

TRANSCRIPT

ENVIRONMENT, NATURAL RESOURCES AND REGIONAL DEVELOPMENT COMMITTEE

Inquiry into the CFA training college at Fiskville

Melbourne — 23 November 2015

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The CHAIR — Good morning, everybody. We will start this public hearing of the inquiry into the Fiskville training centre. I welcome Dr Drew. Thank you for appearing before us today. I have a few things I need to do for the record before we commence your evidence.

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 this hearing will not be afforded such privilege. It is also an act of contempt of Parliament to provide false or misleading evidence to the inquiry. The committee may ask you to appear again if there is something we require to follow up on or we may ask for further information in writing, if that is okay with you. All evidence today is being recorded, and you will be given a copy of the transcript to make sure it is accurate before it is made publicly available. Thank you again for coming in. We have a number of questions we would like to ask you because of your involvement at the Fiskville training site and the advice you were giving at the site.

Perhaps to get started, at what time were you engaged to start performing work for the CFA and who was it that actually engaged you?

Dr DREW — I was first engaged in early to mid 2013, and it was the project officer for the site who engaged me.

The CHAIR — Had you worked previously for the CFA around issues at Fiskville other than the PFOS contamination?

Dr DREW — No, I had not.

The CHAIR — I noticed in one of the documents that you did provide information to the legal representatives of the CFA at the time, Ashurst lawyers. Did you provide the information directly to their law firm or to the CFA?

Dr DREW — In those days I provided the information to CFA through their lawyers.

The CHAIR — So when you were engaged, who made the contact? Was it the lawyers who originally made the contact with you to do work then?

Dr DREW — If I recall correctly, I think it was the CFA that approached me and then Ashurst lawyers approached me.

The CHAIR — And what was the Ashurst approach about? What were they asking of you?

Dr DREW — It was to provide me with an overarching brief to assist with the interpretation of the investigation that was going on at Fiskville.

The CHAIR — In your toxicology private practice the organisations you have provided advice to — we understand you worked originally for ICI; you have done some work with Gunns, the timber processing company that was going to set up in Tasmania; and the CFA. Are there other organisations? Was it on the polluter side that you were engaged, or have you also been employed by organisations representing people who have had contamination with chemicals or contact with chemicals?

Dr DREW — The work I have done has been for a variety of clients: the West Australia Department of Health in generating some air guidelines for them; the National Health and Medical Research Council, assisting them to set drinking water standards; the Queensland government for an interpretation and review of reports in relation to pollution in a river; Safe Work Australia, reviewing the toxicology of nano particles and establishing a health guideline value for lead worker, and — —

The CHAIR — So government organisations?

Dr DREW — Yes, government organisations, and private industry in terms of pollution related to contaminated sites, health risk assessments or ongoing and/or extensions of mining activity, assisting companies with food contamination and potential product recalls — a very wide variety — as well as providing advice to both law firms and individuals in relation to toxic torts and cause-and-effect relationships.

Mr McCURDY — Thanks, Dr Drew. Obviously you are one of the leading experts in the country when it comes to PFOS and our understanding of that. Can you talk to us about safe levels of PFOS in humans and in livestock? Obviously we do not have the standards in Australia. There are other international standards, but in layman's terms can you explain to us about PFOS, because there are different measurements for blood levels and PFOS in water. It is quite confusing, so could you take us through that step by step?

Dr DREW — Okay. In terms of environmental media there are international standards or international guidelines for drinking water. They are different in different parts of the world. The United States has a provisional drinking water guideline of 0.2 micrograms per litre, Germany has 0.3, the UK has 0.3. But also in Germany and the UK water is considered to be wholesome and fit to drink by adults if the concentration is as high as 1 to 3 micrograms per litre.

Yes, some people do get confused with the concentrations in water and the concentrations in serum. The concentration in water is not the same as in serum. It is now best practice internationally, and has been for the last five years or so, for populations who have been exposed to point sources of PFOS — that is by contamination of either food or water — to measure the serum concentrations. Those measurements are usually compared to a background concentration, and if a person's PFOS serum concentration is higher than the background range, that is an indication that they have been exposed to an additional source of PFOS other than that from day-to-day living.

There is consistency in the international agencies when they say having PFOS in your blood does not mean a person will experience adverse health effects. So there is a concentration above background for which it would be very unlikely for harm to a person to occur. What was done for the Fiskville risk assessments was to establish a concentration at which harm would be unlikely. That was established by three independent methods. One was using information from workers in the United States who were involved with making PFOS and so have really high concentrations. The epidemiology studies of those workers, of which there are approximately 10, indicate that a concentration of 2 milligrams of PFOS per litre of blood serum is not associated with adverse health effects in that population.

The second way of establishing a safe serum level for humans is the same way that the World Health Organisation, Europe, America, Canada and Australia set allowable daily intakes for exposure. The same methodology that is used for that was applied to the serum concentrations in toxicological experiments from animals, primarily monkeys — because they are very closely related to us — and rats. Those experiments established no observed effect levels and no observed adverse effect levels, and there are serum concentrations associated with those in animals. There is a standard set of safety factors which are used to convert animal no-effect level to an equivalent human no-effect level. When that is done, the human equivalent serum no-effect levels are 3 to 4 milligrams per litre.

The third way in which a safe level of serum concentration of PFOS in humans was established was to convert the tolerable daily intake set by the European Food Safety Authority (EFSA) into an equivalent steady-state serum concentration. The equations used for that are exactly the same as the equations that a clinician will use to establish a serum concentration for therapeutic agents. When that is done, you end up with a concentration of 2 milligrams per litre as a steady-state concentration. The TDI has been set by EFSA in Europe as a daily intake of PFOS for a person's entire life that is unlikely to be without harm. So the serum concentration set from that is the equivalent for a lifetime exposure.

So those three methods give us a range of PFOS concentration of between 2 to 4 milligrams per litre that is unlikely to be associated with harm. So in interpreting a person's blood concentration there are two comparison points. The first one is: is it above the background range for individuals in a population? And the second one is: is it below the concentration which we consider there is unlikely to be harm to the person? I come back to my first statement, which the international agencies are saying, that the mere presence of PFOS in a person's blood above background concentrations is not necessarily a cause of concern.

Mr YOUNG — Thank you, Doctor, for coming in. I just wanted to ask what knowledge you have of or work you have done on any other contaminants at the Fiskville site?

Dr DREW — My work at Fiskville has been confined to the perfluorinated chemicals, and of the perfluorinated chemicals it is only PFOS which is of concern at Fiskville. PFOA is of concern at other sites around the world, and most of the epidemiology information — that is, the studies on human populations —

from the Ohio valley relates to PFOA and not to PFOS. PFOS and PFOA are two different chemicals and they have different toxicological profiles. It is inappropriate to use information from PFOA to make a prediction about a health effect from exposure to PFOS.

Ms WARD — There is some; the C8 study. There have been some other studies feeding into the C8 study that do talk about PFOS and the contamination and how it has affected people.

Dr DREW — The C8 studies in the Ohio valley are the result of — —

Ms WARD — Sorry, Roger, I just need to cut you off for one second. I apologise. I know that there is a universal C8 study, but there are other researchers who have tapped into serums provided to the C8 study and have done PFOS analysis.

Dr DREW — Could you orientate me to who those researchers are?

Ms WARD — I just need to bring it up. Keep answering this question, and I will bring it up.

Dr DREW — In relation to the C8 studies, there is a whole suite of studies which have been done in relation to that. That population was exposed to PFOA in groundwater, but not just PFOA, PFOS as well, so there was a mixture of the two. PFOA was by far the predominant contaminant. The measurements of people's serum concentrations show both elevated PFOA but to a lesser extent PFOS.

Mr YOUNG — Going back to the original question, do you think that there are other contaminants that could possibly be on the Fiskville site that could be more hazardous to human health, both with short-term and long-term effects, other than PFCs?

Dr DREW — I have not examined those, but it is my understanding from the Fiskville investigation that other contaminants have been investigated, and the EPA-appointed environmental auditor has indicated in his audit of those investigations that the risk of harm associated, that might be associated, with other chemicals on the site is very low.

The CHAIR — Just to clarify, as I understand it, there was present at the CFA Fiskville training ground PFOA as well as PFOS. I think in your assessment you said it was at negligible levels or no level or you did not test for it at all?

Dr DREW — No. A full suite of 20 PFCs were tested for in Lake Fiskville. A number of these PFCs are found in Lake Fiskville. The fish from Lake Fiskville did not accumulate any PFOA but they did accumulate PFOS. Of the people who ate fish from Lake Fiskville, a few of those individuals had elevated PFOS but no elevated PFOA, which is what you would expect if they are eating fish with no PFOA in them.

The CHAIR — Were the surrounding areas — the other properties, the dams on private properties — tested for PFOA as well?

Dr DREW — They were. The farm dam on the associated property again had a number of PFCs in it. PFOS was by far the one with the highest concentration by an order of magnitude. Sheep that drank that water only had elevated concentrations of PFOS — a little bit of PFOA, but PFOS is the chemical of concern.

The CHAIR — Why is the PFOS of concern?

Dr DREW — Because it is the PFC which is found at site and has moved into fish and into humans.

Mr RAMSAY — Thank you, Dr Drew, for presenting this morning at this inquiry. We have lots of questions to ask in relation to the testing that you have done, both with the firefighters who trained at Fiskville and also with those who lived adjacent to the site. While you provide this information in relation to the levels that you believe are safe both from an Australian experience but also an international experience, I am still unclear about a couple of issues. I will deal with them separately as A and B.

A is: with all the testing that you have done on behalf of the CFA in relation to their levels of PFOA and PFOS on site at Fiskville, and also in relation to the Lloyds and particularly their stock and their water storages, I have

yet to have some clarity around whether in fact in your interpretation of those results you see any unsafe levels of both PFOA and PFOS in relation to human and stock contamination.

I raise that as an issue, one, that the government saw fit to close the facility on the basis that there were high levels of PFOS at certain points at the facility and therefore they deemed that as unsafe. I do not see anything in your documentation to suggest there were any levels of unsafe PFOS contaminant on site.

In relation to the Lloyds, the Department of Primary Industries at the time served a stock containment notice on their stock on the basis of test results that you provided to the department. They made a determination at that particular point in time that in fact the stock were contaminated. So I would like to hear your response to that, even though they did lift that stock containment notice. Then following on from that, what other advice you gave to the chief health officer or the then Department of Health or to PrimeSafe in relation to the animal tests or to the department of EPI in relation to stock and to the EPA in relation to the water sampling that you took.

I know that is a large question, but at the end of the day we are trying to — —

Mr TILLEY — Preamble.

Mr RAMSAY — It was not a preamble. There was a number of questions there in relation to Fiskville and the surrounding areas in relation to what is safe and what is unsafe in relation to PFOS and PFOA testing samples.

Dr DREW — I understand your question. You would like me to provide you with some information regarding the concentrations or levels that were found off-site from Fiskville and whether they are safe or unsafe.

Mr RAMSAY — And on-site.

Dr DREW — Can we do off-site first?

Mr RAMSAY — Yes.

Dr DREW — The investigation of the neighbouring farm has been one of the most comprehensive investigations that has been undertaken for environmental contamination of this nature, not necessarily for PFOS but for other contaminants as well. The three media that were evaluated were soil, water and grass. In relation to soil, the concentrations in more than 90 samples were taken in a grid fashion across the farm. All of those samples returned PFOS concentrations that were at least 1000 times less than the United States EPA safe concentration of PFOS in residential soil. That is a concentration that was set by the United States EPA for families to live on, so the soil concentrations at the farm are safe against that benchmark. In fact around the homestead and further away from the Fiskville site, PFCs were not measured at all in the soil. The PFCs in the soil at the site are confined to an area close to the boundary with Fiskville, and as I said, those concentrations are very, very low — much lower than the United States EPA safe level for people to live on.

The next media that was measured was water. Two sorts of water were measured. The one easiest to deal with is the water at the homestead — that is, in the tank and from the taps. No PFCs were found in that water, and that is using sensitive analytical methods. The other water that was tested was the dam water, which is fed by an ephemeral creek which occasionally receives water from Lake Fiskville when it rains and Lake Fiskville overflows — well, it did, but it does not now because the creek has been diverted. That dam has two parts to it, an upper and a lower dam, which are separated by an earthen embankment. In the upper part of the dam the concentrations of PFOS were similar to those found in Lake Fiskville. In the lower dam the concentrations are 10 times lower, which is indicating that the earthen wall between the two dams is efficiently preventing the transfer of the PFCs further downstream.

Apart from PFOS, there were other PFCs also found in that dam water, so that upper dam had clearly been impacted by water from Lake Fiskville. That is non-potable water, and so the drinking water guideline that a lot of environmental consultancy firms use as a screening tool to say whether there should be some concern about that or whether more investigation should be done is not appropriate. There is not a drinking water guideline for stock anywhere in the world, and the way to evaluate whether there is likelihood of an impact to the stock per se is to use the animal toxicology information and compare the daily administration to monkeys, rats, mice and rabbits with the concentration in the dam water. The dose the animals would get from the dam water is much

less than the dose which causes no effect in the experimental animals, and that is supported by the fact that the sheep who drank that water, while having increased concentrations of PFOS in their blood, they were concentrations that were very low and in fact similar to the background concentrations that you and I have in our blood at the moment.

In relation to safe or unsafe levels of PFOS in the sheep or in the lambs they produce, a very detailed and comprehensive study was undertaken, which was designed in collaboration with various scientists from various government departments and, I must say, with the cooperation of the farmer. That was and remains the most comprehensive and detailed study of stock anywhere in the world. From that was established concentrations of PFOS in the meat of the lambs, the liver of the lambs and the kidney of the lambs — so those are the parts of the animal that humans would eat — and the assessment of potential health impacts was undertaken in exactly the same way that Food Standards Australia New Zealand, FSANZ, would do and in the same way that the World Health Organisation would do, the UK authorities and other European authorities — that is, estimating what the intake of PFOS would be for an individual assuming a range of meat consumption by a person.

To give you an idea of how conservative and precautionary this was, at the top end of the range it was assumed that all the meat that an avid carnivore, like myself, would eat was all lamb from the farm. I do not eat any chicken, I do not eat any pork, I do not eat any beef; the only thing I eat is lamb, and it comes from the farm and I eat that at a very high rate. The intake that I get from that is significantly lower than the tolerable daily intake established by the European Food Safety Authority as being safe.

The CHAIR — Just in terms of the PFOS levels in some people, they were quite high. How would you explain that if, according to the assessment you have done, there were relatively low levels of PFOS?

Mr RAMSAY — I am sorry, but he was responding to my question. Just rather than diverting — —

The CHAIR — I just thought exactly — —

Mr RAMSAY — No, this is strictly on the farm and the animals, the water and on-site testing rather than on PFOS levels in other people. I just wonder if we could deal with one, and then perhaps go on to others.

The CHAIR — I just thought it was relevant at that time, but fine.

Dr DREW — The second half of question A deals with the concentrations found on the site. I have not had a large involvement — I have advised the consulting company that did that risk assessment; I did not do it myself — but that assessment has indicated that the concentrations of PFOS on the site are safe. That work was also reviewed by the EPA auditor, and he reached the same conclusion.

What I was involved with was assisting the CFA in interpreting the investigation of water concentrations on the site. Again, there were two sorts of water which were investigated. The first was domestic potable water. Every tap, shower and toilet system that could be found on site was sampled — more than 500 samples. In that water no PFOS was detected in any sample, again using a sensitive analytical method.

The other sort of water that was measured was what we might call industrial water — that is, the water that was used for firefighting training purposes from the fire hydrants that was not intended to be drunk and indeed was not drunk, because CFA informed me that during training bottled water was available for people. I cannot remember the exact number of samples, but the majority of those samples were less than 1 microgram per litre of PFOS. There were a few samples above that; one in particular was from a fire hydrant which was rarely used.

Mr RAMSAY — What do you think was the risk of accidentally taking in some of the fire training water during firefighting training? Was there any element of risk?

Dr DREW — Negligible — absolutely negligible; very, very low.

Mr RAMSAY — We then might move on to the Chair's question: why would there be discrepancies in the measurement of PFOS in some firefighters? I think that was where you were going, Bronwyn?

Ms WARD — Not just them, also neighbouring properties.

Dr DREW — With due respect, Madam Chair, the PFOS measurements in personnel from Fiskville were not very high.

The CHAIR — I was talking about from the farm.

Dr DREW — They were also not very high.

The CHAIR — I understand they are comparably high to what the background level of the population is.

Dr DREW — They are higher than background levels in the population, but not much. If you were to look — —

The CHAIR — How many times as much would you say?

Dr DREW — If you were to look at figure 6 in the information I have provided the committee — —

The CHAIR — Just in terms of levels, how many times higher was it?

Dr DREW — Less than two times higher, whereas the safe level is 20 times higher. If you look at figure 6, on the right-hand side of figure 6 — —

The CHAIR — Page?

Dr DREW — That is on page 18.

The CHAIR — For the purposes of Hansard, the document you are referring to is your statement to the Fiskville inquiry.

Dr DREW — That is correct.

The CHAIR — From your company, ToxConsult.

Dr DREW — Correct. On the right-hand side of that figure there is a whole heap of dots. They represent the serum concentrations for all the people who were tested at Fiskville and also include the farm results. You will see there are only four above the background concentration, and right at the top of that figure you will see a broad dotted line, which represents the level at which we anticipate there to be no harm to a person. There is a big difference between the serum no-effect level in humans and the concentrations that were measured.

The CHAIR — We are not scientists. All we are trying to establish is some understanding, because we have heard from different people who have different views about what PFOS does in terms of the environment — that it is persistent, that it is toxic — and what it actually does to people. I suppose that is what this committee is trying to understand, because there are various views. Would you agree about safe levels of PFOS and what may or may not happen to people who are exposed to PFOS?

Dr DREW — There is uncertainty with what health effects might be possible at high concentrations of PFOS. I think you need to keep in mind that the worker studies, they had PFOS concentrations which were 100 to 500 times higher than the background — the general population — and no specific adverse effects or illnesses have been identified as a result of PFOS in that population. I think that the confusion arises because with epidemiology studies of the general population from around the world in which people have the same concentrations as you and I, the information in some of those studies are showing an association with a concentration of PFOS in the serum. Now, an association is not the same as a causation.

The CHAIR — Does that mean that there is not enough proof yet?

Dr DREW — I actually would not put ‘yet’ at the back of that. The data that is coming out is actually indicating that we should have a lot lower level of concern regarding PFOS than we had 8 or 10 years ago when we did not have that information. None of the agencies are using the epidemiology data to set guidelines. They are all using the animal toxicology information. The problem with the epidemiology data is that some studies are showing an association, which is not the same as a causation. For the same end point, other studies are showing no effect.

The effects that have been associated are very small and clinically insignificant. The associations are very weak, not statistical, and recently, last year, a study was published which demonstrated or showed a strong, rather than a weak, association — a strong association — for the protection of colorectal cancer in humans. That is one of our most significant cancers. But that is just one study, and it needs to be confirmed, as do the studies which show a positive correlation with effects. For example, I have looked at 18 epidemiology studies in the general population which have investigated birthweight in mothers and correlated the foetal birthweight with PFOS concentrations. Nine of those studies show an association; nine do not. Of the studies that show an association, all of the babies are within the normal range that you would expect for a baby.

The CHAIR — Yet you said nine said that they did show an association and nine did not, so is that your interpretation that they were within the normal range?

Dr DREW — No, the data in the papers — —

The CHAIR — But not the conclusion of the paper?

Dr DREW — No, the conclusions of the paper and the data in the paper showed that the weights are within the normal range.

Mr RICHARDSON — Thank you, Dr Drew, for coming in today. Just a question about the Stockholm convention: can I get your thoughts on the Stockholm convention and listing PFOS as being banned and bioaccumulative and toxic? What are your thoughts on that?

Dr DREW — Again, I would respectfully correct you in that the Stockholm convention has not banned PFOS. I have here an extract from an OECD publication that came out just a few months ago in which it summarises the Stockholm convention in relation to PFOS. I would just read a little bit for you:

Inclusion under Annex B restricts, but does not eliminate, the production and use of PFOS and related compounds. This restriction (rather than ban) allows for the production and use of PFOS —

and they go on to list a number of uses.

Listed in those allowed uses are firefighting foams. Annex B also lists applications for which specific exemptions must be granted in order to produce or use PFOS. And there is a whole heap of those. The most pertinent in relation to background exposures is the restriction — not ban, the restriction — on the use of these chemicals for anti-stain, anti-water repellent properties on carpets, leather, apparel, textiles and upholstery; and in paper and packaging, particularly food paper and packaging; coatings, paints; and rubber and plastics. So to answer your question, the Stockholm convention has not banned PFOS; it has restricted the use, but there is a list of allowed uses as well.

Mr RICHARDSON — So do you not have a problem with its continued operation in Australia in the absence of Australian standards?

Dr DREW — I think it is an appropriate position for PFOS to be phased out, as it has been. I think that that is a good thing because it is persistent in the environment for a long time.

Mr RICHARDSON — And the human effects you are referring to, what is the time frame for that set of human effects that has been analysed?

Dr DREW — The factories that were making perfluorinated chemicals leading to the synthesis of PFOS started doing that in the 1950s. In that time folks in America, when they had a job with a company, it was virtually a job for life — they did not move jobs very much at all — so of that cohort of about 3500 people, about 2000 of those have been followed through. So the studies have been investigating these individuals for a few decades. Even now some of them have what I would call high concentrations of PFOS — that is, it is more than 1 milligram per litre, as opposed to 0.1 or 0.2 — and no specific adverse health effects have been identified. If PFOS was going to produce adverse effects or harm in individuals, we would expect to see it in this population, which is the highest exposed population in the world.

Mr RICHARDSON — Finally, Dr Drew, what should the Australian standards be set at? Australia has not enacted standards yet. What in your view should be the standards?

Dr DREW — Could I ask what standards you are inquiring about?

Mr RICHARDSON — So in serum, in water — what standards should Australia set in accordance with the international authority?

Dr DREW — I understand that in early December the enHealth Council of Australia are holding a summit on PFOS with the objective of initiating the generation of such standards. For drinking water it would appear that a concentration of between 0.2 to 0.4 micrograms per litre would be safe for the whole population to drink over their lifetime. That would include infants as they progress through. In relation to the safe serum concentration, it is my personal view that a safe serum concentration for adults is 2 milligrams per litre, but for children, because of uncertainty in the information, a concentration of around 0.8 milligrams per litre would not be a cause of concern.

Mr TILLEY — Thanks, Dr Drew, for giving your time today. I want to close off on the issue in relation to the Stockholm convention. In your expert opinion, with the practices that we are currently using in Australia, would it make any difference at all whether Australia was to sign up to the current Stockholm convention?

Dr DREW — It probably would not, and the reason I say that is that NICNAS, who have the carriage of evaluating and incorporating risk reduction management activities for the use of industrial chemicals, have already started down that track, and the same thing would happen if Australia was to formally sign up. So the formal signature, I think, would be political window-dressing.

Mr TILLEY — Moving on more specifically to Fiskville if I may, but before I go into that, Doctor, have you ever throughout your working career made a mistake?

Dr DREW — Of course.

Mr TILLEY — And when you have made a mistake, what have you done?

Dr DREW — Obviously corrected it. But are you asking me something specific?

Mr TILLEY — It is not necessarily a leading question, just in general terms, in your professional working career. We all, without putting words in your mouth, are imperfect humans; and, yes, we all make mistakes. I am just getting that for the record. Would you try to cover it up, or would you do something about it?

Dr DREW — No, absolutely not cover it up. I have been a toxicologist and health risk assessor for more than 35 years, and I am very careful to maintain my reputation for providing expert, independent and unbiased advice to clients. If an inadvertent error has occurred, either by overlooking something or a miscalculation — and I cannot remember too many of those — the client would be immediately advised, and if I was doing the work for a government agency, the agency would be immediately advised. But we have a number of checks and balances to help ensure that does not happen.

One of those checks and balances is to get our work to be peer reviewed by other scientists. For the Fiskville health risk assessments I have been peer reviewed not only by Professor Brian Priestly but also by the chief medical officer and his technical staff, the EPA-appointed auditor and his toxicological support team. I have been reviewed by the then Department of Environment and Primary Industries and their staff and by the chief scientist to the department of primary industries. So by my account at least five or seven independent scientists have reviewed the Fiskville health risk assessments, and they have all agreed to the conclusions — those conclusions being that there is a very low likelihood of harm arising from exposure to PFOS on the Fiskville site or originating from the site.

Mr TILLEY — If I may ask in plain English, without too much technical jargon — you have been very frank with us today, and I hope to get that to continue — but during the course of this inquiry we have heard from witnesses, there have been other things that we have read in public commentary, there are things in the public domain, a lot of it is perception, so tell me, when you went and entered the gates at Fiskville were you entering the end of days? Did the bogeyman live at Fiskville or his younger brother? Because a lot of this stuff has been scaring the pants off people?

Dr DREW — No. When you enter the gates of Fiskville, there is an extremely low risk of harm. There is — —

The CHAIR — In terms of PFOS or any chemical?

Dr DREW — In terms of PFOS, and the environmental auditor is also indicating there is a low risk of harm from other chemicals or other chemical residues that may be on the site. I think the media has had a role in sensationalising the issues at Fiskville, and it certainly created a lot of anxiety with the Fiskville staff and with the farm neighbours. It is understandable the concern is there when they read it in the newspapers and they have no other information to be able to judge it, and as you say, they are not scientists.

The CHAIR — Again, the newspaper articles talked about all sorts of exposure to all sorts of chemicals. Are you talking about generally with all the newspaper articles and all the chemicals or just PFOS?

Dr DREW — I think the newspaper articles are talking generally about Fiskville, but they do invoke the name of PFOS as a specific stick to wield.

The CHAIR — If I may, significantly, the reason why Fiskville was closed this year was because of the issue of PFOS.

Dr DREW — I obviously cannot comment on the thinking that went behind that, because I was not involved in the decision. I must admit I was surprised at the decision.

Mr TILLEY — So going on, you have come on board and I just need to qualify a few things. At any time of your involvement working across the Fiskville issue, and you have dealt with government widely over many years as well, have you ever provided written or oral advice to the chief health officer in relation to PFOS at Fiskville?

Dr DREW — I have.

Mr TILLEY — Separate to the report?

The CHAIR — I think this has already been covered.

Mr TILLEY — I just want it absolutely directly.

The CHAIR — He already answered that question.

Mr TILLEY — We are talking about reports, but has there been anything else? Have there been any oral conversations apart from what has been provided in your reports?

Dr DREW — When the neighbouring farmer approached CFA about potential concern of contamination coming from Fiskville onto his property, we arranged for a pilot study using just four ewes. From that we did some mathematical modelling to predict what the concentrations may be in the ewes. That information was presented to the chief medical officer and his team — it was a team of thousands — in relation to the interpretation of that information and the recommendation that a study should be done. The design for that, as I said previously, was assisted by scientists from other departments, and as that information became available, the chief medical officer and his staff were kept briefed orally — and not only the chief medical officer, but DEPI and biosecurity as well. In relation to providing oral information, the oral information was provided to keep them up-to-date with the data as it was rolling in.

Mr TILLEY — Thank you. In closing, if you are able to provide the committee with an opinion from your expert background — with the stock contamination notice that was issued, do you have any view on that in particular? Was it a knee-jerk reaction with the bodies that you had, was it safe practice or otherwise?

Dr DREW — I am not really in a position to provide comment on that. I think that the department works under its legislative framework and that the individuals responsible for managing that framework and for managing the activity of the department within that framework did what they saw was appropriate at the time. Again, I was surprised.

Mr TILLEY — And just a closing one, we have heard evidence in recent days about the numbers of experts. It was a question of toxicologists and entomologists. Has there been a good balance of both toxicologists and entomologists providing advice when it comes to PFOS and PFOA?

Dr DREW — In relation to Fiskville?

Mr TILLEY — Yes. That is what we heard the evidence on.

Dr DREW — Why on earth would one ask an entomologist for advice regarding human health effects?

Mr TILLEY — That is the question I am asking you, Doctor. I am asking for your view on that.

Dr DREW — It is a ridiculous proposition.

The CHAIR — Can I just clarify one of the questions Bill Tilley raised about the media and so on — do think that there was any cause for concern for people who had been exposed to any of the chemicals that were used at Fiskville?

Dr DREW — I have not done any specific work for other chemicals that may have been used at Fiskville, so it would be inappropriate for me to comment on that.

The CHAIR — I just thought that you did answer more broadly, and I was just trying to understand whether that was the case or not, in terms of the media reports.

Dr DREW — I am really reluctant to comment on hearsay that appears in media reports. Risk management decisions are best made on objective data, but of course taking into consideration the perceptions and concerns of the community.

The CHAIR — There was, for example, the Monash Health study of those that had worked at Fiskville. I guess that is more what I am talking about, that sort of data.

Dr DREW — I have read that study. The Monash study identified a higher level of certain tumours in Fiskville personnel as compared to the general population. The Monash study was also very careful to point out that they had not controlled for some of the known risk factors for those tumours. They were also very careful to point out that the study did not provide information in relation to causation of those tumours.

The CHAIR — I think you have mentioned that in terms of some of the other human health studies that have been done around PFOS. Again, you are saying there has not been causation factors, only association? Is that what you are saying?

Dr DREW — No, I think there are two different things.

The CHAIR — Yes, of course they are two different things.

Dr DREW — They are two different things — two different sets of chemicals. The Monash study is just a single study, whereas for PFOS there is a collection of epidemiology studies which are indicating, as a weight-of-evidence scenario, that there is less concern regarding these chemicals now than there was 8 or 10 years ago.

The CHAIR — That is the perfluorinated chemicals?

Dr DREW — Correct.

The CHAIR — I will just quickly refer to a couple of the studies in the bibliography you have provided. I have not read — but there is one here that says 2013 ‘Blood plasma concentrations of endocrine-disrupting chemicals in Hong Kong populations’, *Journal of Hazardous Materials*. What was your reference to that; what was that about?

Dr DREW — Sorry, can you — —

The CHAIR — It is on page 39 of 40 pages — page 39 of your report.

Dr DREW — And who is the author, again?

The CHAIR — Wan, H. T., Leung, P. Y., Zhao, Wei — it is on the very bottom of page 39.

Dr DREW — That reference is amongst a group of references which were used to identify what the PFOS concentrations would be in a population that were not workers making the stuff, did not live near a manufacturing plant or did not live in a contaminated area. That was part of the literature review that we undertook to help identify what would be an upper end background level of PFOS in people.

The CHAIR — That was or was not saying that PFOS may be something that disrupts the endocrine system, because this is something that has been referred to? I am asking the question. I do not know the answer. I just thought I would ask.

Dr DREW — The WHO definition of an endocrine disruptor is an agent that is able to interact with endocrine systems that results in an adverse effect.

The CHAIR — I was just asking about that study; that is all.

Dr DREW — Okay. This study is only measuring a range of chemicals that are thought to have interaction with the endocrine system.

Ms WARD — Thanks, Roger. I want to go back quickly to the table that you mentioned before, on page 18 of your submission to us. There is a line in the US data that goes up to just about 0.2. What is that from? Do you know what that refers to?

Dr DREW — Sorry. Could you repeat for me?

Ms WARD — In your graph on page 18 you have got your dots indicating PFOS levels in Europe, US and Australia. There is a line that goes up to the top of the US that would be parallel to around about 0.21 or thereabouts. What does that line refer to?

Dr DREW — That information — the red dots represent the average for the population.

Ms WARD — Yes. I understand.

Dr DREW — The bars represent the range for individuals.

Ms WARD — So the range that has been determined or the range that exists?

Dr DREW — The range that has been measured in individuals.

Ms WARD — The highest one there, what measurement was that? What test or study was that?

Dr DREW — That was a measurement that was done in the US general population. I cannot remember what the specific study was.

Ms WARD — So would it have been the West Virginia Ohio?

Dr DREW — No. We were very, very careful not to include populations that could have been exposed environmentally through contamination, so these represent the range of background concentrations for the general population that would occur from normal day-to-day living.

Ms WARD — So why would it be so high compared to the averages if it is normal day-to-day living?

Dr DREW — The thing about an average is that 50 per cent of people are below it and 50 per cent are above it, so using an average as a comparison is actually fallacious. You need to have the upper range, which is exactly the same as what a clinician will do if he or she is monitoring a therapeutic blood concentration. You need to get it within a range. Below, you are not having the desired effect, and above the upper end of the range, you will have toxicity. For individuals you need that range, not the average in the middle, because it is not going to help you if you are an epileptic and you are tailoring your drug concentration for the average and it is not working.

Ms WARD — We have had submissions and hearings where we have learnt that, using the milligram measurements, firefighters on average are around about 0.08 milligrams of PFOS in their blood, in their serum. It seems to be quite a difference between 0.08 to 0.2, or not so much?

Dr DREW — Between 0.08 it is only a threefold difference, and 0.08 is an average. I have not seen that data. I am only able to comment — —

Ms WARD — That was the data that was provided to us by Jochen Mueller, for example — one instance.

Dr DREW — Jochen's work is an average. If the average is 0.08, and let us say the range goes up to 0.2, that is good. It is indicative of a lack of likelihood for harm to occur, even though there is an increased PFOS serum concentration.

If I may, I will bring you back to one of the earlier things I said — that is, a lot of the international agencies are saying that because you have PFOS concentrations in your blood above the average, that is not a cause of concern and neither is it an indication of impending adverse health effects.

Ms WARD — The study that I referred to earlier, where people had looked at the PFOS levels in blood serum — the C8 health project — was a paper published in 2010 which looked at associations between PFOA and PFOS and serum lipids in children and adolescents that was in that mid-Ohio river valley. That was to get back to you with that information. On page 3 of your statement to us you say:

I have not personally conducted the environmental investigations but rather have used the information from them to assess the possible risk of harm to CFA personnel and others who may have been exposed to PFCs at Fiskville.

Did you use testing provided by the CFA that was undertaken by the CFA?

Dr DREW — No. The CFA engaged — —

Ms WARD — Central Highlands Water?

Dr DREW — I do not think they engaged Central Highlands Water.

Ms WARD — They had been doing their testing for a number of years, the private laboratory part. Central Highlands Water did their own testing, but they were also contracted by the CFA to undertake testing as well — their private laboratory.

Dr DREW — I am unaware of that.

Ms WARD — So you are unaware of where the CFA obtained their results from that they submitted to you?

Dr DREW — No. I am unaware that CFA contracted that water authority to do testing.

Ms WARD — So where did the testing come from that you have analysed?

Dr DREW — The CFA engaged a number of environmental consultancies whose expertise lies in taking environmental samples — soil, water and air if necessary. Those consultancies then submit their samples to independent laboratories for analysis. They receive the results, write a report and give that to CFA. That work is subject to a range of checks and balances to ensure the integrity and veracity of the data. That is one of the things that the environmental auditor looks for when he has assessed the site. I use the reports from those other independent environmental consultants.

Ms WARD — So this is what happened in 2013?

Dr DREW — In 2013, in relation to?

Ms WARD — I think some of the testing that you have analysed was from 2013. Is that right?

Dr DREW — The sheep testing, yes.

Ms WARD — No, the testing of the water and the soil at Fiskville.

Dr DREW — No, the soil in the farm — —

Ms WARD — No, Fiskville, not the farm — Fiskville.

Dr DREW — At Fiskville? I have not interpreted the soil concentrations. The water concentrations that I have interpreted is the data that was gathered in early 2015.

Ms WARD — One thing I am interested in is this idea of half-lives. We know that in humans PFOS has a half-life of around 5.4 years on average, so what would the PFOS and PFOA readings have been to people attending Fiskville or living and eating fish in Fiskville in 2007? This is when the CFA started to cease using this product.

Dr DREW — In the health risk assessment that examines the risk of harm from eating fish there is a section in that report which did back extrapolate the serum concentrations that we measured in 2014 back to, I think it was, 10 and 15 years previous, and those concentrations — we made the assumption that no further exposure would have occurred, so we asked the same question that you asked: what were the concentrations then? Those concentrations were approximately fourfold higher but still significantly below the concentration associated with lack of harm.

Ms WARD — One of the things that I have read talks about the testings. We know there have been a number of tests on rats, and I think there have been a couple of tests on monkeys. I have read that female rats have a half-life of 4 hours in terms of PFOS going through them. How can this tell us what happens to humans when we do have this half-life of 5.4 years?

Dr DREW — Female rat data is not the only data that is used. The data from long-term studies in rats allows them to reach the steady state, and one of the long-term studies in rats did show at high concentrations benign liver tumours occur. In that particular study the rats with the two highest doses lived significantly longer than the animals that did not receive PFOS. One of the things about the effects of PFOS is that they are directly related to serum concentrations, and so it really does not matter if you have a short half-life or a long half-life, if both animals are at the same serum concentration and maintained at that, then you would expect the same effects.

Ms WARD — PFOS being in a rat for 4 hours?

Dr DREW — No, tests are not done like that. You give the animals a dose every day, and so you maintain it. It is not there just for 4 hours.

Ms WARD — No, it has a half-life of 4 hours. So what you are putting in the morning is gone by the afternoon?

Dr DREW — No. It is incorporated into feed, and they eat all the time. If I were to give you a single dose — —

Ms WARD — So how are half-lives calculated?

Dr DREW — Half-lives are calculated on the terminal elimination. So you stop giving the stuff to animals and you measure how quickly the concentration falls off.

Ms WARD — Do you not have to stop giving it to them in order to work that out?

Dr DREW — I just said that. You stop giving it to them and then you follow the decline going down.

The CHAIR — It follows on from what you were saying before and what I was asking you in terms of differences of opinion and what is harmful and what is not. Senversa came into see us, and I think you referred to some of the consultants who have been engaged by the CFA or the EPA to do work around Fiskville. We heard evidence from Senversa that they cited a safe level of PFOS for dermal contact being, I think it was, 4 micrograms per litre, and in their report they recommended that due to the range of circumstances at Fiskville, that dermal contact could be increased to 80 micrograms per litre. But we also were told, just to confirm, that you reviewed their findings and you recommended that the level to be increased could be 2300 micrograms per litre. Is this an example of differences in different points of view? How do you explain your view versus Senversa's proposal based on, I presume, information that they had received?

Dr DREW — Senversa was using information to generate a screening concentration. They had not taken into consideration or did not have access to the specific information that relates to how much of PFOS on the

skin actually goes through the skin. When you use that specific data, very little actually penetrates the skin. If very little penetrates the skin, you can have a higher concentration on the skin than what they assumed.

The CHAIR — You are saying that in terms of the science of skin penetration or the clothing that is used or what was — —

Dr DREW — No, in relation to water being on the skin, the concentration of PFOS that could be in that water was higher than that calculated by Senversa because the actual skin penetration of PFOS was much lower than they assumed.

The CHAIR — But they received their information from other sources?

Dr DREW — I do not know where they received that information.

The CHAIR — And the information that you used was particular studies or well-known undisputed facts within your area of research and science?

Dr DREW — It comes from specific studies done with animal and human skin.

Ms WARD — They only mentioned one study, I think, that they were aware of. They mentioned that they were only aware of one study regarding skin penetration.

Dr DREW — Yes.

Ms WARD — What you think of the statement by Philippe Grandjean and Richard Clapp in a paper published this year, who wrote:

Existing drinking water limits are based on less complete evidence that was available before 2008 and may be more than 100-fold too high.

That the data we are working off was based on — —

Dr DREW — Whose drinking water standard is he talking about?

Ms WARD — He is talking about the US EPA drinking water standard.

Dr DREW — Why is he saying that it is too high?

Ms WARD — He is saying that because he thinks that more evidence has been produced after 2008 that indicates that levels are currently too high, and that they need to be lower.

Dr DREW — I would need to have a look at that evidence to see whether that is actually a reasonable thing to say. I also, however, know of a number of agencies around the world who have landed on a drinking water guideline of 0.2 to 0.3 micrograms per litre as being safe for the general population, including infants.

Mr McCURDY — Dr Drew, as a leading toxicologist and someone who has spent a lot of time at Fiskville and understanding the issues at Fiskville, before they closed Fiskville down, was your opinion sought at all?

Dr DREW — Sought by whom?

Mr McCURDY — By the government, before it closed down Fiskville earlier this year.

Dr DREW — No.

Mr McCURDY — So in terms of water levels, you responded to Mr Tilley's question before, saying you were surprised by the decision. Would you like to elaborate at all on that?

Dr DREW — The domestic water supply had no detectable PFCs in it at all. The vast majority of the industrial water used for firefighter training had very low concentrations, and the industrial water was not used for drinking — bottled water was made available — and so the only exposure that would have occurred during firefighter training would be incidental ingestion or water on the skin. As I just said, PFOS does not absorb through the skin, and the incidental ingestion, the risk associated with that, is negligible.

Ms WARD — So you would disagree with Jochen Mueller, who says that it is not clear how we absorb PFOS or how PFOS enters our bodies?

Dr DREW — If Jochen actually said that, I would disagree with it. I am not disputing that you are saying that is what he said, but I know Jochen reasonably well and I would be surprised if he made a statement such as that.

The CHAIR — Just following up on the question I asked, as a further clarification, regarding the revising of the level at which dermal contact is considered safe, when I asked you about that, you advised that it ought to be a higher level, and you explained that the reason was that Senversa was looking at information that was about how much absorption there can be through the skin. I think that is what you were saying; it is the difference between what they were proposing and what you were proposing.

Dr DREW — That was my recollection, yes.

The CHAIR — What we have here is the Senversa witness statement to the inquiry that included a lot of information about their testing and how they came to their conclusions. I just want to read out a section of this to you. This is what Senversa say when they recommend that the level for dermal contact is 8 milligrams per litre:

Some reviews indicate that dermal absorption of PFOS is possible. Experimental studies show that it is in fact poorly absorbed through the skin. While a dermal permeability constant is available from the risk assessment information system, the value is theoretically derived and is not supported by the available experimental evidence.

As I understand that, they did not include a premise or an assumption that there was an ability to absorb it through the skin. In fact they agreed with you on that point, but they still proposed the 8 milligrams per litre.

Dr DREW — The information on the risk assessment information system from the US EPA is theoretically calculated using some of the physical and chemical properties of PFOS. PFOS and the other perfluorinated chemicals have really unusual physical properties. If you were to take PFOS, add it to water and shake it up, you would end up with three layers. PFOS sits in between the water and the oil, and that theoretical calculation is demonstrably wrong. It is out, it is wrong, by, if I remember rightly, something like 125 000 times, simply because the methodology that has been used for other chemicals, such as dioxins, PCBs, chlordane et cetera — those chemicals which actually partition into the fat of our bodies — was worked out for those chemicals. PFOS does not obey those rules.

The CHAIR — Okay, so that is in your view.

Dr DREW — No, that is demonstrably so. It is a chemical fact.

The CHAIR — No, sorry, not that. What you were saying is that you do not agree that the risk assessment information system was the right assessment to be used on PFOS.

Dr DREW — Correct, and that is not just my opinion.

The CHAIR — That is what I was asking you about, whether that is in your opinion or whether that is a universally accepted view of that process. Is that no longer one that is used for PFOS?

Dr DREW — All of the risk assessors that I know do not use that information from RAIS.

Ms WARD — What period were you employed at ICI/Orica?

Dr DREW — Could you help me with the relevance of that?

Ms WARD — I am just curious. I know you have got a very extensive background, and I know that you worked with them for 10 years, but I was just interested. I cannot find what period you were employed by ICI/Orica.

Dr DREW — It was 1990 to 2000.

Ms WARD — Would you agree that in that period that Joe Woodward from the New South Wales department of environment and conservation said that this would be the most serious groundwater contamination issue in Australia that was created by ICI in a period going back to the 1940s?

Dr DREW — Sorry, what are you referring to there?

Ms WARD — There have been a number of papers produced around pollution in Botany Bay in New South Wales as a result of ICI's ongoing work there, and Joe Woodward, who was from the New South Wales department of environment and conservation is recorded as saying that he believed it would be the most serious groundwater contamination issue in Australia. Would you agree with that?

Dr DREW — The groundwater contamination you are referring to relates to contamination resulting from the manufacture of chlorinated solvents at ICI, which I believe went on from the 1940s up to the 1960s, and at that time it probably was the biggest groundwater contamination in Australia.

Ms WARD — In 2006 Graeme Richardson, the senior manager of Orica, said that the attitude of the company towards the contamination changed absolutely dramatically in the early 2000s. What do you think changed — or had you already gone by then?

Dr DREW — I cannot comment on that.

The CHAIR — Thank you, Dr Drew, from coming in today. As I understand it, the secretariat spoke to you about your statement being able to be made public without the appendices. Is that okay with you?

Dr DREW — Correct.

The CHAIR — Thank you very much.

Witness withdrew.