A. Right, well what he's identifying here Mr Whittall has stated, "Levels of confidence and experience of workers and contractors working underground is of concern." Now, low levels of confidence or lower than desired levels of competence. Low levels of experience, both of those are well established error producing conditions. He then goes on to say that the delays in production were lamentable and delays in the company achieving cashflow, positive cashflow is also lamentable. We know that companies facing financial difficulties have higher risks, everything else being equal than companies that

20 are not facing financial difficulties. Where there are problems in production that also is associated with a number of error producing conditions. They're all very well established holes in the Swiss cheese.

25 Q. Now before we – I go to in interest of time Dr Callaghan, the things that you're now starting to look at and going to apply in your consideration of Pike River documents are reflected in particular in the document FAM00042.18/1 which is a paper called, "Accident analysis and prevention," published I think in 2010 and it relates to Queensland mining accidents and reflects – I think one of the authors, Scott Shappell from Clemson University is someone you have worked with in the past?

30 A. Well I haven't worked with Scott Shappell directly. He and Doug Wiegmann, Doug Weigmann was one of the human factors experts in the Baker Panel Report. They designed HFACS, I worked with their close colleague a fellow called Burt Bouquet who's in the States, he's part of my human factors group.

- Q. Now I'm just going to bring up a few passages from here. Ms Basher could we have page 2 of that document, 18/2? And it starts in the first paragraph and we'll bring up some bits in a minute but I'll highlight them. "The mining industry has witnessed tremendous successes and safety over the last several decades but still remains among the highest risk professions worldwide." So if we start with that proposition and then in about the sixth line there's a passage, "From flooding to explosive agents and the risk of asphyxia, miners are exposed to some of the most hostile working conditions of any occupation." And then we take the next passage please and just speak it or read it as you wish, "Nevertheless."
- A. "Nevertheless, the majority of accidents cannot be solely attributed to adverse working conditions. For instance, a study by the US Bureau of Mines found that nearly 85% of all mining accidents identified human error as a causal factor. Clearly, if safety is to be improved it is vital to study the impact of human error on mining accidents."
- Q. Now Ms Basher could we go to page 6 of that document? And under the heading of, "Unsafe in acts analysis by mine type." There is a passage at the end of the text, towards the end, five lines from the bottom, "The larger question is why decision errors were more frequent at quarries than at other mine types." It then discusses what is part of your evidence today is the decision making process and the three components described. Would you speak to that please?
- A. To how a decision's made?
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- Q. Yes.
- A. Right, well that's important when you're looking back at how people are making decisions. We've heard a number of people talk about their decision making during the Commission. It says, "Their decisions are based on three key elements. One, information, is the information accurate and timely. Two, knowledge, does the individual have the requisite understanding of the situation and training to make the decision. Three, experience, with experience comes a better understanding of one's decisions. The likelihood

that a decision will be successful is markedly reduced if any of these three components are absent or lacking.

5 Q. Now the paper goes on to talk about quarry and coal and other mining activities and there's a comment on the right-hand column, "In contrast to quarries, underground coal mines exhibit a much lower percentage of cases associated with decision errors and would you then read and speak to the next few sentences?"

10 A. Right, because again as Mr Davidson said, this study found that underground coal mines had low level of decision errors and they explained it saying, "This may be due to the highly structured nature of the tasks coupled with the reality that most operations are associated with written and practiced procedures so employees are really compelled to create their own course of action. Also of note coal mines tend to be populated by a more experienced workforce due as evident in the higher attention rate amongst coal mines in Australia. Obviously
15 the decrease in turnover naturally leads to workers with a more experienced workforce." And we'll come to that in my evidence, that does not appear to be the case in Pike River. So we had a high number of unstructured tasks with not necessarily always well written or practiced procedures. The workforce had a high percentage of inexperienced people and there was an increase in
20 turnover, staff turnover.

Q. And Ms Basher, if we go to page 7 of the document and under the heading unsafe leadership identified, "In 36.6% of cases analysed, and then the majority of the causal factors, this level fell into the inadequate leadership category and the most often cited example involved training which accounted
25 for 43.9% of inadequate leadership codes and a contributing factor in 15.6 of all cases." Now the next passage deals with the way training and teaching of procedures is undertaken which I understand from discussing it with you that this comment here is that it was to all industry where there is risk. In respect to that, the hands on training refresher course training et cetera?

30 A. Where is that?

Q. This is the –

A. Training of, well more than the initial hands on training refresher training. Again that very important. We know, and that's just the sort of our

understanding of how education works. We need constant reinforcement. We do need refresher training, we need mentoring. For example, if you come to my, if you go back to my example is when I was trained to be an auditor I had knowledge when I left the courses. What I lacked was experience. It's really important, that's why I was mentored by a lead auditor to enable me to take my knowledge and slowly have experience to be able to effectively use that knowledge in the real world.

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Q. This paper and I'll summarise this again, for time reasons it could be read but it emphasises repetition and continual reinforcement through additional training?

10 A. Yes.

Q. "To ensure the tasks were performed correctly. The operator must have more than a casual understanding of the material have competence and be able to take what was learnt and apply it." And then say, and this comment I want to raise with you, "On the job training programmes and didactic courses, they do not acknowledge accepted learning principles might fall short and lead to accidents as was revealed to those studied."

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A. Yes.

Q. You have something to say about the teaching or training in relation to people who are from other jurisdictions or may have not the same linguistic skills, written and writing skills, learning skills, do you?

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A. Well yes I do. I mean every time we apply an intervention, I talk about this in safety all the time. People have a tendency to have one stop, what I would call a one stop shop. But that is not appropriate. Training needs to be directed, training, safety messages, the provision of safety messages needs to be quite tailored to individuals and individual groups in the workforce.

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A. So, for example, you might want two workers, you might want the entire workforce to do a certain thing, but how you're going to encourage me, Kathleen Callaghan, a middle-aged woman to do that behaviour, one would hope is going to be clearly different to how you would try and get an 18 year old male to undertake the same behaviour. We really need to be cognisant of, again, it comes back to the strengths and weaknesses of individuals. We need to understand how those things work and what we had at Pike River Mine, for

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example, we had a number of, and I don't know how much that influenced it, but we had a number, we had experienced, inexperienced. We had people from South Africa, we had people from Australia, we had people from New Zealand, all of those factors needed to be addressed in determining how best we were going to take that workforce forwards.

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Q. And then, just to finish this paper, in the next paragraph, as of June 2002, in the next paragraph, there's a comment about turnover in management and the last few lines, "That the turnover rate appeared to be higher amongst professional and managerial staff, which also may have affected the training workers received. On benefit of retaining valued leaders may be the positive impact on training." Is that a known factor in the work you do?

10

A. Yes it is. And not just training, in training but also the learnings we have when good safety behaviour is modelled by well respected leadership.

Q. Now we come to the material within Pike itself, the company, and in your evidence you've referred to hazard reports, incident register, investigative reports, operation meeting minutes and some other passages and then quite separately you've read some pieces of evidence that have been filed, and some as you know are subject to a suppression order, so we'll be getting the streaming stopped and I'll mark the part when we get to that, but at the moment working from within Pike, with the company records, itself, first of all, beginning at your paragraph 95, you have gone through hazard reports for October and November 2010?

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A. Mhm.

Q. And your evidence is that having been through those hazard reports, which you've set out a selection of here, you reach a conclusion in your paragraph 97, and will you just state that conclusion, what you infer from it?

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A. The hazard reports are of concern because they document significant and recurring risks to safety in areas such as housekeeping, emergencies and ventilation.

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Q. Now, we have in your evidence at page 42/25, some of these, so Ms Basher, could we have that page up please? And when it comes up I just want you just to take a few examples which reflect what you've just said.

- 5 A. Right. Well if you look at the, sorry, the first one was an error, 3/10, 10, you've got containers left untidy on the ground. That's a housekeeping issue. Housekeeping's actually very importantly causally associated with adverse events. Second one there, hoses dumped on the ground. Another housekeeping event but also I understand, I mean that can be a, that's an emergency management event. Firehoses incorrectly coiled. 6/10, more housekeeping. The next one down again, more housekeeping and emergency things, lots of dust, 7/10, dust. No gas detectors, so an emergency problem. You know, 8/10, the aluminium Coke can. Again that's an ignition. We're worried about ignition sources and things there. And again, you go through them. Just if you read them, they're those same things occurring time and time again. Housekeeping issues, ventilation issues, issues relating to emergencies, where they're causing emergencies or related to an emergency response.
- 10 Q. And this is the stock standard sort of thing that you're looking for?
- A. That I do all the time. And I guess what I would want to say here is each one, and that's, when we look, when I look, the way I've been trained, when we look at reports such as these or all the reports, it's not often that one report in itself is of consequence. Sometimes it is.
- 20 1010
- A. What we look for though – because that's what we call in science an N of 1. What we're looking for is that same event being repeated. It's the repetition of even low level events that gives rise to concern. It's just the weight of the events as opposed to each event needs to be significant in of itself. Sometimes significance arises from sheer repetition.
- 25 Q. Now we then – that's just the hazard reports, is one of the first things you looked at.
- A. Yes.
- Q. There's then what we've had trouble getting the right description for, the incident register or the incident book, which Gunningham and Neal talk about, and incident book.
- 30 A. Yes.

Q. And you've seen the documents called "incident register site summary Pike River Mine"?

A. Mhm.

5 Q. And you've used that to take a collation of material – firstly you've noticed that these reports do not appear to be necessarily chronological or a complete numeric record. You made that point?

A. Well, I guess that when I was looking at that, because I look – people hand documentation around all the time and I am always looking. Everything that I do, everything I look at, I relate back to the fundamental reason that I'm there, which is the prevention of harm, so I'm trying to interpret documents in that sort of light, so when I'm looking at these events, I want to be able to understand them and analyse them and look for patterns, and I still don't know when I was handed the incident reports, I can't work out the sequencing of them. Normally what would happen is that you have an incident, an incident one is given the number 1, and incident two is given the number 2 and so on. These didn't appear to have a sequence such as that. I tried to sequence them by date and that didn't work either. So, I just sequenced them by number, whatever the number meant, I have no idea and what I could find when I did that, and that's why I do it, is that some incidents were not included in that data. Now I don't know what that means, but that's why it's important to me to have some sort of sequence, because I would've gone back and said, "Where is that? Does it exist? Have I not got it? What happens to it?" So, all I've put is that that's there and then when I went through and I could sequence them, I found I was looking for – because again I'm looking for patterns. All I know is that the higher the numbers, the less likely it was that the action was defined as complete. So there was a higher number of incomplete's as the number, whatever the number means, rises.

25 Q. It's quite possible you haven't seen all the evidence in this regard, but have you been shown any Pike record which demonstrates the completion or resolution of matters relating to hazard or incident reporting, something which demonstrates the conclusion or end of a trail of dealing with these matters?

30 A. No, no.

Q. Now, if we just take a couple of examples in here of the same sort of things that you were looking for, or looking at in the hazard reports, Ms Basher at 42/28.

WITNESS REFERRED TO DOCUMENT 42/28

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MR DAVIDSON:

Your Honour, I see in here some names in respect of people who are going to be giving evidence and potentially challenge, therefore subject to the suppression order, so may I ask that that order extend to this page of the evidence?

10 **SUPPRESSION ORDER MADE REGARDING PARAGRAPH 103**

EXAMINATION CONTINUES: MR DAVIDSON

Q. Now Dr Callaghan, you've heard what's said, because of the issues about suppression and the evidence still to be given, some of these matters touch that evidence, and your supplementary evidence, there's a lot of that as well.

15 A. Mhm.

SUPPRESSION EVIDENCE: MR DAVIDSON

EXAMINATION CONTINUES: MR DAVIDSON

20 Q. Now your comment on the incident register is at that page and so if we just summarise that for these purposes. "Process safety failures to follow safe operating procedures or where there's no SOP and recurring samples of the same or similar events over time," and you then identify at 105 the issue of oversight at the supervisory level because the problematic behaviour wasn't able to be controlled and at managerial level because the inadequacies may
25 not have been effectively addressed or lack of support for them?

A. That's right.

1020

30 Q. Now you then have four investigative reports, they're a sample of investigative reports given to you at that time in confidence and there are four, with different authors. Mr Rockhouse is an author, part author of three of them of the four and we're not going to read right through this but if we take that which appears

at 42/31 and this is just an investigation within Pike so it's evidence only in that context. It's a report into the matter I've just referred, that's the explosive primer, P1 explosive found in the engine bay of a drift runner and it is 24 December 2009. So if we have that up please Ms Basher? Is it up already, yes, thank you.

WITNESS REFERRED TO DOCUMENT

Q. It speaks for itself but the first, paragraph (a), well perhaps the quickest way is this. You, there are points you wish to lift from what you see in this report Dr Callaghan?

10 A. Right there are. Maybe just back and I know I'm mindful of time. The things that – a couple of things. One is that these investigation reports aren't too bad actually. So I'd like to say that. I mean they're reasonable investigations and they cover a couple of areas. So the first one there relates to contamination of fuel and oil. The second one that I mention at 108 is discharge into the river.

15 The one that we're concentrating on now is you know the P1 explosive and then the last one was the rollover at telehandler and when I look at them they all showed exactly the same problems. They all referred to systemic problems, all of them. They all referred to problems with SOPs and so, and they're across a period of time. So I think that that's really important. What it showed

20 was wherever we were looking, whether it was environment or all these things, the same issues were being identified. So a lot, this was covering a lot of, a breadth of Pike River Mine operations, it was covering a substantial period of time and the same big problems were being identified. I think that's really important and then when you go down, as we say, into the 109, I mean look

25 there's no requirement to follow an actual methodology to account for sources of ignition. There's no way to account that sources of ignition are returned, there's lack of an accounting system, there's lack of licensed jugger operators, there's an inadequate area for priming explosives, and then that last one (f) that you don't have here. Host contributory factors, that were cumulative in

30 nature and have led to this unplanned event. That's another way of saying that there's widespread systematic issues here and this is, the problem, well the issue for me with all of these is not that Pike River was failing to identifying hazards, that it was clearly identifying major significant hazards and writing

them down. The failure doesn't appear to be with identification of certain hazards, that's, they were identifying these. What I don't understand is why they keep repeating.

5 Q. Now the comments you've made I think apply across those investigation reports in form or another so we needn't go through each one Dr Callaghan, they're there in your evidence but you pick up at 42/32 Ms Basher, a Pike River document, in respect of a review of the surface auxiliary fan failure on the 5th of October 2010. So this is an internal review of that fan failure and the review panel within PRC itself identified all the points that are set out at that page. Again, if we could just swiftly identify the matters of concern to you, 10 the matters you are concerned to get across to this Commission?

1025

15 A. Right, well again I mean, almost all of these are of concern to me in of themselves, but also because they are, you know, they're exactly the same sorts of issues, raised in a different context as we've seen now, occurring over a large time period. Lack of communication to the surface plan, lack of working communication devices underground. Look at (c), no set and relevant procedures to follow. We've seen that time and time again. That is a significant error producing condition. "Could not find the spare fans in stock," 20 not in sight. "Could not find fan drawings in manuals easily," really important. People need to be able to lay their hands on important information. If you recall what I said about how we make decisions, one of the first, the first thing you need for good decision making is timely and accessible information. These people were denied that.

25 Q. Just going on down the list.

A. Again, you know, a list of what is in the fresh air base is required. Now, I'm thinking if we're at this timeframe, and we still don't know what's in the fresh air, what we need in the fresh air base, that raises concerns to me. Gas monitoring procedures needed to be addressed, and you know, there is a high 30 risk of not knowing what gas levels were present underground. We're now in, well this event took place on the 5th of October 2010. You know, we could continue, but again, these are very significant issues. They are recurring time

after time after time and they're all well established conditions causally associated with adverse events.

Q. At the bottom, towards the bottom, "lan, is standard mine degassing procedure to be developed"?

5 A. Yeah.

Q. Yeah, same again. Now, there is a section, I'm not going to take you through but it's at page 33 of your brief, Ms Basher. I'm just going to refer to it. These are a review of some operation meeting minutes which we think now was prepared by someone within the Department. I'm not quite sure for what purpose or when, but it's a review of minutes, and it's under that DOL number, and they come back to the incident reports and they talk about what you call holes, and this is paragraph 114, related to process safety and you pick up, and I'm just referring to the headings, "Lack of qualified staff, supervisory issues, follow-up of actioned items, issues pertaining to emergencies, breakdown of equipment and unavailability of safety equipment," and the last, which appears at page 34, Ms Basher, says, "Contractors underground without gas detection, 30 May. No gas detectors available in control room, 2nd of June. Insufficient gas detectors, 22 July. Shotfire took place inappropriately, 28th of April and 26th of May." So this is a review done of the incident reports, some of which you've seen, and you have commented at your paragraph 115, having read at page 34, Ms Basher, that section includes issues pertaining to emergencies, "Can people make it back to the changeover station from place of one self-rescuer unit. No phones, or phones not working ideally," and so on. The same passage, "(d) Emergency list phone numbers are out of date. Ongoing concern. Surface controllers not taking their role seriously. This is unacceptable. Breakdown of equipment," and so on. Now you have commented at 115, "These reports in PRC itself are telling. Holes appear time and time again in a different context." So, you've got a picture drawn from a whole range of material now. Is there any qualification you want to make to your evidence of the identified holes at Pike River within their own records?

25 A. Do I want to change my mind?

Q. Qualify it in any way?

30 A. Sorry?

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Q. Do you want to qualify it in any way or –

5 A. No. To date, all the evidence I have seen and the evidence I have seen since I wrote my brief just confirms to me, it gives more weight of holes that were identified and repetition of those holes through a significant period of time. Can I just say one thing, and I mean Mr Wilding raised that, it was (c) the follow-up of the action items. That's very important because now that we have all these identifications of hazards that Pike River is identifying, those statements that there is no control over whether assigned tasks are allocated and followed up, and we are beginning to see a large number of open incidents
10 in various departments. Very important. Follow-up of action items is a significant marker of a process safe – to the likelihood of a process safety event occurring, well established indicator, a process safety event is likely.

15 Q. Now, we're getting close to the Gunningham and Neal report, but we must deal with the question of reporting quickly, even though it's a critical part of your evidence, is it not?

A. Mhm.

20 Q. And your evidence is that process safety information comes of course from incidents that occur where accidents, incidents occur, but near miss is a vital part of reporting?

A. That's right, enables us to be proactive.

Q. So the thrust is to get people at all levels to report errors and violations, including those by the report-maker themselves, if you can?

A. Mhm.

25 Q. And your comment is that one of the critical elements of reporting is that the organisation must be "just". It's your word, "just"?

A. But that's actually the word in the literature, "just culture".

Q. Just explain that please?

30 A. A just culture – it's complicated. A just culture is drawing – it's actually the line in the sand in essence where disciplinary action becomes necessary and there is always a trade-off, because what we want is people to come forward and tell us, no holds barred, what's happening and clearly if there is the risk of disciplinary action there, the factors that tipped them towards to being open

and honest about ways in which they might've stuffed-up, is reduced. So, it's a balance between a need for information and a need to, in certain circumstances, discipline.

5 Q. You then address the question of, "What are the tipping factors that make people act in unsafe ways?" Now this is a big topic and it's in your paper, but can you, in the context of what you've just said, what are the things that in a good culture tip people over to act in an unsafe way?

10 A. Well, when we've got here lots of things, we need – there is always factors that lead people and they can be quite individual or they can be relevant to groups that tip people towards or away a desired behaviour. But one of the things when we see routine violations, it's very easy to say, "Right, broken the rule, you know, discipline." Discipline's unlikely to fix lots of rule breaking and especially with routine violations. Some of the factors that are associated with people repeatedly breaking the rules are those things that I've put there. It's
15 "everybody does it this way" and sometimes there's a good reason for people doing it this way. It might be that the rule is poor and needs changing, but very importantly here, the thing about routine violations is that everybody knows about it, including managers and supervisors and they don't act to stop the rule breaking and therefore it becomes routine. Now the way to address a routine
20 violation, as I say, is not punishment.

Q. If you look at paragraph 121 of your brief, which is at 42/35, and the suppression order extends to this passage, so that passage and your reading of in relation to it, is suppressed.

25 **MR DAVIDSON:**

The witness there identified sir, for the record, is witness Silke, S-I-L-K-E whose brief has been filed.

SUPPRESSION EVIDENCE: MR DAVISON

1035

30 **EXAMINATION CONTINUES: MR DAVIDSON**

Q. And finally on this issue at page 36 Ms Basher, the operation meeting minutes reviewed at 2010, these DOL and a DOA document. There is reference to

what you call a very telling email from Mr White to Mr Couchman and Mr Rockhouse and Mr Ellis written in November 2010 where he's reacted to some of the extremely serious concerns raised and just read from the next piece please, in response?

5 A. Well it says in response to the repetitive use and misuse of fire hoses he states, management of fire hoses will not stop the tardy lazy practices of people who obviously don't care about the proper use of equipment. Now that tone, that language and I accept in a context and I'm just reading from these minute notes, that just gives me pause for thought really because later down in
10 the document, it talks about there appears to be no fresh drinking water available to mine staff and I understand that sometimes the men were drinking from the hoses and again when we're looking at why people do things and we were going to resolve, you know, there is a difference in my mind and I'm not saying this is the case here but there is a difference between lazy, you know,
15 lazy rule breaking people versus thirsty workers and if they're thirsty workers, then the appropriate intervention is going to be different than if they're tardy lazy, you know, people. The point I'm trying to make here.

Q. Now that law is under the heading, if you like, of the way the management at all levels respond to the workers and to errors, the violations?

20 Q. It is the way error, human error is inevitable. That is the very nature that's critical to our understanding of management and safety in workplaces. The way in which we deal with error and even which, the way in which we deal with violation needs to me, to be at all times based on the evidence and it's leading us with the sole aim of the prevention of harm. Punishing people
25 inappropriately using derogatory language, blaming people, failing to look at the reasons why behaviour is being undertaken, all is actually the antithesis of good safety management. Very clear, well established in the literature.

SUPPRESSION EVIDENCE: MR DAVIDSON

30 1045

EXAMINATION CONTINUES: MR DAVIDSON

Q. Now there's much more of this, but the Commission is able to read it from this and other statements.

A. Yes.

5 Q. So you reached a conclusion on this before we can, I think, very quickly deal with Gunningham and Neal at your paragraph 131 of page 40 and we are out of the suppression zone now. You've drawn a conclusion and firstly you say again, you're conscious that there may be contest with much of what you have read, whether by the company or individual and you conclude, "A repetitive
10 element", which is at page 41, Ms Basher, "and it's difficult to discern, for you at this stage, a comprehensive response to this fact." At paragraph 132, at page 41, you take the science you've described, apply it to Pike River and you say it showed many of the characteristics which increased the risk of a major organisation accident. Then explain please, the next four lines and their
15 ramification? Paragraph 132 at page 41, third line, "These characteristics were known by –

A. Were known by a variety of parties?

Q. Mmm.

A. Well, they seem to have been known by a variety of parties. They're clearly
20 written down. What I'm saying next, "It is unclear whether those who may have been able to prevent the tragedy understood what they were identifying, understood the ramifications of what they were identifying or understood the picture as a coherent whole, understood the patterns that are important to be identified."

25 Q. And at page 42, Ms Basher, in your concluding paragraph the status summary there, can you put it in your own words please?

A. Well, they are my own words. What I'm saying is that all the information that I
30 have seen shows me recurring patterns of causal factors that I know are well established in the literature to increasing the likelihood of a process safety event. And then as we've put there, if that information was not held by all, you know, with such a vital interest in preventing tragedy, then I think we need to examine why it wasn't.

3281

COMMISSION ADJOURNS: 10.48 AM

COMMISSION RESUMES: 11.08 AM

EXAMINATION CONTINUES: MR DAVIDSON

- 5 Q. Dr Callaghan, just before we broke, you referred to the need for cohesion on safety issues throughout the whole of the workforce, top to bottom, and I understand that means that barriers, which you've referred to in reporting for example, must be removed or encouraged to be removed. You've got an expression, which you know I want you to use. It sounds a bit cliché, but it's a summation of what you think safety has to be seen as by all those in the workforce. Would you like to tell the Commission?
- 10 A. Not just to all those in the workforce. What I've talked to Mr Davidson about is I'm very much of a believer that safety is a team sport. That means that everybody, there's a number of stakeholders, there's the people at all levels within the individual workforce. We need to, at the level of a company, at the level of the industry, at the level of the wider sort of national socio-political sort
- 15 of level, all those people are stakeholders in the safety system and the safety of individuals at work. It is very much a team sport and needs to be recognised as such.
- Q. Now we're coming to the Gunningham and Neal report, and first, do you know Professor Gunningham and Dr Neal as part of your academic work?
- 20 A. No, I don't.
- Q. You have approached this review, and that's all you've been asked to do, review that report and make such comments as you think fit, by looking at the functions of an inspector and that is because the report focuses, as we can read, in the interactions between the inspectors and the company. You've
- 25 noted, I think, that the reporters have had access to some people only who they've listed in the report?
- A. Yes.
- Q. And there'll be a lot of other information they don't have?
- A. Yes, that's right.
- 30 Q. When you have addressed the functions of the inspector and this is, Ms Basher, at 42/43.

WITNESS REFERRED TO DOCUMENT 42/43

Q. You've set them out in your paragraph 141, and of these four functions, you have taken function (b), that to ascertain whether or not this Act is being or has been or is likely to be complied with and your view is at 142, that, until that's addressed the others can't be dealt with. You can't enforce. You can't help
5 until the problem has been identified, actual problem or likely problem?

A. Well, that's what I have learnt through the practise of medicine, through the little bits I've done in business management. I mean, we start with definition of the problem, before we move into intervention and treatment. So, to me, (b) is definition of the problem where as helping and enforcement are treatments or
10 interventions. So I think it's always important to define the problem before we intervene.

1111

Q. Now as a general comment based on the evidence you've gleaned and read so far, the question of compliance with the Act in terms of all practicable steps,
15 have you comment to make about how easy it might be or difficult it might be for the inspector to reach a conclusion in that crucial regard?

A. Well again if you recall what I was talking about earlier that we have health and then we have safety and within safety there's personal and process safety and if we leave health out now, health is a myriad of complexity in its own right.
20 But even if we look at process and personal safety, as I said, those factors that contribute you know, towards accidents, if we look at all those things it requires such a depth of knowledge and such a breadth of knowledge, that again I cannot conceive where one individual would be able to have all that breadth and knowledge to be able to ascertain whether a company was complying with
25 the Act across all those hazards. I think it's very difficult and again, if we come to decision making which I referred to before where you have those three factors that are necessary, you need timely, appropriate information, you need knowledge then you need experience, again you can start to see that while it might seem easy, in reality, judging whether or not the Act has been complied
30 with I think is a extraordinarily complex task which cannot be underestimated.

Q. Now there's one point you have raised with regard to the authorship of the review. At Mr O'Connell's evidence with the EPMU which is the EPMU0022/8, Ms Basher could we bring that one up pleas?

WITNESS REFERRED TO DOCUMENT EPMU0022/8

Q. In his paragraph 18 has looked at the report through the lens we see there that if was flawed on the basis that there was conducted by academics and not by underground coalmining experts and therefore there's a question raised, which others may well raise, regarding a review in that concept to review his ability, what do you have to say about that suggestion that people without the specific mining, coalmining expertise are outside the boundaries as it were?

A. Well again I would just emphasise that to my mind, not just to my mind but safety is a team sport. It requires the input of people across a wide range of disciplines and going back from a purely scientific basis, you know, because at the end of the day it's scientists and people that develop protective equipment all the way down to the workers. Everybody has a role to play. Everybody carries a piece of the safety jigsaw and I must say, in my experience it is sometimes the least expected people that have the most important piece of the jigsaw. I think for anyone in the safety field to be dismissive of anybody's contribution, is something that we all need to think about really.

Q. Now I think part of your thesis you wished to get across as you look at Gunningham and Neal is that to fulfil the responsibility the inspector has which you've identified, there must be recognition of the human factors you've talked about and I think there's a rule of thumb about accident causation in terms between the human and the technical if you like?

A. That's right. And again I don't want to say that we don't need to look at technical factors, we clearly do, you know, it's vitally important that human factors is an important piece of the safety equation. In fact the rule of thumb that Mr Davidson is referring to is well established. It's probably changed a little bit now, but the rule of thumb is what we call the 80/20 rule, that means that all the evidence across a wide variety of industries now across the world is showing that 80% of adverse events are due to human or organisational factors, whereas 20% only are due to technological factors and that's probably changing with the human organisational aspects going up as time moves on and the technological aspects going down.

1116

- Q. So you've taken this factor into account as you now start to look at the Gunningham/Neal Report and in the report, and it's referred to in your paragraph 49, you've identified the Gunningham/Neal report where at paragraph 49, "The Department's role is to ensure employers are aware of their obligations, to support and assist them to understand and give effect to these obligations and enforce as necessary." It's actually your paragraph 845. So here you are looking for the evidence of what you call function (b), "Try to ascertain whether the Act is being, or is likely to be complied with, right?"
- 5
- A. Yes. Can I just add to that though? I mean we're talking about compliance with the Act. I think it's really important and that's certainly how I do it. It's not compliant – we've got to be compliant with the Act but I always have in mind, I think we always need to keep in our mind why are we doing all of this and the purpose of the Act is to prevent harm. So, every time I looked at all the interactions of the inspectors or anybody, in this case the inspectors at Pike River Mine, I am sitting there thinking, "How did this interaction lead to the prevention of harm?"
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- 15
- Q. And if we then look at your paragraph 146, which is, Ms Basher, 42/44, you've taken a piece from the Gunningham and Neal report where they're reporting what they were told by some senior officers and how that engaged with the company as an issue arises. And there's a set of questions there which includes, for example, they encounter methane. The inspector provides advice, rather than directing them what to do. Might ask, "You've got a system to manage gas outbreaks. Is it adequate? How are you going to deal with the risks? We know, we'll flow from these outbreaks." They might even suggest where the company might find the outside expertise, et cetera, What's your comment about that sort of interaction?
- 20
- 25
- A. Well, I – again, because I come back at the end of the day to performance. I'm interested in the bottom line, what is actually, this is going to achieve, and I think that this gives us very limited information about whether or not the Act has been complied with. What it tells us is what people sort of say they're going to do. Now that's important but I think it always needs to be followed up and that's certainly what I learnt as an auditor. It was, "Tell me," and then one very quickly moved on to, "Show me," so I would, these questions in of
- 30

themselves, I don't think that they give us, in my terms an evidence basis for compliance. I would want to go down and say, right "show me now", "show me how you're complying with the Act".

1119

5 Q. You've used the expression, "it's not the talk but the walk"?

A. I cannot again emphasis how important it is, not really interested in the talk, see an awful lot of talk in safety, I'm fundamentally interested in the walk. It's the walk that leads to the prevention of harm, not the talk.

10 Q. So your conclusion at paragraph 147 on this page is that the sort of question and answer there gives little information to formulate an evidence based opinion on whether or not the Act is being complied with, that's your first comment about this approach?

A. That's right, that's my contention.

15 Q. And yet as we go on we see in your paragraph 148 again from the Gunningham and Neal report told by some senior departmental officers, shifting away from a reactive event face focus to positioning ourselves to better understand patterns of incidents, accidents and fatalities and to addressing these, stay ahead of the game, you focussed and targeted and based on the intelligence we gather, you absolutely endorse that?

20 A. Yes I do.

Q. Now at 149 on the same page you have a set of circles of how this is done or should be done. Is this a standard form representation in a science?

25 A. No this is something that my group put together when we're talking with business about what they should be doing. But it follows the standard, anyone who has seen something like this, I mean this is like a continuous improvement cycle and again I don't want to spend a lot of time on it but it's important. Because when we're talking about looking at patterns it all seems, might seem a little bit airy fairy. There is, we need to look for patterns systematically. So what I tell people to do, so this is a system that needs to be present in an
30 organisation. Whether that's a company like Pike River or whether it's something like the Department of Labour in my opinion, it's certainly what I saw at Civil Aviation Authority. So we get a whole lot of data from a number of sources, we don't need to go into that but that calculates what we call the

burden. That's the, that gives us an indication of the size of the problem and then very importantly we need to understand, we use investigation to understand the cause because again if we have things like, you know, procedures are not being complied with, the burden just gives us the number, why we need to understand is why the procedures are not being complied with, that's the cause. That's –

5

Q. So if we use a fire hoses which we've come up against as the burden, the problem?

A. That's right.

10 1122

Q. And then take the cause "Why?" We'd be talking about possible reasons, don't know the importance of firehoses, housekeeping, busy, thirsty people, that sort of thing, "Why" questions?

A. That's exactly right, because all of those have a different fix, don't they?

15

Thirsty people are different from naughty people, to use a different word. So we had a cause and then when it comes to the intervention, again it's really important to understand the science of this. We don't pluck interventions, though I often see that occurring and can see that in recommendations. What we have is once we have a cause, we need to from the published literature and our experience, choose an intervention that we believe is likely to be the best intervention for what we know. But again, it's only a statistical choice, isn't it? We're choosing what we believe. We implement it. And what I put out here is that there are ways to implement interventions. Not all interventions –

20

we need to monitor that this has worked, because sometimes it doesn't. And in my experience, almost inevitably, the best laid intervention still needs tweeking, and then we use that because if this is working, if our intervention is working, we see a reduction in the burden, and again, I can't labour that point too much. That was what I have seen in the Pike River documentation. The burden has remained unchanged. I see the same thing happening over and over again. That gives me cause to believe that whatever, either interventions were not being implemented or the interventions that were being implemented,

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were inappropriate. You need to see a reduction in the burden. You need to see a change in performance.

5 Q. Now that takes us to, I think, to the question of audit and Mr Cooper gave evidence, both in written form and yesterday regarding an audit safety system, analysis of systems and process, and the report – and we know this. The report refers to the fact the inspectors do not conduct general safety systems audits, and we know they weren't trained to do so. What do you say first about the systems-based approach and, secondly, audit?

10 A. Well, when we're talking about systems-based approach and I don't really want to get into that. That was in my para 154. What systems approach means is different depending on context, but if we're talking here about auditing of the documentation, I guess, so standard SOP's looking at the system, the safety management system, I think they're vitally important.

1125

15 A. In fact, because that is the talk in one way, what we're looking for in the documentation is the talk, and then we go and we need to establish what is happening in the walk and the discrepancy, all those things are important. There could be problems with the talk. There could be problems with the walk. There could be a gap between the talk and the walk. All of those are of
20 fundamental importance in establishing, and in fact I can't logically see how one could determine whether or not anyone was compliant with the Act until you had undertaken some form of audit.

25 Q. And that's what your paragraph 158 records at page 46, Ms Basher, where we don't go into the technical debate but it precedes that, Dr Callaghan, because you've come down to concluding that audits are important ways in which an inspector achieves his or her functions for the reasons we've just mentioned, and you can't find by that paragraph, any valid justification for not performing an audit in the Gunningham and Neal report?

A. No I can't.

30 Q. No warrant for not performing it?

A. No I can't.

Q. So an audit obviously, a lot in this room will know that Civil Aviation audits are, "painstaking," is one word but they're exhaustive. They're across industry –

- A. And they're crucial. They are crucial to the maintenance and enhancement of aviation safety.
- Q. Health and safety systems or practices without an audit function. Can you point the Commission towards another industry or activity where there is no audit function as to safety?
- 5 A. Not, not that I can think of. I mean, individual companies I know sometimes don't perform internal audit and I'm very strongly reminding them that they need to do a reactive audit and they need to always do proactive audit. It's just important.
- 10 Q. I'm really putting the question to you, not so much of a failure to carry out an audit but the fact that there is no audit function for these inspectors. Is there anything like that you can think of, where people responsible for looking at this health and safety aspect, don't audit?
- A. No.
- 15 Q. Now, you then address the question, testing the Gunningham and Neal report at 159, page 42/46 Ms Basher, and you're saying, asking the question, "What did the information available tell the inspectors about how Pike River was identifying and addressing hazards," and your evidence at page, paragraph 159 is that even within the Gunningham and Neal report, there are
- 20 many holes identified in the interactions which they've set out?
- A. Yes.
- Q. And this not going outside, it's just within the report itself?
- A. Yes, these are just, these are phrases taken from the report.
- Q. So the example has then come up on the next page, Ms Basher, page 47, and
- 25 I'll just paraphrase these for your confirmation, they've got, firstly under (a) "The guidelines provided only very general guidance and lacked the sort of attention to specific issues that provides practical direction to duty-holders. What guidelines are you referring to there?
- A. I think these are, what they're talking here is just these were, as they're talking
- 30 about the industry code and guidelines given, this is, we don't necessarily need to get into it –
- Q. No.

A. I'm not saying that we need to be very prescriptive but some – it's important I think that people have some indication of the line in the sand.

Q. Yes.

5 A. In order to categorise things. We know that ambiguity, lack of instruction, clear instruction are all well documented error-producing conditions.

Q. And that's what you say at the end of (a) there, (b) you've come, you've mentioned before, "Multiple and technically very challenging mining conditions and changing conditions, difficult periods." You've identified those as human factor causative issues?

10 A. Yes.

Q. "Some interventions introduced new hazards," for example, cold, that's referred to, that's the fan system. "Need to be mindful the management of one hazard does not create a new hazard." That's a well known factor?

A. Yes.

15 Q. "Change in key management staff," you've referred to under (d), "A period of vulnerability," and the point you made about safety as a team support I think is there. In addition, "Teams need to be rebuilt as the previous team dynamic changes." You need some degree of flow, of constancy?

A. Yes, indeed.

20 1130

Q. And then training of contractors, you've identified. So at paragraph 160 your conclusion is the inspectors had there, quite apart from what you've seen, information which identified some hazards and showed problems with management and the compliance with the Act which is your primary premise here might be an issue for Pike River Mine, okay? And then you've gone to address the report's conclusion, this is the same page 161, "That Pike appeared to be an employer which took its safety responsibilities under the Act seriously and in part that came from a consideration of whether the Department of Inspectors had armed themselves with full and accurate information about the mine's compliance with the Act." And you've looked for
25 the data which supports this statement, did they get full and accurate information, the inspectors get that information. So again staying entirely
30 within the report, you've looked then at accident incidents at paragraph 162

and you've identified the report as saying, "A small number of such injuries serious harm could be identified from the available documentation." And over the page Ms Basher at 48 paragraph 163, "Most incidents reported in the incident book were slips, trips and falls, which did not merit major attention."

5 Can you make a comment about that statement?

A. Yes well I think as has become abundantly clear in the last view days of the Commission that there are lots of events, hazards, incidents, accidents that are reported, whether we see them in what they call the deputy production sheets or whether they're in the incidents, there are lots and lots of bits of information that go well beyond slips, trips and falls.

10

Q. And then at 164 on the same page the Gunningham and Neal report says, "The mine was willing to undertake its own investigations and take appropriate corrective action voluntary. And you have a response to that?"

A. Well yes I can't comment on its willingness to undertake its own investigations. Certainly it undertook investigations and I've said some of those investigations you know, are pretty good. But where it says, "To take appropriate corrective action voluntarily," yes I focussed on the word, "Appropriate," because if you look back, if you think back of that diagram that I showed you, we don't see, I don't see a reduction in those events. Events keep being repeated. The fact that they're repeated indicates to me again, that either the action was not undertaken or it was not appropriate. If it's taken and it's appropriate you will see a reduction in the burden. You will see events stopped being repeated.

20

Q. And you then at paragraph 165 refer to Mr Couchman's evidence here about his role to audit the firehoses to see they were serviceable and they weren't being rolled up and so on and he sets it all out there, "It's not easy to fill the machines, they'd cut the end of the branches off, they'd move sections and so on." So it was an ongoing issue, virtually every audit I did I came across fire hoses that hadn't been rolled up." That's the repetition point isn't it? So no matter what the willingness, you're saying where's the result? Where's the cure?

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Q. Well as I said, at the end of the day what we're all concerned about isn't it is the reduction of harm? We want to see the result. We want to see the

reduction of harm, the reduction of the potential for harm. It's as simple as that for me.

5 Q. So when you see in the next paragraph 166 you state, "The statement at paragraph 386 of Gunningham and Neal that the Department of inspectors took steps to ensure that there was no recurrence," you conclude on what you read that that seems at odd with the data?

A. Well I've seen substantial recurrence.

10 Q. Now you then address the question of reporting as Gunningham and Neal considerate it and at paragraph 168 you refer to Mr Poynter's evidence, what you call a very important fact, "He's been told by a number of people the number of ignitions was far in excess of those who had been advised about it formally." And Mr Louw communicates, it's all there on the record. You got that paragraph, 168 of your evidence?

A. I do.

15 1135

A. Yes I do. I think, I mean that stood out to me as interpersonal interaction and it stood out for a number of reasons because Mr Louw is saying, if there is more ignitions. So you know again not a technical expert but ignition seemed to me to be an important thing to consider when we're looking at the likelihood of a process safety event and then he says, if there's more ignitions than Mr Bell has, you know, if that there are more ignitions than I understand have occurred here at Pike River, there is more than the supervisors choose to report. So already now we're raising the issue of whether or not supervisors are providing accurate information and we still, we certainly don't know why if indeed that's
20 the case. And then he says, it's not being investigated. So I sort of interpret that as the supervisors may or may not be reporting and I'm not going to investigate that and you know the issue sort of comes to a close. The issue to me is not necessarily whether or not, how many ignitions there were, it's the discrepancy, it's such an important discrepancy and I would've followed up on
25 the discrepancy alone.

30

Q. You then say, don't look at this in isolation Ms Basher at 42/49 and you begin in paragraph 169 to say, "This seems to end the communication" the point you've just made and you see that as highly relevant. When you say at 170,

there are things which you identify in the same regard. So if you could just speak to that as concisely as you can?

- 5 A. Well I've talked about (a), at (b) I'm just indicating that he said things here and he describes the conversation with the deputy and he's told things are pretty good. If he had any concern he would've told me. Now I'm surprised, that's a very naïve comment from somebody that's involved in garnering information and particularly so in light of comment 3 which he says he's trying to get comments back from other people but their manager is just round the corner. Now we all know, you don't need to be a human factors expert to understand that. If your manager is lurking around the corner, for whatever reason, one tends to have a hesitation in maybe speaking up as clearly as one might when the manager is not there. And again that indicates to me if I use scientific language, it indicates Mr Poynter's understanding of social pressure as an important tipping factor away from reporting. So that makes no, little sense to me in light of his comments that if he had a concern he would've told me. We know that people who have concerns have multiple tipping factors away from reporting those concerns. And again the last thing is something that again has been raised, I've heard raised in the Commission. Is, you know, they put here safety representatives never really made much of a positive contribution. Again we cannot, it is a team sport, we cannot be dismissive if anybody's contribution. We never know who's going to hold the vital bit of information.
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- 20
- Q. Now we deal now briefly with Mr Poynter's evidence because some of it's been already dealt with in cross-examination. Ms Basher, 42/50.

WITNESS REFERRED TO DOCUMENT 42/50

- 25 Q. Looking at paragraph 174 Mr Poynter says, "Recall following the outburst report up Mr Slonker however I never received the report" and that's I suppose an obvious comment. The issue is, why I didn't receive the report, that's the follow up issue you've raised?
- A. Well it is, and if happened for the first time you might just tuck it in the back of your memory but as you'll see it happened again.
- 30 Q. I think 176 is a medical evacuation incident, something about a compliance boundary. Is that something you can speak to here, do you enough information?

A. Yes, well this was just an interesting one to me 'cos this was a fellow who hurt his back and had trouble breathing and it all seemed quite serious. As it turned out it was relatively non-serious medical issue. But number of things because and again these are the small details I don't want to place too much weight on them at all. But when we're talking about a company being, because they talk about Pike River being very willing to provide information, was just this struck me because there's a very clear email that talks about, along the lines of we don't, we're actually not obliged to give you this information and the fact that they note that down, to me, that's what I call the compliance boundary. They're making clear to my mind what is needed to be provided and what's not. Just there is a statement.

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A. But the other interesting thing about this to me was that it turned out to be a non-serious injury as it's defined in the Act. It was a very trivial medical injury and it wasn't followed through. But if you have a look in terms of like process safety events and other important aspects, there was a real problem with housekeeping that we already know, sufficient in this stage that rags and plastic had been sucked up through the rotors of the emergency helicopter. That's important information to me and in fact it was written about by Neville Rockhouse, put a sort of memo out to people about it, but it was something that just wasn't mentioned at all that I could see by the Department of Labour inspectors. They concentrated on whether or not the fellow had a serious injury.

Q. I'm going to move, in the same vein, at page 42/51, please Ms Basher, where we're talking about a minor soft tissue injury suffered by a worker and the notation that, "As the incidents were not serious harm, I concluded no further action was necessary." And you said, "Yes, well it wasn't a serious harm, but there was an accident investigation report called Avko, A-V-K-O, which is in the evidence, as for the potential causes for the fall of rock that hit the worker. One was failure of ground support elements, one was in appropriate ground support design and one was failure to install support elements to standard." What do you say then in your paragraph 80, what do you mean by that?

- 5 A. Well, what I'm looking at here is we've got, you know, Mr Jenkins has a minor soft tissue injury, so that's been categorised as "not serious harm" and the matter seems now to be unaddressed. If you think back to that chance, you know, and the arrow going through, there's a number of potential – first, there's a number of potential outcomes, isn't there, when the rock comes? Mr Jenkins could've been hit as he was with the minor soft tissue injury. Mr Jenkins could've been hit and suffered a major injury, or maybe the rock fell and Mr Jenkins wasn't hit at all. Underlying that, and that's the important thing to me, is that these people have included, Avko have said, "The rock fall can be attributed to a failure to install the correct ground support regime." And then some potential causes associated with failure to adequately install ground support, is poor communication and poor training. Two highly significant error producing conditions and as well as we've got inadequate installation of the ground support. That's the factors that stand out for me. Yes, I'm concerned for Mr Jenkins, but I'm also concerned about how the rock came to fall on him.
- 10
- 15
- Q. One other matter in this category and it's at page 52, Ms Basher, is a serious harm incident referred to at paragraph 185, "An investigation report was made which established root cause through, first of all, inadequate fastening. No construction execution procedure or job safety and environmental analysis for setting up the ventilation ducting. Failure to manage it when the end cap fell off twice before another incident. Lack of reporting of previous two incidents where the end cap had come off. Lack of investigation by the crew as to why the end cap kept falling off." They all speak for themselves?
- 20
- A. Yes, they do.
- 25
- Q. And so, in terms of the inspector's response to that, you'd expect what?
- A. Well, I would expect that their level of concern would be significant given these things, and again, it indicates repetition. It indicates significant error producing conditions in its own right, all outside whether or not Mr Vorster has serious harm or not.
- 30
- Q. Moving to page 53, there's a passage from Mr Firmin, so moving to another inspector here, referred to in his evidence. "Kobus Louw was uncomfortable being the manager responsible for the processing plant where he thought he didn't have work or much expertise and he, Kobus Louw mentioned he was still

a little concerned about being statutory manager over areas of the operation he did not control.” Now these obviously stand out for you, these statements?

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5 A. Well they do again, because, I mean if you all think about it yourself, it is very unusual for people to put their hand up and identify their personal limitations. We are not good at doing that and yet here is a man who is willing to identify potentially highly significant personal limitations to the regulator. The first time he did that I would've thought that would've given anybody considerable pause for thought and nothing seems to have, no action seems to have been taken
10 and then Mr Louw does it again, puts his hand up for the second time indicating he is concerned about potential personal limitations to fulfil his function.

15 Q. Now Dr Callaghan just we have to move swiftly towards conclusion now and I'm just going to deal with two issues now. The first is culture referred to at page 55, 42/55. The Gunningham and Neal report says something you agree with at paragraph 203, "The growing evidence far more important than RHSMs, there systems is workplace culture and culture eats safety systems for breakfast."

A. Yes that's right.

20 Q. So you've acknowledge that but you very strongly disagree with the authors clearly at paragraph 204, "That these issues of safety culture are largely intangible and do not lend themselves to ready investigation." Speak to the topic please?

25 A. Well again very quickly, there is nothing in the scientific evidence that could support the fact that safety culture is largely intangible and does not lend itself to ready investigation. We investigate safety culture repeatedly across a wide range of industries. In fact the Department of Labour itself has a safety culture survey on its website, encourages employers to investigate their safety culture and in fact I work – we're undertaking with the major oil and gas supplier
30 currently now, I'm in the process when I go back to work we'll be looking at the results of a 3000 wide employee safety culture survey. So just simply not a statement that can be supported by the evidence.

Q. And the curious feature of that is that the Department has a safety culture questionnaire on its website does it not?

A. Yes that's, yeah.

5 Q. I want you to read please your paragraph 205 and go to the page to 56 as well for that, it's a summation. "To dismiss."

A. "To dismiss safety culture as too complex and intangible is to ignore a core element of the disaster at Pike River. It is to ignore the mainstream literature and a vital component of the national strategy. It is to ignore the lessons New Zealand should already have learnt, the lessons from Erebus."

10 Q. Now you then question because you're challenging obviously the Gunningham and Neal report. In your paragraph 206 of that page, you say, "You don't get a sense from the briefs that the inspectors, that was perceived the holes opening up through the cheese, that the inspectors understood they had information that showed that Pike River was not necessarily complying with the Act," and
15 their focus seems to be to you, on individual technical mining issues and incidents of serious harm.

A. Mhm.

20 Q. You asked the question at 207, "Why might the departmental inspectors have missed such a pattern of holes and why was there such a largely reactive event based focus?" And you've reached a really, entirely off your own back a conclusion that the Swiss cheese holes lie within the Department of Labour itself?

25 A. There are certainly and these are just taken straight from the Gunningham and Neal report, they clearly identify a lot of very well established, well known error producing conditions, holes existing in the Department of Labour.

30 Q. Now time is against your reading all this through but you refer to resource constraints, lack of capacity and expertise to be more than standard's facilitators. The high level documentation within the department needing improvement, misperception about the role of codes and other guidance material and that's the comment that the mining inspector's saying, it's very difficult for the inspector to enforce a code of practice that's not an approved code. That's a strong point of your evidence as I understand it Dr Callaghan?

A. Yes.

- Q. Or, "Ambiguity," over the page at 42/57. "A gap between the aim expressed by the Department of having people who are experience, trained and professional," and then the lack of capacity and expertise referred to, the lack of audit, tensions between generalists staff and specialist staff, work plans not covering all pertinent areas. Time shortage. (I) is one way to deal with the issue, to free specialist mines inspectors for specialist tasks would be to team up general and specialists." Do you think that's slightly an unusual comment?
- 5
- 1150
- A. I just think when they write, "General inspectors can undertake checks on machine guarding," and the like, really might not make full use of general inspectors and certainly doesn't give me any indication that they're thinking outside of machine guarding.
- 10
- Q. And then you've got, "Training is a work in progress. More is needed. Documentation, or lack of guidance for Department staff. Tension, management and mining inspectors. High work load. Potential lack of contemporary knowledge and the fact that the inspectors were not equipped to investigate complex issues in safety culture." That's your plucking it out of the material you see in this report?
- 15
- A. That's right.
- 20
- Q. Could you read –
- A. Can I just make, sorry, one point here and maybe this is not the time to make it and simply want to say it in – I think it's very important when we look at the holes and we look at the holes in themselves. The holes that we identify, the errors, the error-producing conditions at Pike River Mine are not dissimilar from the ones that are identified at the Department of Labour. They are very, very similar and I think we need to be mindful of that.
- 25
- Q. Would you read paragraph 210 at page 58, Ms Basher? You have stated the first proposition, the first two sentences and then you say – read the passage please, "Rather than reflecting," paragraph 2010.
- 30
- A. "I have considered the interactions"?
- Q. Yes, you've given the first two sentences.
- A. Yeah.
- Q. Read the last sentence please.

- A. "Rather than reflecting on the Department of Labour inspectors themselves," in the end this is very important to me, "The issues I have raised above indicate significant problems at a higher level than these inspectors."
- Q. And the next paragraph?
- 5 A. "Professor Reason's model refers to the organisation. The organisation in this model does not refer solely to the company in question. It refers to all organisations in the system where a causal nexus can be established, leading from the event. There is evidence to show a causal link with the regulator. I believe there is potential for the causal nexus to extend back to wider
- 10 Government.
- Q. Now to conclude, I am going to ask you to just make your own short statement to conclude, Dr Callaghan, but before you do, I just want to, from your page, your evidence at page 59, you are here to help the Commission but also to look forward and you are going to participate in Phase Four, are you not?
- 15 A. That's correct.
- Q. So would you simply address or read (c) at page 59 and then I'd like you to just not read anything else and just to conclude by stating your overall position with regard, that you wish the Commission to understand from all the evidence that you have given today?
- 20 A. "A legislator, the regulatory agency and the company, together with the workforce must be conscious of the personal process and organisational safety issues and such recognition goes far beyond the skill in addressing a technical issue, whether that be mining or other. They must be conscious of the trends and patterns shown by multiple sources of data obtained from each workplace
- 25 and the meaning of such data in light of up-to-date scientific information."
- Q. And that may be it, but is there any, as it were, ending message you have to the Commission, based on all the evidence you've given today?
- A. Well I guess that really it is that one at (f) maybe. The last message I would give is that one that I write at (f), "If we are to truly understand what happened
- 30 at Pike River Mine and why it happened, for the purposes of trying to prevent a similar event in any industry in New Zealand happening again, we need to interrogate the strengths and weakness at all levels of the system and unless

we clearly define the problem, any intervention is unlikely to be as efficacious and as efficient as it could be.”

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5 THE COMMISSION ADDRESSES COUNSEL – APPLICATIONS FOR CROSS-EXAMINATION OF WITNESS – ALL GRANTED

CROSS-EXAMINATION: MS MCDONALD

Q. It really just follows on doctor, from what you were just saying, it's really just a point of confirmation. Paragraph 208 of your brief of evidence?

10 WITNESS REFERRED TO PARAGRAPH 208

Q. All of the matters that you've listed there?

A. Yes.

Q. I'll just get you to confirm that those are all matters identified in the Gunningham and Neal report, aren't they?

15 A. Yes they are.

Q. That was commissioned by the Department of Labour?

A. That's right.

CROSS-EXAMINATION: MR HAMPTON

20 Q. Doctor, you've spoken of cohesive attitude, team sport, those sorts of things. In the context of that and understanding that I am representing the EPMU, the union here, the role of employee participation in all these things that you've spoken of, that's got to be fundamental as well, doesn't it?

A. Yes it is. As I say, it's a team sport, you never know who's holding an important piece of the puzzle, normally multiple people are holding different **25** pieces of the puzzle that need to be put together.

Q. If there's no proper or there's inadequate employee representation on issues of health and safety well then that's a real problem, isn't it?

30 A. I think it's a problem from a number of issues. It means that you might get a reduction in information and it might mean that not all, you might not understand the tipping factors that are important to everyone in the workforce before you try and put in place an intervention. So that reduces the likelihood

or it reduces, it raises a possibility that your intervention might not be as appropriate or able to be as easily implemented as one might hope.

Q. And in relation to Pike the materials that you've looked at would indicate that there were areas where the employee representation was inadequate?

5 A. I've seen some indication of that.

Q. Would you have a concern, I take it you do have a concern for example, what you have already noted I think it was in your paragraph 170, those passages from Gunningham and Neal that summarise from paragraphs 428 to 431, the contact with the Department of Labour inspectors with health and safety representatives?

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A. That's right, I made a comment –

Q. You know the passages I'm talking about?

A. – that's right, I've just talked about.

Q. Including Mr Poynter's, people may be elected, maybe good people, they don't understand their roles and the manager's around the corner, those sort of things you mentioned before. Your comments about those in terms of health and safety, that's of concern to you, is it, in terms of Pike culture?

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A. That's why I've put it in the report, in my brief, yes.

Q. And that's a real concern, isn't it?

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A. Yes, it is a real concern.

Q. If I put that alongside, were you here when I put a document to Mr Poynter yesterday just before lunch, an email from Mr Whittall saying about no union involvement in effect?

A. Yes.

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Q. If you have that sort of attitude to union involvement does that give you, alongside the concern you've already expressed about employee representation on health and safety does that give you additional concern?

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A. Yes, it certainly does. I guess in the sense of, I mean sometimes union is seen, which they are, but you know, and I'm not talking about in a political sense, I would be worried – worried is too strong. I think that it is important, again it comes back to that team sport, that every group, subgroup within a workplace feels part of the complete picture, so any group, I think that felt that

they couldn't contribute or weren't being allowed to contribute, that would raise a concern to me, because it's the voice that needs, has the potential to add value.

5 Q. And the union an important voice that would add value on issues of health and safety amongst other things?

A. Yes.

Q. Have you read the EPMU evidence filed in this Phase of the Inquiry, particularly the evidence of Mr Matt Winter and Mr Garth Elliot?

A. Yes, I have.

10 Q. And the evidence there which they've set out, and I'm just paraphrasing or summarising, but of at least some reluctance if not antipathy by the company towards union involvement in any aspect of this endeavour. Would that be of concern to you in terms of this cohesive team playing aspect that you've talked about?

15 A. Yes, it would.

Q. And does that demonstrate something of the culture of the management of the company itself?

A. It might well do.

20 Q. And if that starts from the top of the management, that's going to have an effect all the way down, isn't it?

A. There is an expression that says, "The fish rots from its head."

Q. Sorry, say that again please?

A. There is an expression that says, "The fish rots from its head."

CROSS-EXAMINATION: MR WILDING

25 Q. Dr Callaghan, in light of your evidence, could I just ask you to give us a basic flavour of some of the components that might be required in order to effectively inspect a workplace? I take it first you'd agree that there would need to be an inspector with relevant technical expertise?

A. Yes.

30 Q. And so in the underground coal mine context, that would mean someone with mining expertise?

A. Yes.

Q. And also relevant practical experience?

A. It would.

Q. And if that mine included an electrical system, then it would include an electrical expert?

5 A. That's what I understand from listening to people talking that that's an important subset of technical expertise.

Q. And would you agree it would be important for the inspectors to be able to call in additional expertise when necessary?

A. Yes.

10 Q. And that means that they first would need to know the limits of their own expertise?

A. That's right. That's very – I mean that's important. It's also very difficult. I mean you can't, it's you don't know what you don't know, so systems need to be set up. We need to think about that, because again that's an error producing condition. We need to ensure that people can call on expertise and that others check so that where they haven't known what they don't know, that that's been defended against.

15

Q. And they need to have a system to allow them ready access to those other experts?

20 A. Yes, definitely.

Q. And are you saying in addition to that technical expert, there needs to be an expert in human factors inspecting workplaces?

A. Yes, we talked about that last night. I think that if you, going back to my evidence, we know that at least 80% of events have a human factors component. It's been well discussed in the literature now for at least a decade, if not more, about the need to include experts in human factors when we're being proactive about safety in a regulatory environment.

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Q. And is it your view then that the required level of expertise in human factors necessary to identify all of the issues is unlikely to be found in a technical expert?

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A. That's right. They are, both issues are complex in their own right.

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- Q. Would that human factors expert need to operate specifically in relation to underground coalmining or could that expert visit other workplaces?
- A. No I think that that expert would be able to provide evidence, in the same way that I am here, that the things that you're looking at in the human factors tend to be more generic, so they would operate on a far more generic level giving advice and visiting a wide variety of workplaces.
- 5 Q. And is your thesis that it's important that there are people with that expertise visiting a wide range?
- A. Yes I think that that would enhance the safety.
- 10 Q. And in terms of the personal characteristics required of those two inspectors, you would say that they both need to have leadership skills?
- A. Yes certainly, some aspects of leadership skills. These are people that are required to provide direction, these are people that are required to empower people, they are known leadership characteristics.
- 15 Q. And a high level of interpersonal skills?
- A. Very much so, I mean Harry Bell and I were talking about that yesterday. Inspectors have within a very short time period, let's say a day, they need to be able to interact effectively with man on the coalface all the way up to CEO of the organisation. That requires, the way in which you're going to interact with different people is going to be different depending on who and what role they fulfil. That requires that ability to be able to effectively deal with such a wide range of people indicates a very high level of interpersonal skill ability.
- 20 Q. And I take it from that that your view would be that the inspectors do need to have communication with people from all the various levels of an organisation?
- 25 A. Most definitely.
- Q. I presume they need to be able to be in an independent position?
- A. Very important.
- Q. To be able to deal with stress?
- A. Yes.
- 30 Q. To have a high level of analytical skills?
- A. Most definitely and if you think about those patterned recognition, a very high degree of analytical ability needed to be able to recognise patterns quickly and effectively.

- Q. Do they need access to legal advice?
- A. Yes, we talked about that – as the inspectors themselves when I was listening and certainly if I call on my experience working in CAA in the regulatory environment, there are legal issues that need to be considered and I think that
5 access to appropriate and timely legal advice is really important for an inspector to fulfil their role, to gain clarity about issues, that's part of the information that they need in order to be able to make effective decisions.
- Q. And by, "Timely," does that mean they potentially need to be able to access legal advice by telephone if an issue crops up during an inspection?
- 10 A. I think that that would add a lot of value. If you need to obtain legal advice by writing a memo that goes up to your department head who passes it on to somebody else and eventually it works its way to the legal department, often the issues you know, you've had to make a decision in the absence of information that might have been important.
- 15 Q. Just briefly touching on the sort of information that the Department of Labour could usefully receive, I take it you'd accept it that it would be appropriate that they continue to receive accident notifications?
- A. Most definitely.
- Q. But in addition to that, they ought to receive lead and lag indicator data?
- 20 A. I think that we certainly need to place a lot of emphasis on performance data which should include some lagging measures of performance. We accept that but they're indicators of failure. We need to place a huge emphasis, an increasing emphasis on leading measures of performance, they're valid and reliable and enable us to predict the likelihood of tragedy of adverse events, so
25 that we can prevent them effectively.
- Q. And also high potential incident data regardless of whether there was any injury resulting?
- A. Oh that's most important to me. As I said events of harm are as evidence of failure. I think we need to place a lot more emphasis on prevention of harm.
- 30 Q. And presumably the Department then needs to have the ability to analyse that type of data?
- A. Yes.

Q. And the Department and inspectors need to have the time and skills to be able to then question on the basis of that data?

A. Yes.

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5 Q. You're familiar with the concept of a safety case?

A. Yes.

Q. I realise there are a number of definitions but broadly speaking is it fair to describe it as a comprehensive set of documents, the purposes of which is to show that a system is adequately safe in a particular context?

10 A. Yes.

Q. And as the circumstances of workplace changes so does the safety case and the safety systems need to be reviewed?

A. Yes they do.

Q. And presumably time is required for that?

15 A. Yes I think that's very important and that was one, you know, if we're listing to Pike River Mine and I've some of the evidence, things change very quickly and plans were being changed a lot and what I was discussing was that it takes time for a regulator in this case to be able to examine what is going on for the purposes of assessing compliance with the act. There needs to be sufficient
20 time and I guess that we balance that against business imperatives. It's attention but it's attention that I think we need to make explicit and look at ways of how we address that, that attention.

Q. Would safety case be a useful set of documentation for a regulator to receive?

A. In my opinion, yes.

25 Q. And would you also say that evaluation of that would again require those two types of expertise, technical expertise and also human factors expertise?

A. Yes.

Q. Just finally in relation to the Civil Aviation context, the regulator there is responsible for investigating so as to ensure a safe workplace and also
30 enforcement?

A. Yes, it has an enforcement, the way the regulator has been set up has an enforcement activity.

Q. And in practice it tries to separate those two functions. Is that correct?

5 A. Yes, from the – I need to take you back a step. The International Civil Aviation Organisation has an annex which is one that I follow when I was operating as an air safety investigator. Annex 13 says we investigate events, accidents and incidents for the sole purpose of understanding what happened to prevent further similar events happening in the future and then it states, it is not for the attribution of blame. So that has led that, that puts a complexity to when you want enforcement action. So ICAO's not about enforcement or attribution of blame. However the regulator needs to be able to take appropriate disciplinary action. It's appropriate and what happens at least when I was at the Civil Aviation Authority no reason to believe that it's changed, those safety and enforcement functions are kept quite separate and again that's important from the view as a participant in the aviation system. So a pilot for example, or a company that they can see that those functions aren't blurred, they have confidence that one is about safety, one is about enforcement.

10 Q. Do you have a view on whether workplaces also ought to separate those functions?

15 A. That's the basis of a just culture, that there needs to be clearly identified when discipline is necessary, that's decided in advance, conceptually and all employees are made well aware of where the disciplinary line stays and therefore they know that anything that hasn't crossed that line is within the realm of safety, safety only, no apportionment of blame.

CROSS-EXAMINATION: MS SHORTALL

20 Q. Now you have a no expertise in underground coalmining health and safety, do you?

25 A. Not directly. I've been, as you've seen from my evidence, I've been to a coal mine before and that was deemed important as part of my training in occupational environmental medicine.

Q. You have no expertise in coalmining health and safety, do you?

30 A. No, not exactly. I've seen coalminers for the purpose of assessment of their fitness to work.

Q. You've not worked in the area of underground coalmining health and safety, have you?

A. No.

Q. You've not provided consultancy services in the area of underground coalmining health and safety, have you?

A. No.

5 Q. None of your qualifications involved any study of underground coalmining health and safety, did they?

A. No they did. That's what I've said to you, in terms of my training as an occupational environmental physician, it was deemed necessary that one of the workplaces that we visited in order to understand that was a coal mine and we spent half the day at Mines Rescue.

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Q. Wasn't at Pike River, was it?

A. No, it was in Huntly.

Q. Was that Huntly?

15 A. It was at Huntly.

Q. So it wasn't a West Coast coal mine?

A. No.

Q. And none of your academic work has involved any review of underground coalmining health and safety, has it?

20 A. No, it hasn't but actually when you touch on that it would be – we would very much like to do that HFACS analysis if it was thought helpful of similarly as they did in Queensland on New Zealand mining.

Q. None of your teaching has involved an assessment of underground coalmining health and safety, has it?

25 A. It has in my – I was the head of the occupational and environmental medicine unit at Auckland University, so again that was part of teaching for all the students on the diploma of occupational medicine.

Q. So what part of that teaching – just explain that to me, what part of that teaching assessed underground coalmining health and safety?

30 A. When we took students down the Huntly coal mine.

Q. That's a half day visit, you've talked about?

A. No, it was a whole day visit. So, it started early in the morning. The students went down the coal mine, got to talk to the workers, got to see all the

equipment and then came up and spent the rest of the day with Mines Rescue so that we could understand the role of Mines Rescue. We could understand the physical and mental capabilities that the Mines Rescue Service volunteers had, all those sorts of issues, so that we could understand hazards associated with underground coal mines, issues associated with the medical fitness of underground coalminers.

5

Q. And beyond that one day, has any of your other teaching involved an assessment of underground coalmining health and safety?

A. Well, actually yes, because we spend an awful lot of time in coalminers lung disease for example, is a topic actually that has been raised for the Royal Australasian College of Physician's exams in occupational medicine, so we spend quite a lot of time – coalminers pneumoconiosis and things like that. Hazards associated with coal mines are often discussed in occupational and environmental teaching, certainly at the level of a trainee and a specialist.

10

Q. And what about in your teaching? What part of your teaching has involved an assessment of underground coal mine health and safety?

A. Well, I'm a teacher and an examiner for the Royal Australasian College Physicians examination to be a specialist occupational and environmental medicine specialist, so all those areas I've just discussed, all within my own personal teaching and responsibility.

20

Q. Has any of your writing involved any analysis of underground coalmining health and safety?

A. No, not my research with the university, no.

Q. Now you'd agree with me that the application of human factors to mining accidents, coalmining accidents, is relatively limited to date?

25

A. Human factors analyses of them?

Q. The application of human factors to coalmining accidents is relatively limited to date. Would you agree with that?

A. No, not necessarily. I mean I think the fact that Scott Shappell came from the US to have a look at, you know, 508 mining incidents in Queenstown, shows that the extent of which human factors is understood across the world. And in fact, actually the upper big branch mine report touches on an incredible number of human factors issues, so I think that that indicates that there is

30

some quite widespread international understanding of human factors issues in coalmining.

5 Q. Well, I'd like to just put aside big branch for a moment. I'd like to talk about the Queensland review and in fact that's the only academic support identified in your brief, isn't it, for the proposition that human factors issues are known to the mining industry. You'd recall those are the words you put into your brief?

A. Well, I think that's a good indicator that they're known.

10 Q. And the project there, the application of human factors to the mining industry, that was initiated by the Queensland Government Department of Mines and Energy, in March of 2008, right?

A. Well, I presume so. Well it says the acknowledgement is there to acknowledge the funding for the research, yep.

15 Q. Are you aware that the project was conducted through SIMTARS by a PhD student from Clemson, in South Carolina?

A. I don't know – in fact Mr Davidson asked me who Miss Paterson was, and I said, "I don't know." I presumed just because of Scott Shappell's role at Clemson that that would've been somebody like a Masters or a PhD student undertaking some of that research. That's the nature of academic work.

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20 Q. Well do you understand that the student was based at SIMTARS for the duration of her project.

A. I don't know what SIMTARS is.

Q. You're not familiar with SIMTARS?

A. I don't recognise the name, no.

25 Q. As part of the student's research and analysis, that student made visits to mines and quarry sites. Were you aware of that?

A. No.

30 Q. You had not made any visits to underground coal mines in connection with your analysis from a human factors' perspective on health and safety at Pike, have you?

A. No I haven't.

Q. And one of the noted limitations in the Queensland study was that the data coders were not experts in mine safety and regulations?

A. Mhm.

Q. You remember that from the article shown to you by Mr Davidson?

A. Yes, it says, "Ideally double subject matter experts, those who are experts in both mine safety and HFACS would've been used."

5 Q. And you're not an expert in mine safety and regulations are you?

A. No I'm not. However, when I've been providing some of my, when I've been working on my brief, I have had the advantage of when I wanted to question something, like think, have I got this right, I have been able to ring Harry Bell, for example, on the telephone.

10 Q. Well, that's of interest to me as well because to overcome the problem in the Queensland study about not using double subject matter experts, you'll recall from the article that all of the coders were given access to mining terminology dictionaries and had access to experts in mine safety. Do you recall that?

A. Yes, I'm just reading it now.

15 Q. You're reading it now for the first time?

A. Yeah, I'm just reading it as you're talking to me.

Q. So describe to me the extent of that access you've had for purposes of opining from a human factors' perspective on health and safety at Pike?

A. Well, as I just said to you, when there was something that I needed to discuss, I could ring people like Harry Bell, had access to Neville Rockhouse. I had a number of people that I could ring. But again, what I want to stress is that human factors, I'm not saying that I'm an expert in mining safety, in no way. There doesn't need to be expertise in the industry to be able to provide effective and efficient human factors expertise. That's well established. All the major leading human factors people, Jim Reason, has opined and has been well accepted in the safety world. He's opined on Chenobyl. Best as I know, he's not an expert in nuclear energy. He's opined on *Challenger*. As best I know he's not an astronaut, et cetera, et cetera. I think it's really important that we understand that human factors is generically appropriate, is generically useful, universally applicable. You'd need to be an expert in human factors, not an expert in the technical aspects of the industry, all of whom had human factors issues.

20

25

30

Q. But you would agree with me, wouldn't you, that the only academic support that you've identified, and I know you've mentioned for the very first time now, big branch but I'm not aware of academic support in that area. The only academic support identified in your brief, or in your evidence, for the proposition that human factor issues are known and have been analysed in the mining industry is the Queensland article and I'm just putting to you, limitations from that article. That's all I'm doing.

5

A. That's fine. I accept those. It's not, it's, you know, academic articles always have limitations in of themselves and the authors have identified those limitations, as you've read.

10

Q. Yes, the PhD student, that, Jessica Patterson. Do you recognise that name?

A. No. We've talked about that before. I said that I just assumed she was a student of Scott Shappell's.

Q. Now another recognised limitation in the Queensland study was that the documents analysed were completed by mine personnel and there could be inconsistency. This is in the language of the article itself. There could be inconsistency in the quality of the reports and the training of those competing them. And you would agree with me, wouldn't you, that your analysis from a human factors perspective of health and safety at Pike should have the same limitation?

15

20

A. No, I think that you're talking about two different things. What I've just, in fact, we were just about to send it forwards for publication. We've done exactly the same with Scott Shappell's) colleague, Bert Bouquet, who's a member of my human factors group. He's based in the United States in Florida. He flew over and we undertook an HFACS analysis of the New Zealand Health and Disability Commissioner's reports and HFACS them as well.

25

1225

A. The problem that we're talking about and that's a different – these people are talking about the fact that they've had to use the miners or in the case of HDC we had to do the same. We had to use what they identified as the error producing conditions and the unsafe acts and things from the reports, that's just what you have to do. You take it as face value because you can't go back and re-quiz the people. So what they've done, that's what they're saying.

30

They're saying that they've taken the analysis of the reports as read. That is not what I did. I didn't look at the – and I know that Mr Wilding, he put up the – when we were talking about his documents, he showed the causal factors and they were from the reports. I don't read – well I read them, I don't – that's not what I'm interested in. I haven't examined those. I have examined what people at Pike River thought as such were the human factors causes. I just looked at the events as described.

5
Q. So just to bring us back to the Queensland article, in that Queensland study, given the recognised limitation about the inconsistency in the documentation, all of the documents used for analysis had been reviewed by trained and experienced mine's inspectors, such that inadequacies were corrected prior to the analysis. Do you recall that from the study?

10
A. Yeah but what we're talking about is they're not necessarily trained in human factors. You know, I recognise –

15
Q. I'm just talking about the underlying data set, just the work that was done for purpose of the analysis.

A. Oh that's right the underlying data set and I've made a note to myself of that, the underlying data set has a huge number of limitations and they acknowledge that. All that they're looking at is – the basis I believe of this article was to see if HFACS which has been applied in a huge number of industries, could equally be applied to mining and it seems that it can be.

20
Q. And my question to you just out of that is that no such review filter like was used for the Queensland study has been applied for purposes of your analysis from the human factors perspective?

25
A. I wasn't HFACS coding. I wasn't – it's a completely different task. I'm not trying to code HFACS. As I said I would love to in which case then we will have a number of mining experts and things do that if we're to repeat the study in New Zealand.

30
Q. Now the largest limitation noted in the Queensland study was that ad hoc data had been used, do you recall that?

A. Can you show me what page it is?

Q. You can come to page – actually we could pull it up if that's easier. It's FAM00042.18/7

WITNESS REFERRED TO DOCUMENT FAM00042.18/7

Q. And you see on the right-hand side there's a subheading, "3.5 limitations."

A. Yes.

5 Q. And directly under that subheading I'm reading from the article, it states, "The largest limitation of this study was that ad hoc data was used making it impossible to speak with the people involved in each incident or accident." Do you see that?

10 A. Yes, that's what I talked to you about was the limitation, that's the same, we've talked about this. That's the limitation I said was in the HDC data, you have to take it at face value.

Q. And so you would agree with me that your analysis from a human factor's perspective of health and safety at Pike should suffer from the same significant limitation, right?

15 A. Oh I can't go round and retrospectively analyse things? Yes that's always right. I mean I'm looking at this as sort of what I've been is something equivalent to like what we do in medicine or what I do in medicine all the time, a clinical audit by file review. So it is a file review but I think what is really, really important to understand is that each one, and we're doing a very different task from HFACS, so that's got to be well recognised, is that I don't
20 look and place evidence and say, right this person has given me a really important bit of evidence in their own right because I accept, Mr Davidson talked about that at length, that any one of those individual witness statements might include a whole lot of inaccurate information. So I don't place any reliance per se in each individual's specific person.

25 1230

A. What I look at and that's overwhelming evidence to suggest that, that no matter which source I am looking at, that they are telling me the same story. That's the weight of evidence I willingly accept that any one of those witnesses could be taken out on the basis of having inaccurate information, really
30 important that you would have to take out an awful lot of witnesses and their evidence before you stopped seeing a consistent pattern, a consistent story pointing you in a certain direction.

- Q. I'm going to come to what you've looked at but just before we get there, I just want to ask one more question on the Queensland study before it's come in through your evidence. This significant limitation that was identified in connection with that review was mitigated because and this is reflected in the article, because of the large number of cases that were analysed and the requirements in force by the Government department for accidents, forms and reports being the documents that were used as the basis for the study and I just want to be clear, are you saying mitigating factors don't exist for purposes of your analysis, do they?
- 5
- A. What are you saying? They saw a large number, you're saying that they saw a large number of events? Well they've analysed 508, I've got to say, I haven't counted them personally but I'm pretty sure I've seen well in excess of 508 incidents in relation to Pike River Mine and I say well, well, in excess of that if I include all the hazard reports, the stuff that CAC has done, the deputy production reports, the investigations when I've listened to all the people, well in excess of the information that they saw, yes I've had access to.
- 10
- Q. You've looked at all of the hazard reports from Pike?
- A. I haven't looked at all the hazard reports but I say that I've looked overall I've seen well in excess of 580 incidents.
- 15
- Q. You've not looked at all of the investigative reports, have you?
- A. No I haven't.
- Q. You've not looked at all of the operation meeting minutes, have you?
- A. No I have and again, well happy to suggest that you know the more information the better from my perspective. I'm a scientist, so the more information you have, really happy to be given the opportunity to look at all of that and I might well be able to change my opinion.
- 20
- Q. But the opinion, you've provided opinions to the Royal Commission today, haven't you?
- A. Based on –
- 25
- Q. Notwithstanding those gaps in your review?
- A. – and I've highlighted those limitations and I've said repeatedly, if you can give me more information that would lead me to change my mind in any particular way, I would happily do that Ms Shortall.
- 30

- Q. Well let me just go through a couple of other categories of documents, just to confirm whether or not you've looked at them. Have you looked at the company's health and safety management systems manual?
- A. Don't know, you'd have to show it to me. I've seen an awful lot of information.
- 5 Q. It doesn't stick out in your mind in any way, the company's health and safety management systems manual?
- A. I don't know because Mr Rockhouse provided me with huge numbers of procedural pictures and things. But you can take it, I'm happy to say no.
- Q. You haven't looked at all the staff health and safety committee meeting
10 minutes, have you?
- A. No.
- Q. You haven't looked at the company's I Am Safe handbook, have you?
- A. Yes I have.
- Q. You've looked at that one?
- 15 A. Yes, I have.
- Q. Okay.
- A. And I've looked at all the examination procedures and questions and answers associated with that, as well.
- Q. You haven't looked at all the company's management plans, have you?
- 20 A. No.
- Q. You haven't looked at all of its standard operating procedures, have you?
- A. We could actually ask these questions relentlessly and I'd have to say that I've had access to, I haven't had access to a huge amount of information Ms Shortall, what I am saying is the information that I have had available to
25 me, shows me repeated well established causal factors that are associated with a process safety event and yet again can I say, I am more than happy to examine any other information that anybody would like me to have a look at in order to see if I change my mind. But to be honest, if you go through this entire list, I'm not entirely sure what point you're trying to make.
- 30 Q. I'm just –
- A. I am saying that I have a very open mind and I am prepared to look at all the evidence that I am shown and I am also very happy to suggest that I haven't looked at all the evidence. Not in any way, shape or form.

Q. Let me just run through with the leave of the Commission, I just want to ask about three –

THE COMMISSION ADDRESSES MS SHORTALL

1235

5 QUESTIONS FROM COMMISSIONER HENRY:

Q. Dr Callaghan, I've got two or three questions. The science and thinking that you've taken us through today, my understanding is you're saying it's well known?

A. Yes, it is.

10 Q. And has been well known for some time. Now this week, what we're actually focussed on this week is the external oversight at Pike River.

A. That's right.

Q. Primarily by Department of Labour. In that thinking, and your teachings, have you or any fellow academics – if I can call you that – have you communicated that kind of information to Department of Labour? For example, do they have any people who study in your faculty?

15 A. No, but I think you'll recall Mr Cooper said yesterday he's heard me speak. I know Mr Cooper. He's heard me speak at a number of events, so I certainly see Department of Labour and I can't identify them all, but you know, I
20 certainly see Department of Labour people at a lot of conferences that I attend, or that I speak at, so – and there has been, there was, we had a human – my group put up the first sort of human factors symposium for business and healthcare in May this year, so it was an inaugural one and it was actually really well attended. There was 180-odd people from across a wide range of
25 business there, and we had a considerable amount of support from the Department of Labour in doing that, if that answers your question.

Q. What I'm interested in really is, you know, has this kind of thinking transferred itself to the Department of Labour in their policy and operational policy aspects?

30 A. Well, if you look at the document that I've referred to in my evidence there, their cultural safety snapshot, an awful lot, we refer just to repetition, but pretty much everything that I've covered today is included in that safety culture

document that they have. I guess that what I would say is that they're aware of the issues. I know that there's people in the Department of Labour who are more aware than others. I would say probably an evolving process for them.

5 Q. Yes, for example, quite a lot of the concepts that you talked about are included in the ICAM's model which is –

A. Yes, ICAM is based on – I included that in my evidence. ICAM is based completely on Jim Reason's organisational approach. I know the people that set up ICAM and lots of people go from New Zealand to ICAM training.

10 Q. Yes, and that's really an investigation process or technique which looks back along the line using the Swiss cheese model which is used in Australia.

A. Yes.

Q. But we didn't have any sign of that thinking in our discussions this week with Labour, and you can't answer it, I'm just puzzled why they don't have that kind of model in their investigations, as far as I can see?

15 A. No, I'd agree with you.

Q. And the last question I've got really is the effects of stress on communications. From the scientific studies, is there a correlation between the amount of stress a person is under and their ability to process information? I'm applying it to, for example, the inspectors?

20 1240

A. Well I can – that was what I looked at. It was one of the fundamental things that I looked at in my Masters' thesis with looking at pilots ejecting from fast jets, because you can imagine, that's a highly stressful circumstance to be contemplating leaving your aircraft, and the literature is – actually the cognitive literature is very clear on the effect of stress on decision making and effects in a number of different ways. What it shows the more stress we're under the less perception we have of environmental clues so we just don't perceive all the information available to us. So that's called perceptual narrowing. When we're faced with alternatives, understanding an ability to be able to choose between alternatives narrows. We can't process information that readily, I mean there's just a huge number of effects of stress and overload and time shortage on the cognitive process, all to its detriment.

30

Q. So if whether it's at the mine or at the department –

A. It makes no difference.

Q. The person's under a lot of stress, the information that we are looking at rather clinically now might not be perceived in quite the same way?

A. Oh it might not be perceived at all.

5 QUESTIONS FROM COMMISSIONER BELL:

Q. Good afternoon Dr Callaghan, I've obviously got a few questions as well. Lost time injury frequency rate is not a good indicator of process event as you've said.

A. Yeah.

10 Q. HPI, high potential incidents probably are a better indicator.

A. Sorry?

Q. High potential incidents probably are a better indicator of a process event?

A. Oh most definitely.

Q. Are there any other lead indicators you would refer us to?

15 A. Oh yes in that, I think I've given it to you so I won't necessarily repeat it. In my evidence there's a document – this one, "Process safety leading and lagging indicators." They give huge numbers, well not huge numbers, significant numbers of them in the back and I think that they're all really important things that could be used in the future. They're like percent of action items followed
20 up in a timely fashion, maintenance you know, mechanical integrity looked as a percentage looked at in a timely fashion. All those sorts of things are really important leading indicators of process safety.

Q. What do you think about the fact that this safety case situation has to be generally signed off by the regulator, do you think that would be a problem for
25 the regulators in New Zealand?

A. At present? I mean that's been one of the things that I've tried to raise in my evidence is that safety and it's contemplations to be able to look at all the
30 myriad of hazards and factors that can lead to safety problems, is a very complex – it requires expertise over a wide range of areas an ability for all those experts to be able to come together and coalesce an opinion as to whether or not in its hole, something is relatively safe or not. And I think that's really important. I'm not entirely sure that from the evidence that I've heard that

that would be something that could be easily undertaken by everyone at the Department at this time. That would be my general feeling, don't know.

5 Q. Yes. Andrew Hopkins wrote a paper about the balance between the prescriptive legislation enabling, how do you think – where should that balance be in terms of legislation, mine safety legislation? Do you have an opinion on that?

A. Between enabling and prescriptive?

Q. Yes.

10 A. Well I've read lots of Andrew Hopkin's work. I mean he's a well known expert. I couldn't comment in mining specifically, I think that there needs, that there has to be a balance. Where you've got absence of information, I've been talking to other people, I mean the world that I live in has a number of different guidelines, whether I'm doing assessment of fitness to fly, there are guidelines that at least give me an indication, a very clear indication of where the line in the sand is drawn, so absence of anything, I'm not sure how you can begin. I
15 wouldn't know how to begin to assess something where there was no even general indicator of the line in the sand. So I think there does need to be, I don't want, and certainly it never works to be incredibly specific about each and everything, but I think there needs to be sufficient guidance there, that
20 people can, as I say get an idea of where the line in the sand might be.

1245

QUESTIONS FROM THE COMMISSION:

25 Q. Doctor, I don't have any questions about the evidence you've given this morning but you referred or Mr Davidson did, to your intention to provide input to the Commission in relation to our Phase Four aspects and could I just ask whether you'd be happy if one our counsel assisting were to make contact with you and get some indication of what sort of input you have in mind because we're in the process at the moment of planning for that phase and obviously we welcome your input. But it would also be nice to have some advanced
30 warning of what it might comprise?

A. I would be very, very happy and Mr Wilding and I started that process last night.

Q. You did, right okay.

QUESTIONS ARISING - NIL

WITNESS EXCUSED

COMMISSION ADJOURNS: 12.50 PM

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