T R A N S C R I P T

ENVIRONMENT, NATURAL RESOURCES AND REGIONAL DEVELOPMENT COMMITTEE

Inquiry into the CFA training college at Fiskville

Melbourne — 6 November 2015

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Dr Mike Logan, director, scientific branch, Queensland Fire and Emergency Services.

The CHAIR — Good morning, first of all, and on behalf of the committee inquiring into the Fiskville training centre, I would like to welcome Dr Mike Logan to give evidence. As you know, we have asked if you could provide a presentation and then we will follow by asking you questions. As outlined in the guide provided to you by the secretariat, all evidence at this hearing is taken by the committee under the provisions of the Parliamentary Committees Act 2003 and other relevant legislation and attracts parliamentary privilege. Any comments you make outside the hearing will not be afforded that same privilege. It is an act of contempt of Parliament to provide false or misleading evidence to the inquiry, and the committee may, if it is acceptable to you, ask you to return at a later date to provide further evidence if required. All evidence given today is recorded, and you will be provided with a copy of the transcript prior to it being published to check for accuracy. We now pass over to you to provide a presentation. If you could perhaps record your name and position so that we have it for Hansard. Thank you.

Visual presentation.

Dr LOGAN — I am Dr Mike Logan. I am the director of the research and scientific branch for Queensland Fire and Emergency Services. Thank you for the opportunity today to share a little bit of the work we have been doing in Queensland to try and understand firefighter exposures. Today I will really just scratch the surface. I have got a great team working on all of this, so I will illustrate some points as we go through. You will see some of the background slides, which I really will not talk to, but hopefully they will promote a better conversation as we go through the time.

What I will do with the slides is just cut through to really address very briefly the four points that were raised to me in the correspondence. Euphemistically this is known as 'come to work clean, go home clean'. That is a fundamental premise of all of this. From my point of view, there are a couple of ways of looking at all this. One of the roles of the area that I work in is that we provide expert scientific advice on how to manage hazard material incidents or large urban fires, and pretty much anything else that is of interest to the Queensland community from an emergency perspective. To do that you have got to understand how people are exposed and what that actually means.

So one of those roles, from my point of view, is that if you ring me up about a fire — for example, a carpet factory fire — I want to be able to predict the likely exposures of the firefighters based on their task and where they are and what they are doing at the fire. I want to predict the likely exposures of all the other responders — there might be ambulance, police, EPA or their equivalents, local government or whoever comes to assist to resolve that emergency — and the community.

To do that we have got to understand what it means by exposure. Today I am going to define exposure as a contact with that material. I think the easiest way of describing that, in some respects, is to think about a spill of petrol. If I spill some petrol on the ground and I walk up to it and I smell it, I am exposed. If I walk away from it, I am not carrying anything with me. If I step in that petrol and walk away and the petrol is still on me, I am contaminated. There is a very big difference between the two, if that makes sense. I am going to use that descriptor for the conversation, so when we are talking about 'exposed', that is how I am going to describe it.

Now, having said that, there is my aspirational goal. We are a long way down that path. My area has about 20 years worth of air-monitoring data at fires, around the fire and in the community of varying levels of sophistication. It is on our program of works to summarise it and publish it. But that leads us into trying to resolve some issues about the science. That then leads into the practical elements: OHS, community protection, environmental protection and all that sort of stuff. The first step about science is that we have got to understand how the PPE performs. If we have no idea, we really do not know where we are sitting. So that is where the genesis of the next few pages will start to reveal itself in terms of what is going on.

The first question that the committee was interested in was: what happens in a fire? It is very complex. It is easy to say, but it is very difficult to answer. You have got to think of a fire as a whole series of competing chemical reactions over competing time frames. There is not one thing going on in a linear fashion. There is everything going on, and everything that is going on is impacting on the base reactions or the base behaviour of what is going on, if that makes sense. There are a couple of ideas of the things that will actually impact.

There is the structure of the chemical itself and how it breaks down. Is it affected by temperature? Is it affected by oxygen? Is it affected by the thing we put on it to try to put it out? Is it affected by the container it is stored in? All of those things start to come into play. And if chemical A is burning and making chemical C, does

chemical C then actually change what is going on? That is the $64 question I get. What is happening? What is it making? What are we going to do about it? That is where our goal of trying to predict exposures starts to come into play. That is where we start to look at it from that point of view.

What do they make? They make lots of things. If I just took this simple plastic here, we are probably looking at more than 140 different compounds that have been generated. The difficulty with that is they have not all been made at the same time, so the product composition and distribution changes. When I measure it, what am I measuring? Am I measuring only at this time or am I measuring over the life of the incident? If I am saying there is 140 here, it is quite possible there is only 140, because that is all we have been able to measure. As science evolves, we get to be able to measure more and more things. We need to put that in context when we start looking at some of the work we have done.

But within that, people talk about toxic chemicals and those sorts of things. There are various frameworks to define toxicity. That is another issue that starts to come up. What I might consider toxic personally may not meet the criteria of a framework as being toxic, but it might meet the framework of another set of rules for being toxic. We apply a framework that is commonly used within Australia to put in at least in acute terms where we might be sitting in terms of levels of concern. Whether they apply to a firefighter going into that particular environment is a different question. But it gives us a basis by which to actually compare — is it good or bad? — because otherwise we have nothing to compare; it is just a number. That is one of the difficulties when we start looking at stuff.

From a community perspective, if you think about it, are you safe in your house? What does that mean? Now we have levels of concern that we apply to put a framework around that, so we know what it means to manage your safety or my safety or a firefighter's or other emergency responder's safety. You can see here all this sort of stuff starts to get made, and these are just examples. You could spend your entire life looking at all this sort of stuff.

The next question is: how does it get into us? Here is the basic construct of a fire. You have got fire, heat, particles, airborne contaminants — and they may be both gases and particulates or a combination thereof. The common pathway is usually air. We mostly see that, and people experience that as smoke. Smoke is the visible part. There are a lot of things you cannot see. The other common pathway is by contact. For example, your barbecue — you might, after you have had it cooking, go and touch it. That might be a way of contacting that material. For a firefighter that may be going into a burnt premises, touching surfaces, whether it be a partially burnt wall or a window, or picking something up, trying to determine origin or cause, all those sorts of things. There are a number of ways of looking at it.

The receptor is who gets affected. That is me. Looking at how does it affect me or how does it get into me, the most obvious way is lungs, without a doubt. It is hundreds of times more effective getting things into me through my lungs. If I work hard, it is even easier. Whilst I am sitting here pretending to be knowledgeable, I am breathing probably around 6 to 10 litres a minute. If I get more nervous, it will go up a bit further. But if I work hard, such as a firefighter trying to do a rescue, I may be breathing at about 125 litres a minute. While you are sitting here and talking, the little breath you get, that peak flow may be more than 400 litres a minute. When you think about it, we are now doing 80 to 90 times quicker bringing something into our lungs than we were just sitting here. It changes how we think about how things get into us and how fast they get into us. Because it is that material getting into us with its time that gives us the dose. That is where the experts you have had talking about health impacts start to come into play, in describing how these things start to hurt us. Because I am at the front end, if that makes sense.

If you look at it, if the lungs are the most effective way of getting it into us, what do we have to protect? We have got to protect the lungs. Some of the presenters this morning spoke about SCBA and other forms of respiratory protective equipment. That is one way you can protect yourself. The assigned protection factor for SCBA — a simple way of thinking about it is that it is the difference between the amount of it over there and the amount of it in me — is 10 000, but experimentally people have measured it upwards of 300 000 plus. So it is very, very good at keeping things outside of me.

In fires, if I am protecting my lungs, and then we have evidence that stuff is getting into firefighters — and the literature is replete with all that sort of stuff — how is it getting into me? Because if it is not my lungs, what else is going on? That assumes you are wearing respiratory protective equipment. We have got to make that assumption as we start. Practices have improved over the decades. The question then becomes: is the skin a

significant route of entry? When we started looking at this question, there was almost nothing known in terms of the firefighter as to whether it was. It became pretty obvious that we needed to at least try and figure out and actually describe whether skin was an issue or was it not. To do that we have got to think about it in terms of it getting past your personal protective clothing, next to your skin and onto your skin. Does that makes sense? Now we have to start thinking about how we actually do this.

It sounds relatively straightforward. Normally what people do is take pieces of skin, white skin. It is not quite possible, so we have used skin surrogates. But the environment we are in is not very good for measuring things, because it is so hot and musty. Most things that you normally use to measure things do not like being in that environment. We have had to develop a few ways of trying to be confident that what we think we are measuring is in the right ballpark, if that makes sense. We need to put that in the back of our mind, that there is always a possibility that there are other things going on and that we may not be able to measure them. We are very conscious of all of that in this whole study as to what is actually going on.

Think about their clothing. What is the primary hazard when they go into these fires? It is heat. Their clothing and the standards really revolve around heat — thermal protective performance. Various standards describe that sort of behaviour in different ways: how good the clothing should be against heat, how good it should be at letting heat out so the person does not cook inside, or stopping things getting into it. Most standards really talk about a very limited array of chemicals, mostly liquid contact, caustic soda or those sorts of things, corrosives, because they are the sorts of things they might accidentally encounter, not necessarily in a fire but in other ways around their job.

If you go and ask the question about what people know about smoke, there is very little. The standards are rather silent on all this, because they are really focused on the bit that gets them all hurt straight up. We now come in to say, 'Hey, what does happen? Does the clothing do anything? We might as well stand naked in terms of the ability of clothing to protect us against these airborne contaminants'. Now we start to get into what we are looking at. That really captures what might get made to how it might get to us to now starting to frame the questions that we are starting to look at.

To give you an idea, as I said, this is a snapshot today of what we have been up to. You will see lots of stuff that is ongoing or reports. We are slowly publishing it; we are just not as fast as we need to be, but then our primary role is doing other things. But you get an idea: we are looking at wildfires, rooms, petrochemicals, industrial simulations — all that sort of stuff — to better understand what is going on, because we want to use that information to inform the debate and we also want to use that to challenge the way we do business. Can we do better in the way we are doing business? But now we will have some science to support us.

The other element of all of this is: when are we dirty? We want to be able to do that as well. That was one of our objectives. Could I say to someone in the field, 'Your gear's dirty, go and get it laundered'? We have a whole bunch of objectives. You can see from all of that what is going on.

To give you an idea, does your clothing do stuff? I am giving you snapshots of studies here. There are two very different studies here. This one is a very simple study. This is about firefighter instructors, what we call hot fire. They are doing a scenario. We have sent them in a few times. I need to emphasise that this is the clothing that we are currently wearing and the tactics and the processes that they are currently doing, if that makes sense, because this is how we are looking at it — from that point of view. What we found was their clothing actually offered some pretty good protection. This is quite high exposure, and in some of the studies we have done we get, relatively speaking, low exposures — 'relative' in terms of being self-consistent for here. Here we have a peak of around 8 million nanograms. A nanogram is one thousand millionth of a gram, so it is a very small amount, and now we are talking about 8 million of that per cubic metre.

What we are interested in is we summarised up all the PAHs we could measure and said, 'What is the difference between inside?'. If you were to come and play with me as one of our experiments, you are in your clothing, we are going to get you to do a task and later on we will talk about it. One of those tasks might be search and rescue — go and look for someone. Another one might be extinguishing a fire. Another one might be overhauling a fire.

What are we looking for? I am not too concerned about what is in the smoke, because you are not really exposed to the smoke. The smoke might be up there; you would have to be pretty tall to get up there, and it is very, very hot. I am interested in what you are exposed to, if that makes sense. So what we have done is we

have measured what is outside your clothing to get an idea of what is outside. Then what we have done is we have measured the same materials inside your clothing. So is there a difference between outside and inside? Then what we have also done is we have taken a patch of the outer shell of the garment and said, 'What deposits onto that?', but we are focused on PAHs. Because of that cross-contamination issue, we are interested more in where those things touch people, if that makes sense.

So now I have got what might deposit on your clothing, what might be outside and what gets through, and now I am interested in what gets on your skin. We are focused on PAHs because they do stay on your skin. Other materials will come off very, very quickly, and there is another body of work we are doing with the University of Adelaide about gases and skin from that point of view, but a very restricted range at the moment.

So now we have got this picture: outside, inside, on clothing, on skin. We are only doing three patches on the skin — chest, arm and leg. There have been two papers recently that have done a little bit more. That alone cost us about $5000-$5500 a firefighter, so it is not cheap. So I have to try to get as much as I can in one go, and hopefully I will not muck it up or lose it. What do we find? What we are finding is that there is a big difference between outside and inside. You can see here for the polyaromatic hydrocarbons that we are getting between 80 per cent and 97 per cent difference. So the clothing is actually stopping a lot of stuff getting through. We did not know that. It was like, 'Wow! That's pretty good'. If you compare it to other sorts of protective clothing that firefighters wear, it is pretty similar.

You will probably never, ever get complete prevention of stuff getting through, and one of the reasons for that is, if you think about it, if you move, even in your clothes now, it creates pressure differences, and that forces air to move, so you will drag stuff in. The other possibility that we may be measuring stuff inside is that we are using pumps, so we might be forcing stuff in. So the true protection factor may actually be higher, but I cannot say that, if that makes sense. I have to be a little conservative from that approach.

But what is clear across all our studies with the garments we are using, either under the previous version of the ~~EPA~~ (NFPA) 1971 and the Australian standard, is that they are offering some protection against these sorts of materials. It does vary a little bit, which may be a reflection on how people are doing things inside, but I cannot prove that yet. So you get an idea.

You have got a few more pictures. Rather than me talking about it, here is an example of deposition on clothing. Pretty much whatever is in the smoke in terms of the polyaromatic hydrocarbon perspective will get on your clothing. The numbers are quite low. This is just a ratio point of view. We can use that to estimate total loads and all that sort of stuff, because as I mentioned if people touch things, where does it become dirty? That is what we have done, from that point of view. You can see here where I have compared the air against what is on the clothing. They are pretty similar. There are a few minor, little differences, but for all intents and purposes it is pretty good. So I can tell you now, if you stand in the smoke, guess what is going to be on your clothing? Whatever is in the smoke.

But what I am interested in is does it get on your skin? As I said, we are using patches to simulate skin. This is similar to some work that was done in Europe in the 1990s and the 2000s, so what we can do is compare our results against some of this work from other occupational settings — aluminium workers, road workers and that sort of stuff. The Europeans did a lot of good work on that. We can show on the skin patches that we are getting deposition~~s~~ of polyaromatic hydrocarbons. Why is that important? If the stuff sits on your skin, for some of these chemicals, the half-life — and that is the time for half of it to go from the outside of your skin into your body — can vary from about 5 hours to 8 or 9 hours. So if you are letting it sit there, you are giving it an opportunity to get through your skin. Now we can say, 'Look, for all intents and purposes it is on your skin, and we have now shown this complete route'. The question then becomes: what do we do with it?

You can see a bit of an idea here. It does vary. We have got a whole bunch of questions on all of this. The numbers are low, so I need to put that in perspective. We are talking about thousands of millionths of a gram per square centimetre, so they are not very high numbers, but they are there. The trick for us is: is that good or bad? This is where the science becomes a little uncertain, because some of that criteria that we might apply does not exist. We have got to start to put something in — a line in the sand. We have derived a line in the sand that, if research provides better results, we can actually shift very easily. I will show you how we apply that shortly so you get an idea.

Off gassing I will not talk about from that point of view. You can come back and ask questions about it.

There is another example where you do search and rescue and extinguishment overhaul. These spikes got huge. These are the highest exposures we actually measured so far. We used to use our instructors for all of this, and being a scientist I used to get upset — well, not quite upset, but concerned — when they were giving me three to sixfold differences, because that is terrible, and from the background that I come from in research, it is like, 'Oh, my God, how do I explain that?'. Now after doing this broader work I have to go back and say they are actually pretty good at what they are doing, because we are now getting differences of between 30 to 300-fold between teams doing the same work. That then raises a really interesting question, for which I do not have the evidence, about tactics and what people are doing inside the fire. That is pretty clearly a new body of work to go into, but you get the idea. There is a lot going on.

Now on this, when they are getting much higher exposures, we have seen benzo[a]pyrene previously, but it has always been below the limit of recording, so I could not tell anybody it was actually there. Whereas now, in this example, we have shown it for the first time on those skin patches. Benzo[a]pyrene is interesting because it is one of the PAHs classified as a carcinogen, and its half-life for getting through the skin is around 4½ to 5 hours. What can I do about all of that? This is what it looks like, so I am not going to spend too much time on it. You get the idea. Qualitatively a lot of things are going on. Things either get on surfaces, get off surfaces, come back on, come off, all that sort of stuff, put it in your clothing and all those sorts of bits and pieces, but that is really not the key message in all of this.

Pretty much what it means so far is you have got to wear your SCBA for these sorts of stuff. Do not stand in the smoke. Your PPE does offer some protection, but remember protective clothing is not your no. 1 risk control measure. Unfortunately for firefighters and many emergency responders, the administrative controls and PPE become your first two choices because all the other controls you normally have for managing risk do not exist in this context. Eliminating it, engineering controls and all that sort of stuff are out the door, so we are back to the two you prefer not to use. But it is not the be all and end all, because you need to select that stuff in the context of what you are trying to do and what you are trying to achieve, if that makes sense. This stuff is not intended to let you swim in it; it is intended to protect you against some of this stuff. You still need to design how you are going to do business around minimising those opportunities.

There are a whole bunch of other questions. The other thing that is pretty obvious from this is if it is getting on your skin, we need to get it off. The recommendation is pretty simple: go and have a shower when you get back to the station as soon as is practicable. Because if I can stop it from staying on your skin — so you could turn up to work, go to a fire, come back and do nothing for the next 10 hours and let it stay on your skin — if I get you to have a shower, for that extra 9 hours I can prevent more than 90 per cent of it getting through your skin by doing nothing else. I can put in some really simple measures to minimise opportunities for exposure and opportunities for things to get through the skin, assuming we protect the lungs, if that makes sense.

It also then gives us, as we said before, opportunities about tactics, challenging the way we do business, but also our uniforms. Should we be wearing a uniform all day or swapping it after jobs? All those sorts of things. What do we do about the truck? Brian Whittaker from Melbourne spoke about them instituting a clean inside the truck and putting in lockers and those sorts of management practices for used gear. That is really what probably everyone is going to go to in the longer term. You are going to start looking at it from that point of view. We keep a truck for 10 or 15 years, and you take it from a simple perspective — I want it to be as clean as the day I got it when I give it up. I do not want 15 years worth of activity in it, if that makes sense. Even if the numbers are really small from me wiping stuff on the seat, over 10 years it slowly builds up. If I can take that out of the equation, it is another opportunity for exposure I have eliminated. That is what I want to try and do, so it is going to raise a whole bunch of interesting questions.

It also raises a whole bunch of interesting work that is going on. In the United States some of this work has prompted the discussion — this is part of what today is about — which has then led industry, NIOSH and the NFPA to now go and do a whole bunch of research in similar areas, because everyone is on the same boat about trying to understand what is going on. Everyone is just on a slightly different road from that perspective. From our point of view, I have got literally hundreds and hundreds of research papers, hundreds and hundreds of pages of trying to understand what is going on, and in some cases we have got no idea of what it means. It is a number. There is nothing to compare it to so that I can say it is either good or bad, so we are trying to figure all of that out.

What I can do is summarise it all for a firefighter. They do not have to read a document like this, but they can read that. We are doing two things with this. We are putting it into a piece of software as well, so you can go and say, 'I did this, this and this at a fire', and it will tell you what you should do next. But if you cannot have that, this is the sort of thing that can go up on the station wall. As an example you can say, 'I was really unlucky and I went to a pesticide warehouse fire and I somehow volunteered to go in and put it out'. What are you going to do? I am going to decontaminate you on site. The entry team who came out is going to get washed, probably with detergent. I am going to tell you to have a shower at the station anyway, because that is going to be our normal practice, but I am also going to take your gear, and it is going to get laundered.

That is as opposed to an LPG fire, so a little gas cylinder, where we know from the results we have got that you can go to many, many of these before we consider your clothing to have the level at which we think it should get laundered. We are still going to say to you, 'Have a shower at the station', because we think that is good practice no matter what, but your gear does not have to be laundered. Your agency may say in its policy, 'We think you should anyway'. Great, that is your agency policy, but as I said, with all the work we have been doing we have come up with a number that says at this point we think your gear should get laundered. As science evolves, people who do more research in this area will come up and say, 'This number might be too high or it might be too low, but there is other research now that says this number means this'. You can now shift it, and what will that number do when it shifts? Every single piece of advice here will now shift with it, so it is self-consistent.

With the piece of software, as I said, you can literally go in there and say, 'I went to a chemical fire, and I did three activities around the cold zone'. Plug it in, and it will tell you what to do next. You will not have to be decontaminated on site. It will tell you, 'Go and have a shower and follow your agency policy on cleaning your gear, but we do not think at this point you need to'. That is what we are trying to do with all of this. We have got to summarise all of this stuff into a very simple message, and clearly this is a step on a journey that will probably never end, if that makes sense, but it is a step on the journey of trying to understand what is going on from that perspective. As with all of these things, when you start doing this stuff, more and more questions get asked, and sometimes you do not know what that actually means, so it poses more work to be done.

We have been very, very fortunate that the commissioner and a few agencies have supported us in trying to actually understand all of this stuff. I have been very lucky that I have a very, very good team to actually assist us to do this stuff, and with the training facility we have, if you couple the expertise of the firefighters with my science folks, you come up with a pretty good product to try to work out what is going on. I think that is a very simple introduction to hopefully promote a few questions back and forth for the remaining time.

The CHAIR — Thank you; that was really good, and it sounds like it is a really proactive organisation in terms of research. Are there similar things in other states? Do you know if there is similar work being done?

Dr LOGAN — Yes.

The CHAIR — I just do not know, that is why I thought — —

Dr LOGAN — Most jurisdictions. We have done some work with FESA (now DFES). We certainly share the information, but every jurisdiction has what is referred to as a scientific unit, and they are doing various tasks of interest to each of those jurisdictions, just as we are within Queensland, from that point of view.

The CHAIR — Okay. You talked about the studies that you have done on exposure to the smoke and so on. Have you done any studies or could you make any comment about the contact with recycled water used in firefighting, so the firefighting water that is then recycled? Does the same sort of thing apply?

Dr LOGAN — We have not actually done anything on that, from that point of view. The only work we have done on recycled water was with respect to communities that were putting in recycled water. In conjunction with Queensland Health we were part of a team that did a risk assessment on the various classes of recycled water. I believe that report was provided to AFAC a few years ago to assist other jurisdictions, but in terms of looking at the recycling of firewater we have not actually looked at that.

The CHAIR — But in terms of that study that looked at it and how it affected communities, could you maybe just give a bit of a — —

Dr LOGAN — I have to think about it, because it was a wee while ago. It was looking at class A to class D — I guess it is — various types of water, and looking at the various routes of exposure for firefighters attempting to create a risk assessment from it to work out whether certain types of recycled water could be put into the fire mains. I forget, but I think it was class A-plus or something that might have been the value which they said would have been suitable from that point of view. But I would need to defer back to the report from that point of view, but I believe it is available through AFAC.

The CHAIR — Maybe, if you do not mind, afterward we might ask for a bit of detail, so we can get that?

Dr LOGAN — Yes.

The CHAIR — That would be great, thanks. In terms of the work that you do, because it seems proactive, who decides what area of study that you are looking at? If there is a particular issue that arises, how would that be then referred to your organisation?

Dr LOGAN — In our organisation — I guess within all organisations there are various forums for employees/organisation — my area is pretty fortunate. We have seven scientists full time, including myself, plus a bunch of firefighters — eight firefighters — and I have volunteers. The group I have are all university scientists anyway, so they are capable of doing research, so it works in a couple of ways. The issue might come from an issues forum, whatever the question is, and it will come to my area. Usually the first thing is: do we know anything about it; what are the issues? Sometimes we need to go back and get a little bit more definition about what the question actually is, so we might help define the question a little bit further. Then we may do that classical literature review if we do not already know about that issue.

I am somewhat fortunate that we probably have about 25 000 to 30 000 research documents in our own internal library; that is a pretty good place to start for most things associated with fires, hazardous materials, emergencies and all those sorts of things that are of interest to us. Then we will do the usual literature search. Then what will happen is, if we do not think we can get a satisfactory answer, we will go back to the boss and we will say, 'We think this is the next course'. We will then brief everybody, saying, 'This is what we think the story is so far' or 'Gee, we don't know anything about this, but it is pretty obvious that this is the question that needs to be answered'. Then normally we would go to the bosses and say, 'This one we can do with a reasonable cost', 'This one will bankrupt the organisation', and ask, 'Which one do you want to do? What is the priority for you?'. For example, we have done work on diesel emission exhausts in fire stations. Obviously we assisted Queensland Health with the recycled water issue that came up, firefighter exposures, and a whole bunch of issues that or interest to Queensland fire and emergency services.

The CHAIR — I am not wanting you to comment or anything around Fiskville, because of course you do not have all the details, but, for example, would it be possible for your organisation, in the case of a contamination or allegations of concern around a training facility or something like that, that may be referred to your organisation to look at?

Dr LOGAN — We may become part of the process to reviewing what is the question, if that makes sense, from a Queensland perspective. I may turn around and say, 'This is beyond our expertise'. We all use our expertise, but sometimes we say, 'Guess what, we need to go and talk to these people and these people, because they are the right people'. Certainly, with health questions, we have like most organisations an occupational physician available to us. We may look at it and go, 'This is a job for him'. Then our role becomes providing the best information to that person to ensure that they can make an appropriate determination, if that makes sense. So we will become a support, rather than leading it, from that point of view, because it is going to step outside our area of expertise.

We also need to be very careful in all of that to say very clearly to the bosses that 'This is where our expertise are; we need to be sure that here is a group of people who are very good in this', and we will facilitate that. So we will look to universities and all of that sort of stuff. Like most places, you keep a big black book of people who can help out.

Mr TILLEY — Thank you; that was well explained. It is an old saying in the area of crime scene examination that 'Every contact leaves its trace'.

Dr LOGAN — Very true.

Mr TILLEY — And exploring those is very important. With your research, a lot of the stuff you are talking about I suggest are structural fires and those types of things?

Dr LOGAN — Yes.

Mr TILLEY — Has Queensland done anything in relation to bushfire research?

Dr LOGAN — Yes. We have been measuring exposures in bushfires as well for two elements. That work is ongoing as well. What you would have seen on the little graph was a line there that said, 'When do you launder our bushfire gear'. That is clearly a question for us, because I want to know that. I want to provide that advice. That impacts on how long the gear lasts. If the manufacturer says you can only wash it 50 times, what does that mean to us? When are we going to put that sort of value in?

But I also want to know what our rural firefighters, or any folks working in those areas, are actually exposed to. Over the last few years we have been doing a series of experiments. I will use the word 'experiment' in inverted commas. We take an opportunity of when they are actually doing work, and then we will put stuff on them. For example, in order to work out whether respiratory protection is required you need to know how fast or how hard people are breathing. We put some respirators on folks, but we can measure their airflows. Then what we also did was we measured what sort of contaminants they were exposed to. So now not only do I know what they are exposed to, but now I know how hard they are working. We can then start comparing that against standards such as ISO standards for work rates. We can then put all that sort of stuff in place.

Then I can go back, for example, for a respirator. A respirator is a little bit different to an SCBA. SCBA — and these days we will exclude the previous generation — are almost always positive pressure. They force the air into the face mask. You have always got a little bit more pressure than outside, if that makes sense. Then you breathe. You are being supplied air at basically a little bit above atmospheric pressure. With a respirator, for most intents and purposes, you are drawing the air in from the outside, but it passes through a filter. That filter, depending on what it is designed to take out, may be really good for what you are looking at or really bad for what you looking at. It is much like a cup; it can only absorb so much. If you are working really hard, you are going to fill that cup really quickly if there is a high concentration. But if you are working very slowly and there is very little there, then your cup will last for a long time. But we needed all that data to understand how good our canisters would actually be and could they protect us against the things we thought they need to be protected against. We have defined all that.

We now have a multistaged approach for respiratory protection. That is slowly unfolding. We have done one piece of it. We are about to trial the next piece, which is with ~~this~~ some interface rural brigades. They will be provided with P3 full-face respirators with canisters. Having said that, the canisters are not ideal for wildfires at the moment. There is an NFPA standard which is going to address some of those shortfalls. Every opportunity I get I encourage manufacturers to meet that, because by default it is going to meet our needs. The biggest issue in most respects for the canisters is carbon monoxide. There are lots of other things in the atmosphere, and most of these canisters are usually pretty good on all of those, except for the very low concentrations of formaldehyde. But it is the CO I want to get rid of, so I am encouraging manufacturers to improve that side of the house, and we are looking at all of that. We keep a really close eye on what is actually going in all that space, and every opportunity I get to prod the stick at the manufacturer and say, 'Hey, when is that coming?', we do all that.

We have got that piece of work going on for respiratory protection. We have got a piece going on for the deposition on clothing, because I want to know about all that as well. I think about it as it is not just urban firefighting. Because Queensland Fire and Emergency Services covers across urban, rural, SES and disaster management, my area will get the question from no matter whom. I am not personally too concerned. For me it is a question of helping someone, if that makes sense.

Mr TILLEY — I think the Chair probably covered little bit of that. Interagency within Queensland is pretty good, by the sounds of things. You are sharing a bit of information. How are you going with other jurisdictions? Are there things that in Queensland you are doing particularly well that you are sharing with other jurisdictions, and vice versa?

Dr LOGAN — It is not for me to tell people how to do business, but what we do is we share. There are a number of national fora. But also, for example, we have presented elements of this work to Western Australia,

New South Wales and New Zealand — internationally. My job in some respects, if you think about it, is not to develop products and hold them internally. My job is to develop products and ship them out. I do not care where they get shipped out to, if that makes sense.

Another project we are working on is a piece of software for decision support. Someone mentioned before about 'When should I be decontaminated?'. We are developing tools for that piece of software which literally tells me if I am exposed to this chemical at this concentration and it gets some my skin, this is what I should do. That is a collaboration with the University of Adelaide and the US and Australian governments. That is free to all first responders. Pretty much what we do with this stuff — there is no cost on this; it costs us to do it — is to share it and then it is for your agency to hopefully discuss it, digest it, share it internally, debate it, pull it apart and think about what it means to you. We will do the same thing with information that comes from other agencies. How does that actually work for us? Can we improve it? We may find someone that comes back and says, 'Actually, you didn't do this very well; you should think about that', and it is like, 'Oh, yeah; that's a really good point'. So even from some of this work we have now started collaborations. We are doing some collaborations with Western Australia. We just had a firefighter from New Zealand who has a very strong science background come across as well. From my mind, the more we spread this out and share it, everyone benefits.

Mr TILLEY — In that sense I have heard the words 'New South Wales', 'New Zealand' and 'Western Australia'. Is there any particular observation that you have made in your experience in relation to Victoria, both with the MFB and the CFA?

Dr LOGAN — We work with both the MFB and the CFA primarily through either the hazard materials units or their scientific officers. We might ring them up; they might ring us up. It is no big deal to help them. At the end of the day, from my perspective, it does not matter where the phone call comes from. We will help that person, from that point of view.

Mr TILLEY — As you said, it is not your job to be able to tell people how to do theirs, but is there any observation that you may have that might be occurring in Victoria that you think maybe they should reconsider?

Dr LOGAN — I am not familiar with all of the ins and outs.

Mr TILLEY — Yes, sure.

Dr LOGAN — I know what happens where we are. Obviously we always need to get better.

Mr TILLEY — I am probably not getting too far off the track, colleagues. You were talking particularly about platforms. You were talking about the truck itself and equipment. When we talk about interoperability, the NATO treaty, for example, is so that other nations can use equipment linkages. Significantly through Australia and within Victoria we probably have hoses that do not adapt and a whole range of things. Is there a bit of research going scientifically between agencies for platforms, hoses, couplings?

Dr LOGAN — I understand through AFAC that they have groups that look at all of that commonality. There are Australian government processes as well that are looking at interoperability and commonality.

I guess the quick answer to all of that is describing what we mean by capability. What is it we actually want to be able to do? It might mean that I use piece of equipment A and you use equipment B, but we achieve the same outcome, in which case we have a common capability. So if I requested it, I know that you could deliver that capability. The capacity, or how many times can we do it, I guess is the challenge always across Australia — where does it reside and how much do we actually have? The commonwealth, outside of this scope, anyway, is doing some work on all of that and EMA and AFAC have been doing work on that, certainly in the last couple of years, to better understand all of that. I think you can see the fruits of that in the last 5 to 10 years with the interoperability of fire services supporting each other, or ambulance services crossing the border for major incidents. It is a big but small country. We have to help each other.

Mr TILLEY — You were talking about protective clothing particularly, so leading on to the possible contamination of equipment — the platform, the hoses and things — have you done any investigation into that area?

Dr LOGAN — We have done some work, not a huge amount. We generally look at incidents case by case. If you think about a fire and the hoses being here: was it contacted by fire run-off water; what was in that fire water run-off; should we clean it; how should we clean it? We have processes internally for all of that. As I said, the piece of software we are developing will address some of that as well, because not only is it people, it is also objects. For example, your pen is sitting there, you had an ammonia spill, you can literally type in, 'It was ammonia, it was a pen, I think it was contacted. What do I need to do next?', and it will tell you what to do next.

What we have not done in the tools so far is recommend the solution in terms of chemical A or chemical B. That is the next stage and there is a lot of discussion around all of that. But we are slowly getting into all of that as well from that point of view.

Mr TILLEY — So in the context of the testing, in the Queensland training facilities — and we had a small discussion about water quality — in those complexes within Queensland, what quality of water is used in training scenarios in Queensland?

Dr LOGAN — We are using potable water. One of the reasons for that is the arrangement of where the facility is. We are on a lease next to a refinery and the wastewater goes into the refinery wastewater system. They are subject to environmental protection requirements so they would be particularly unhappy if we got them into trouble. There is an entire process. Even before our water gets into their wastewater stream, it is partially cleaned up to a standard that they are happy with which was obviously negotiated at some point to then match into their system from that point of view.

Ms WARD — You spoke about training and using BAs and in your report you say that the primary route of entry for pathway for airborne contaminants into the human body is usually inhalation. What are your thoughts on using BAs in firefighting and in training?

Dr LOGAN — In training and firefighting?

Ms WARD — Yes.

Dr LOGAN — There are two ways of looking at all of this. In the United States, NIOSH defines an internal firefighting environment. It is what they call an immediately dangerous life and health environment which, by default, is an SCBA environment. There is no question about it. There is a point at which you must wear SCBA. Organisational policies based on knowledge of hazards, measurements, those sorts of things will then dictate selection of SCBA, and some of the pieces of software also have a respiratory protection selection tool. You plug in the chemical, tell me how much and I will tell you what you need to wear. We are also subject to all our work health and safety acts which generally call up the Australian standard which has very clear criteria on how you should select your respiratory protection. So from a training perspective, if you are going to play, you need to train on this type of equipment.

For example, I go to emergencies where I am the bunny that goes into the lethal concentration of a chemical spill and all the gas is everywhere. That does not mean that I have to go and practice in it, because I know that if it goes wrong it is going to hurt. But you can still practice with it. You practice with it at safe levels but you want to practice with the purpose of: what are you actually trying to practice? You focus on what you are actually trying to practice to give enough to tickle machines or whatever it is from that point of view. You do not say, 'People, you can swim in it', because it is a lethal concentration. That is not good practice. From a respiratory protection point of view you do need to practice because there are rules about how you train people to wear the stuff to start with. Then you move from there.

Obviously, every organisation has a policy for the selection and use of respiratory protective devices at emergencies. These days there is a lot of detection equipment quite often available and if you have knowledge of the material, you can measure it. You know what you are trying to do and you can then make a reasonably informed decision about what you should wear.

Software such as what we have been developing internationally will then assist that process further and it will completely standardise. For example, if you turn up to the same incident as me, I give you information and you go tap, tap, tap; 'I think it should be A', and I do the same thing and come up with B, we have now got a disconnect. It could be policy, it could be whatever, but the software takes into account what standards apply in the US or Australia or wherever. It means that if you plug in the same numbers as I do we are going to get the

same answer and now we start getting this consistency across how we are actually selecting stuff. As I said before, the respiratory protective equipment is one piece of your tree, so to speak, as to what you are actually trying to do with that emergency.

Ms WARD — Would you recommend that every firetruck has BAs?

Dr LOGAN — It depends on what their purpose is. All I can say is that in Queensland we have a range of respiratory protection devices available that will obviously continue to evolve. We have many what we call rural appliances that do not have SCBA, because their role is not to go into those environments where they would require it. Their policy then is that they call for assistance from the correctly fitted out vehicle with the trained people to do that.

Every agency across Australia or wherever would sit down and work out from their policy perspective as to how they approach business. It is not for me to say which one is right or wrong. I know from what is our policy in Queensland, from that point of view, which is one reason why we are doing a lot more work on respiratory protection.

Ms WARD — Thank you. With the transfer of contamination, you spoke at length about contamination on clothing and in boots. How important is it to remove those clothes and to decontaminate, especially in training situations where you are in the clothing for anywhere up to 8 hours a day, and that can be day after day?

Dr LOGAN — What I can say is that in Queensland, for example, at the training facility we now have to shower after every activity and that sort of stuff. We have brought that in with the recruits and the instructors.

Ms WARD — When did you bring that in?

Dr LOGAN — That is a good question. It would be a little while ago, because as we have been going through this research it has been done hand in hand with the instructors. They can see what is going on and we can see what is going on, and so their practices have changed. We now have a standard presentation that we give the recruits. When they go down they have a whole bunch of rules that they now have got to follow, and instructors in particular, because from my perspective of it in Queensland these folks are the ones that go most often into these practice fires, so we think they are at the highest risk of getting stuff on them, so they have a change of clothes, shower, new set of gear, all that sort of stuff as a routine matter of course.

Ms WARD — Would it be in the last 10 years?

Dr LOGAN — Yes.

Ms WARD — So, 8 to 10 years, 5 years?

Dr LOGAN — No. The current evolution of what we have been doing has probably been settling in over the last five years, maybe within two or three years probably, and that will continue to evolve. As we tidy up some of the little edges, that will then go out further and further, if that makes sense, as a stepwise process.

Ms WARD — And has there been a decontamination that has been engaged in longer than that?

Dr LOGAN — Decontamination in terms of what?

Ms WARD — Just removing your clothes, getting out of them as quickly as possible, showering — —

Dr LOGAN — It depends on the nature of the incident. We will make that determination at the incident. There is a policy, so, for example, if you suspect you are exposed to asbestos fibres, our policy is you get washed on scene, your clothing gets taken and it gets taken away and laundered. If you have been to a fire and you may have been, say, the pump operator but you feel your clothing is dirty, then the policy is you can put your clothing into the normal laundry process and it will go and get cleaned and come back, if that makes sense. So the encouragement of, I guess, keeping gear clean is always there.

Ms WARD — Where you are training using benzene or diesel or other petrochemicals — when you are training in that situation — what would you do with your gear in that circumstance, and how long has that policy been in practice?

Dr LOGAN — Most of that would happen at the live fire, so they would then just adopt their policy. They have a massive cleaning regime, so to speak. They have got lots of gear. It just goes away and gets cleaned and comes back. So they just adopt their process from that point of view. Does that make sense?

Ms WARD — Yes, absolutely.

Dr LOGAN — But with all that, you still adopt what I would call the normal processes. If you do not have to stand in smoke, you do not stand in smoke. So you adopt all of those things to minimise your opportunities for stuff to touch you. You may be extinguishing a hydrocarbon fire with foam or whatever or just demonstrating how it behaves or something along those lines; you do not have to go and stand in the smoke to see what is going on. That to me is just part of a normal process of managing people and clothing, if that makes sense.

Ms WARD — So you would advise people to get out of their clothes as quickly as possible, on the PAD, and not trek it through change rooms or mess halls.

Dr LOGAN — Well, Whyte Island has a clean and a dirty area, so they will get undressed, go have their showers, the gear gets binned, and then they come back out clean per se. That is pretty much what we adopt with the fire stations — clean and dirty.

Ms WARD — How long has that been the practice for, do you know?

Dr LOGAN — I think station design has had that for quite a while, but we reinforce it at every opportunity we have in terms of talking to people. Certainly most places have a locker room, or most of the urban stations. Stations of various ages have different designs. So what we did, say, for your turnout clothing in some locations where there was no locker room — you know, they were sitting next to the trucks so there were issues or concerns about diesel exhaust deposition — was that we have either built lockers for them or we have given them plastic covers so their clothing sits in that, or certain trucks have been removed from service or filtering arrangements for the station's throughput or the air management of locker rooms has been changed. We think about it in a holistic approach — you know, what is the situation at this station, what do we have to do to get you up to what is the minimum? Then when your station gets rebuilt, guess what, you are going to get these steps, which are the current standard, which is a separate locker room, separate air conditioning and all that sort of stuff.

Ms WARD — And is it the same practice in the training facilities in Queensland as well?

Dr LOGAN — That is my understanding, yes.

Ms WARD — Would you recommend training of firefighters with fuels like benzene diesel car bodies — those real-life situations, if you like? Would you recommend that they train that way or that they use more of the MFB approach which we heard about earlier today, which is to simulate situations using gas?

Dr LOGAN — Every organisation will make that policy decision themselves. All I can speak about, so far as I am aware, is that in Queensland a lot of our props are LPG, but we do have some props that burn particle board, or hydrocarbons for some certain types of petrochemical burns, but they have got very specific aims and objectives, if that makes sense. That is what you need to think about: what are you actually trying to do, and then how do you demonstrate it from there?

For example, one of the experiments we did was a simulated industrial situation. We burn 8 litres of diesel. It sits in a spill pan. There is what is called a plastic IBC with it with a wooden floor, and there are another couple of containers with a little bit of alcohol to represent pretty much a panelbeater's shop. There is going to be a bit of flammable liquid, there are going to be some containers and there is going to be a little bit of ethanol/paint. But it is in a spill pan, because we are doing it in what we replicate as a panelbeater's shop and we know it is going to get horrible and nasty. But this is what we need to know from measuring exposures to prevent an accidental running fuel fire inside that space while they are doing stuff for us; it is in its own little bund point of view as an extra factor.

But that is a very specific experiment, and part of the process for us is that we walk people through why we are doing it, what you are likely to do and what we are going to do with you afterwards, which means you are going to have a shower, your gear which we take away is going to get laundered anyway, but all that sort of stuff

comes into play as well. It is really about what you are trying to achieve with the training and then matching it to whatever your agency's policy is.

Ms WARD — If your aim is to teach people how to fight fire, how important is it that it be a real replica fire which is using petrochemicals, as opposed to a gas fire which replicates it as closely as possible?

Dr LOGAN — It depends on what you are trying to teach them. If you are trying to teach them extinguishment techniques, then you may find that you can do that with certain solvents or gases and achieve everything you wish to achieve. That will come up to whatever the agency decides. But to play, if you are going to extinguish fire, you need to know how to do it. Even in a simulated environment, which will be small amounts of fuel — those sorts of things — you can do that. The trick with all of this is that if I only have to burn 20 litres of solvent to get the effect that I require to practice those techniques and stress them in the right way, that is all I require. I do not have to do 500 litres because it looks better. Even in our experience that is a challenge for us — what do we require to do what we need to do? — because for us, we are putting a lot of stuff on people which may hinder their movement. I am now putting an extra safety factor in what they can actually do.

When we designed some of these experiments, we sat down with the instructors and said, 'Right, here's what we are thinking. Feasible or not feasible, how does that affect safety?', and literally stepped our way through it before we started to make sure that we had a good idea of what to expect. Then we did a practice one, with nothing on, to make sure that we were in the right ballpark. It turns out that in the initial industrial one 20 litres more fuel made it too hot, that in their expertise the firefighters would not be keen to go into that fire. That made it very easy for us to say, 'You drop that down'. It still achieved everything we required, but it made the experiment safer from that point of view, and everyone is in on the same page.

The CHAIR — Just on that, does that mean then you analyse each proposed training scenario and look at the pros and cons of it?

Dr LOGAN — In the experiments for us? Yes. But I do know some of the experiments we have done have become training scenarios to demonstrate certain effects. At Whyte Island, for example, if I want to go and do some training — this is the Queensland thing — I have a whole bunch of paperwork to fill in: what chemicals am I using, how bad are they going to be. Invariably we only use water from a hazardous materials point of view, because I do not have to play with anything else. I can make machines sniff anything they want. I just do not have to tell people that they are alarming. I just tell them it is X as opposed to Y. I fill out a risk assessment, which has all my safety information and all that sort of stuff, and we have to do that before we are allowed to do our little scenarios anyway. For me and the group that I work with, that is standard practice when we go down to our major training facility.

Mr TILLEY — A couple of quick ones just to finish up. You have been with Queensland fire service since 2004?

Dr LOGAN — Yes, we transferred across. I probably did not give you the history. I originally came from the CHEM unit, which is the chemical hazards and emergency management unit. That was set up, I believe, around 1989 after a series of fires and an environmental incident. The Premier's department set that up. It was transferred into the Department of Emergency Services. One of the activities was providing expert advice on resolution of hazardous materials emergencies or large fires to support the combat agencies. I think that started around 1991. I started there about 1998. Then in 2004 the director-general at the time and the commissioner determined that the best fit for the area that I worked with was actually across to the fire service, which in some respects was pretty obvious. Who we spend most of our time with is fire or police from that point of view.

Mr TILLEY — It is fair to say you have been in the game for a significant period of time.

Dr LOGAN — Yes. I am starting to become one of the older ones now, which is a really bad look!

Mr TILLEY — You would have come across quite a number of people in your field. It says here that you are internationally recognised and have peer reviewed a number of papers and things.

Dr LOGAN — Apparently.

Mr TILLEY — Just leading into the conversation, at any stage in your career have you ever been out to Fiskville?

Dr LOGAN — No, I have never been to Fiskville. I have been to Carrum Downs for hazardous materials exercises, but I have never been to Fiskville, so I have no idea what it looks like.

Mr TILLEY — In your field of study and with your expertise you would have come across a number of experts. This committee has received reports from a significant number of people. I could probably get a bit of help from my colleagues here. There is the Joy report. Have you had an opportunity to have a look at that?

Dr LOGAN — I have had a read of it. As I said, everyone prepares. I have tried to read a lot of the submissions to get a feel for what people have submitted. You have had a lot of people who have a lot of expertise across a lot of different areas to come and assist.

Mr TILLEY — To assist the committee would you be able to offer the committee any observations that you might have made as a result of your reading of those documents?

Dr LOGAN — I have only looked at them from the perspective of preparing to talk about our firefighter exposure work. But having seen the names, you have some pretty eminent people coming to support you. Melbourne has got some very clever people, from that point of view, to assist.

Mr TILLEY — I appreciate you saying that they are eminent people and that they have certainly been in the game for a long time. No doubt whether you have or have not worked with these people, my earlier piece of questioning was to establish how risk averse you might be. I would like to press you a little bit harder. When I asked if you had any particular observations, is there any particular criticism or do you think that some of the peer reviews that may have been made — —

Dr LOGAN — I have not looked at any of them from that point of view, I guess, is the very simple answer. I looked at them from a perspective of attempting to prepare myself and what we are trying to set up, so I have not really reviewed from that -perspective.

Mr TILLEY — I am not asking whether you have reviewed them, but you have had a bit of a read. Is there any particular point that you may or may not be critical of?

Dr LOGAN — No, I do not really have any view from that perspective. I just note what has been said.

Mr TILLEY — You are not expressing a view at all?

Dr LOGAN — No. I have read them, and I have noted them. They are all subject to their rules of engagement and what they have been asked to provide, and I am not privy to all of that sort of information. It would be very remiss of me to comment when I do not know the full facts.

Mr TILLEY — So in their science, from what you have read, you would not suggest they are wrong in any way?

Dr LOGAN — No. I do not — —

Mr TILLEY — Or it is a cover-up?

Dr LOGAN — No. I have no comment.

The CHAIR — I am sorry — —

Mr TILLEY — Chair, are you trying to close this down? This is important.

The CHAIR — No. I think people came as experts from other jurisdictions to provide information to us based on what we asked for.

Mr TILLEY — Again, you are under no obligation to answer — —

Dr LOGAN — I understand. I have no knowledge of any of that.

The CHAIR — Can I just ask a quick wrap-up question in terms of your international reputation and so on. Our background papers talk about your being renowned for being able to identify emerging issues and being proactive. Are there any particular things that you could count off the top of your head in terms of firefighting and safety and protection for firefighters?

Dr LOGAN — Obviously everything linked to exposure certainly is one area we would be doing. Respiratory protection — when you bring them across into rules — that is a no-brainer from our perspective. We are trying to be ahead of the game. From our point of view we also look at — say, in Queensland, for example, in the last five years we have had a massive development in the LNG industry. We now have literally hundreds of gas detectors across the state and arrangements that we have put in place to try to deal with those emergencies. We have shipping across the Great Barrier Reef. They have to be responded to, so how do we think about dealing with those sorts of things.

We are a big state, so one of the issues I always have is: how do I pre-position equipment and resources and really from a fundamental point of view put the right people, right process and the right technology in the right place for the right type of incident? For us, it is keeping ahead of what is likely to come in terms of products and what they might mean. That does not necessarily mean just to people; it might mean to the environment. So something that looks particularly innocuous we might look at the chemistry or the materials involved and go, 'Hmm. We might have suspicions where this one might go'. We may prepare ourselves on the basis that it might head down that path, to an extent, as best you can.

The other element I have been proactive about is keeping a view on the literature — what is actually happening here now and overseas. With our contacts internationally, we provide a lot of interaction with them as well, so we get an idea of what is coming up with them. Detection is a huge one. Can we measure things? Then what you do with that and what do the numbers mean. There are issues that are coming up around all of that as well, so we try to assist in that as best we can.

The CHAIR — Are perfluorinated chemicals or compounds considered an emerging issue?

Dr LOGAN — That was always coming. The concern has been around for at least a decade, if not more. As people have been able to measure it, you find more and more that the number of papers have gone through the roof. That is one. Nanoparticles will be another one that comes up. I know there are a number of regulatory agencies looking at those at the moment. They will also have impacts on emergency responders to certain sorts of incidents, looking at both respiratory protection and skin protection from that perspective, and biological materials. We are aware of the issue of fluorinated surfactants. It applies to some other materials as well.

The CHAIR — Thank you so much for your time in coming to talk to us and for answering all the questions.

Dr LOGAN — Thank you.

Witness withdrew.