

**STANDING COMMITTEE ON  
ENVIRONMENT AND PUBLIC AFFAIRS**

**INQUIRY INTO THE IMPLICATIONS FOR WESTERN AUSTRALIA OF  
HYDRAULIC FRACTURING FOR UNCONVENTIONAL GAS**

**TRANSCRIPT OF EVIDENCE  
TAKEN AT PERTH  
MONDAY, 17 FEBRUARY 2014**

**SESSION ONE**

**Members**

**Hon Simon O'Brien (Chairman)  
Hon Stephen Dawson (Deputy Chairman)  
Hon Brian Ellis  
Hon Paul Brown  
Hon Samantha Rowe**

---

**Hearing commenced at 10.22 am**

**Professor TARUN WEERAMANTHRI,**  
**Executive Director, Public Health, Department of Health, sworn and examined:**

**Dr MARTIN MATISONS,**  
**Principal Toxicologist, Department of Health, sworn and examined:**

**The CHAIRMAN:** On behalf of the committee I would like to welcome you to this hearing. Before we begin I must ask you to take either the oath or affirmation.

[Witnesses took the oath or affirmation.]

**The CHAIRMAN:** Thank you very much, doctor. Gentlemen, you would have signed a document titled “Information for Witnesses”. Have you read and understood that document?

**The Witnesses:** Yes.

**The CHAIRMAN:** These proceedings are being recorded by Hansard. A transcript of your evidence will be provided to you. To assist the committee and Hansard, could you please quote the full title of any document that you refer to during the course of the hearing, for the record. I remind you that your transcript will become a matter for the public record. If for some reason you wish to make a confidential statement during today’s proceedings, you should request that the evidence be taken in closed session. If the committee grants your request, any public and media in attendance will be excluded from the hearing. Please note that until such time as the transcript of your public evidence is finalised it should not be made public. I advise you that publication or disclosure of the uncorrected transcript of evidence may constitute a contempt of Parliament and may mean that the material published or disclosed is not subject to parliamentary privilege. Professor Weeramanthri, do you wish to make an opening statement?

**Prof. Weeramanthri:** I do.

**The CHAIRMAN:** Please do so.

**Prof. Weeramanthri:** Thank you. First of all, thank you, Mr Chair, for the invitation to appear before this committee. As I said in my covering letter for the submission, the submission is given in my statutory role as Executive Director of Public Health. I would also like you to note that Martin Matisons, who is appearing with me, fills the departmental role of Principal Toxicologist and he has also been the Department of Health’s representative on the inter-agency working group. He is an expert on this matter from a health perspective.

My submission goes to terms 2 and 3 of the committee’s terms of reference—broadly around chemicals and groundwater issues. Without going through the written submission line by line, I ask you to note that it starts with a description of why the powers of the Executive Director of Public Health are actually quite limited in this matter under the Health Act 1911 and, as you would know, the main regulator is the Department of Mines and Petroleum plus other regulators. The powers that we do have under the Health Act 1911 are mainly reactive, so our suggestions in the submission are about the appropriate role of the Department of Health in the overall regulatory framework as that comes together. Without having the determinative regulatory powers, how can we still contribute to the overall regulatory system in working with other government agencies?

One point that has been clarified since we put our submission to the committee is that we now know that all chemicals used in the fracking process will be disclosed and publicly available. That gives

---

us a deal of reassurance in terms of our ability to make health assessments of the process. At the end of the submission we divide our recommendations broadly into two groups: a set of strategic recommendations and a set of technical recommendations. The strategic recommendations include the development of a MOU around chemical risk assessment with the Department of Mines and Petroleum. This will encompass some of the issues in the submission. Lastly, what I would like to say is that from a health point of view we are very keen to be aware of, and get, the best science around this matter, including the international literature and the international and national experiences around industries elsewhere as well as our overall experience with regulation around the mining and resources industry in this state. What we then have to do with all of that is create a regulatory framework that is specific to Western Australia and this industry and the variety of circumstances in which it might come to bear.

Whilst we are aware of the literature elsewhere, there are clear differences here in Western Australia that we also have to take into account. The most obvious is that some of the literature refers to coal seam gas whilst here it is about shale gas; so we have to be specific in terms of what we take and how we apply it to Western Australia. I will end my introductory statement there.

**The CHAIRMAN:** I thank you very much for that and for your written submission to the committee. Could you please outline for us the department's role in the approval process for wells that are to be hydraulically fractured and obviously in the course of that indicate your interaction with the Department of Mines and Petroleum?

[10.30 am]

**Prof. Weeramanthri:** Yes, broadly; I think it is important to note that we are still at a fairly early stage in this whole process with speculative exploration at the moment and it will probably be five to 10 years before the industry can potentially go to commercial operation. I believe that the Department of Mines and Petroleum will produce a full regulatory framework in the next six or so months and what we will do is be involved in the inter-agency working group and develop specific memorandums of understanding agency to agency. We will also be involved in groups that are looking at the new science because the regulatory system evolves over time just like it does with any other industry. As new science comes to bear we will have to assess the impact of that on our regulatory system. That is the long way around of saying that clearly the Department of Mines and Petroleum will have regulations as they do now under their acts that deal with well integrity and engineering standards but what we will then do is assess that and assess our degree of confidence in terms of their regulations and how that impacts on our assessment of health risk. Our role is to continue to give feedback to the Department of Mines and Petroleum on its adequacy in regard to the act and regulations and our expert input to expert assessment of whether it is sufficient to meet our understanding of the risks and how best they can be mitigated. If they have best practice engineering standards around well integrity for example, my initial read of the literature is that that would be very, very reassuring to us in terms of any risk of seepage of fluids through the well and into groundwater. I might ask Martin if he has anything to add to that.

**Dr Matisons:** That describes the process fairly well. We will comment on the proposals as they come in and look at the specific health-related issues. There will be some preferred proposals —

**The CHAIRMAN:** Proposals for what, Dr Matisons?

**Dr Matisons:** In terms of fracking and well drilling.

**The CHAIRMAN:** Here, when you say proposals, I am keen to see whether you are talking about proposals for a regime to be created led by the DMP or are you talking about proposals as in individual applications to drill a well?

**Dr Matisons:** I was looking at the individual situation. Dr Weeramanthri has covered the whole regime processes, but we will advise the DMP on how we will look at individual proposals, how we will assess them and where our priorities will lie in terms of health risks.

---

**The CHAIRMAN:** Gentlemen, in both the submission and Professor Weeramanthri's opening remarks there seems to be a concern to make sure that public health is properly consulted in both the development of fracking regulations—for want of a better word—as well as assessing individual applications to explore or develop. Is that the case?

**Prof. Weeramanthri:** So when we provided our submission to you, Mr Chair, we provided it as the Department of Health's point of view and clearly a lot of the things that we wish to happen are, actually, already happening within the wider regulatory framework such as the disclosure of chemicals; some discussions from the science needs group about the importance of baseline monitoring et cetera. So, yes, I think everyone shares a concern to maximise the benefits of the industry and absolutely minimise any potential impact on health and environmental issues. That is shared; the question is: how you best do it? What we are saying in our submission is: clearly, we have limited regulatory power; we are not the main regulator. That happens with many health environmental issues. There is an overlap of regulatory functions. We are comfortable with that, but, given that situation, how do we maximise our inputs to the process. We are doing it through the interagency working group and we will see the outcome in the whole-of-government regulatory framework. It is important that the whole system of regulation be open and transparent to the public, so it is a really big step in terms of the disclosure of chemicals being open to the public. I think our concern is that the health considerations to be taken into account are actually shared by everyone. I think when you look at the history of this industry in other parts of the world, given that there are differences, many of the concerns expressed by the community do relate to health, public health and groundwater. I mean, I think that is why we are here and it is how we address those that we have to get right.

**The CHAIRMAN:** Thank you for clarifying that, it is an important part of our inquiries—how the various regulators within government interact with each other. I wanted to make sure that I have a clear understanding of where you are coming from. On that subject, I will just ask how progress is going between yourself—the department—and the DMP in developing a memorandum of understanding?

**Prof. Weeramanthri:** Most of the work at the moment has been towards getting the regulatory framework right. We have not done much work on the individual memorandum of understanding with the Department of Mines and Petroleum. The working group has been together now into its third year, we have also been involved in the science group since last year. I have met personally and been briefed by the deputy director general of the Department of Mines and Petroleum and the acting director general of Department of Mines and Petroleum. I am very comfortable with the degree of interaction between our departments at an officer level, as well as a senior policy level. It is coming together in the way that I would expect a sophisticated whole-of-government system to come together. We have, obviously, had experience with other issues so we know what needs to happen for best-practice regulation. You can see everyone being clear about their roles and responsibilities and clear on how they work together, and all of that should be open to the public. We have not yet done the work that is needed between us and the Department of Mines and Petroleum in terms of a memorandum of understanding. It is just an issue of priorities, we will work on that. Again, we are not rushing to do this tomorrow or next week, we have some time to do it properly and to do these things, kind of, in order. So no, we have not made much progress but we will get onto it.

**The CHAIRMAN:** One of the concerns that comes through in your submission was to ensure that public health as a statutory entity had input at the various stages, whether it be in casting an overall regulatory regime or in operational phases down the track. From what I am hearing now, you are satisfied, are you not, about how those matters are progressing now?

**Prof. Weeramanthri:** You are correct. Best practice says that we get involved early; we stay involved; we get our best scientists together with the engineers and other people; and we construct a

---

regulatory regime that actually evolves over time. We have had experience, without naming examples, where we were involved late in the process and, generally, the outcomes in terms of the public et cetera and confidence in the process are less good. The most recent good example I can point to is when we worked with the Water Corporation around the managed aquifer recharge process at Beenyup. It was a very complicated complex issue with significant public health concerns but an extensive community consultation process run by the Water Corporation—again we were at the back of the process—and very good outcomes and support for the process because it was an open and transparent process. I am just saying that we have that experience and we are now trying to—we are a bit earlier in the piece because it is still, kind of, early on in this industry—create that same confidence from the public around the regulatory regime and how our place in it is defined so people can be assured that health people are looking at the public health concerns, along, of course, with water people, environment people and mining people. So, yes, I am happy with how we are going so far.

[10.40 am]

**The CHAIRMAN:** It is very reassuring to hear all that. If it should come to pass that you are not satisfied in your role with a regime that is adopted, what would be your responsibility as executive director, public health, to do something?

**Prof. Weeramanthri:** My statutory responsibilities are quite clear, and they are mainly limited to reacting after the event. That clearly is not ideal but there are other regulators who are tasked by the Parliament with making sure that it does not get to that stage. It is not up to me to comment on the current legislative framework or government policy; that is the way it is. Given that, I think we can make it work. Hopefully, we never get to that situation. If we have a transparent monitoring program in place, all of that will be available to people so action will be taken well before it gets to a problem where there is any serious threat to public health.

**The CHAIRMAN:** Thank you for that. Your submission and our inquiries generally lead us to ask a question that you might decline to answer in view of your last response; that is, do you have adequate powers, through legislation or other means, to provide protection for public health in this manner?

**Prof. Weeramanthri:** The exact definition of my powers is in the written submission. I will not comment on government policy in terms of future legislation or changes to that, except to say that the government is on record as being committed to introducing a new health act, which will allow for a more flexible, more proactive risk management approach to a range of public health issues.

**The CHAIRMAN:** Is that a new health act or a public health act?

**Prof. Weeramanthri:** It is a new health act.

**The CHAIRMAN:** We will perhaps inquire as to the progress of that with other people. Before I hand over to my colleagues, I have some questions. I will just ask a general one: What are some of the risks to public health that fracking operations may cause? Do we currently have monitoring regimes that go far enough to adequately protect public health?

**Prof. Weeramanthri:** I can answer that in broad terms, and maybe ask Martin to provide some more detail. Generally speaking, the main risks to public health that we have focused on in this submission and which most people will talk about are risks to water supplies. That can either be groundwater or surface water and it can actually occur at various stages in the process, as I understand it. I do not claim to be an expert on the mining industry or the fracking industry, in particular, but obviously one gets briefed about these things. It can occur in the drilling phase even before fracking is undertaken. It can occur during the fracking process. Obviously, the fracking process involves mostly water under high pressure as one type of fracking plus chemicals plus sand and other proppants, and the chemicals are of particular concern. There are potential issues around whether there could be any connections between the fracks and groundwater supplies and/or

whether there could be any seepage from the well as it goes through aquifers. That is in general terms and that is why your question around well integrity is critical.

In terms of the other issue about deeper connections between the fracks, the distance between the aquifers and where the fracks originate, clearly shale gas is at least two to three kilometres below the surface and quite a distance from where most aquifers are. The literature suggests that if you have a vertical separation distance of over 600 metres, any risk to public health is very minimal because the vertical dimension of the frack rarely exceeds 500 metres. If you have that kind of buffer, you are not likely to be able to create a channel between the frack and the aquifer. There are also issues at the surface in terms of the wellhead but also the storage of water on the surface. As you know, the fracking fluid goes down but varying quantities come back up again and you have to do something with that water and chemicals. You have to either use it again after suitable treatment or you have to store it or dispose of it in some way. The general understanding a few years ago before I started reading about it would have been that most of the risks were below the surface. My understanding is that there are as many risks on the surface as below. That is general in terms of water. The other thing that is evident to me from reading the literature is how complex the water systems are—the connections between groundwater and surface water et cetera and the streams and the flows. You really do need to be an expert. These flows can reverse; it is not always one way to another. You really require the skills of geologists to make assessments about risk in particular areas. There are also other issues such as air pollution, which we have not gone into here. There are risks of an industry coming in above ground. In most industries the greatest risk to workers is through transporting things. You suddenly create a network of roads and people driving trucks et cetera. There are occupational health and safety risks that are not anything to do with the chemicals or the industry but to do with people getting to and from work. You also have a set of issues around the quantity of water you need, so regardless of the quality of water to do with fracking, you also have issues to do with extraction of water. Depending on whether you are at an exploratory phase or a full mining phase, you are going to require varying millions of litres of water. Where do you get it from? Can you affect the source of the groundwater and how will that affect potential supply to communities or towns in the region that may depend on that source of water? There are a range of issues. I have probably missed some.

**Dr Matison:** I think you have covered them all.

**Prof. Weeramanthri:** There are a range of issues. They are not always the obvious ones in terms of the public health risk.

**The CHAIRMAN:** Before we move off that point, we have a long history in this state of mining operations of various types, conventional oil and gas, drilling and so on. Are the challenges from a public health point of view much different with regards to hydraulic fracking operations or are they similar in many ways to the sort of things we have been dealing with for many years?

**Prof. Weeramanthri:** That is a good question. I think there are some differences. The issues around groundwater extraction are fairly fundamental in that presumably most of these operations are occurring in arid or semi-arid regions. The issue of requiring large volumes of water is a major one. That is shared with some other mining operations but it will be particular and constant with fracking. The other issue is the chemical issue. We have focused a lot on that. I think we are in a situation in which we can actually have world's best practice regulation in this state. Part of that is full disclosure of chemicals. When we look at the experience from other places in the world, we cannot be expert on everything that has happened everywhere but our sense is that it has been quite difficult at times in other places to get disclosure from companies around commercial-in-confidence considerations about exactly what is being introduced. We think that is absolutely vital. There are a large number of chemicals—as in a couple of hundred—that often potentially could be used. It would be up to the company exactly which they choose to use in any particular frack, and that would have to be disclosed. That, I think, is different. If we can get full disclosure of chemicals and

we can get proper monitoring, both baseline and ongoing, I think that is part of the key to getting this regulatory system right.

[10.50 am]

**The CHAIRMAN:** Thanks, professor.

**Hon BRIAN ELLIS:** I will just follow up on that one if I can because you stated at the beginning that you understand now there is full disclosure. Where did you get that information from?

**Prof. Weeramanthri:** The Department of Mines and Petroleum have said that they have now introduced this as a requirement, so we are assured by that.

**Hon BRIAN ELLIS:** So, you are assured by that and you have been part of the interagency working group that, I presume, had the responsibility of the draft of the new regulations. Were you part of that?

**Prof. Weeramanthri:** My understanding is that the development of new regulations is essentially held by the Department of Mines and Petroleum in terms of their act and their regulations. I am not sure whether the working group has had specific input to that. It might have had some advice or something, but I will ask Martin.

**Dr Matisons:** The interagency working group was not responsible for developing the regulations; it was the Department of Mines and Petroleum. The interagency working group has looked at various issues that may come up and provided advice, but it was not the developer of the regulations.

**Hon BRIAN ELLIS:** I am interested, then, that you are explaining what the interagency working group did. It does not sound like it had much influence, then. You were there for advice, really.

**Dr Matisons:** And to be informed as to what the processes are to provide advice back to the Department of Mines and Petroleum. It provided advice to the other regulators and departments that were within that group so we knew what was going on and provided feedback into various aspects in saying, "Okay. We see this is happening; maybe this is better" et cetera. It was really exchanges of information both ways.

**Hon BRIAN ELLIS:** I am trying to clarify in my mind whether you are satisfied with your role in the interagency working group. I am not sure that I am getting that feeling. Have you seen the draft regulations and are you satisfied with them?

**Prof. Weeramanthri:** I might answer that first. If an agency owns an act, and we own multiple acts, whether it is the Health Act or the Radiation Safety Act et cetera, we take responsibility for developing regulations under our act. The fact that the Department of Mines and Petroleum owns those acts, it will take prime responsibility in terms of putting forward legislative options in terms of change. That is just part of the normal process, so we are very comfortable with that. But we will take advice, obviously, from other agencies if they are impacted. Obviously, then, you also have got a chance to provide comment when it goes to cabinet et cetera. That process is standard. They have made a series of changes to their regulations, and the latest set of draft regulations has gone out for comment and we have got until May to provide comment on them, which, again, seems to me to be a reasonable and satisfactory amount of time for us to have input into them. We have not looked at them yet, but we will. Yes, we are happy that they take prime carriage of their legislation, just as we will take prime carriage of our legislation. Yes, we are happy with our input to the interagency working group, but we are recognising that we are advisers in providing the best advice we can based on our experience and our reading of the health and other literature. But, in the end, they are the prime government regulator in this space, and that is as it is.

**Hon BRIAN ELLIS:** The reason I am asking, though, is that in your submission in one of your recommendations, you still want proposals referred to you. If you are involved in this interagency group, giving full advice to DMP, why, then, do you need proposals referred to you because you are already in the process?

---

**Prof. Weeramanthri:** Thank you.

**Hon BRIAN ELLIS:** I ask that because I just do not want to see a heap of bureaucracy created that may not be necessary.

**Prof. Weeramanthri:** My experience with these processes is that you have got to get the general framework right and robust and get the right kinds of discussions occurring, and I believe they are. But then you are going to get an evolution in the industry with new technologies; it is not going to stand still. What we have seen with fracking is an amazing kind of evolution in the technology to make it possible now to do this at a scale that was not previously able to be done and make it commercially viable. Then you are going to get very particular proposals put to the Department of Mines and Petroleum, which may raise issues that have not been dealt with or thought about before and you are going to have to be able to go back and forth a bit on this. Clearly, then, it is recognising the unusual, being able to have clear flows of communications and memoranda that capture: “In this kind of circumstance, we should refer it to the Department of Health for a particular assessment. It might take a bit longer, but it meets these criteria and decision points.” As the regulatory process evolves and matures, you start to define these things much better: When do you come to me? How long do I have? What kinds of decisions will you ask me to make? If you do not get to that point of discussing it, what happens is it kind of goes along, issues come up, but there is no clear way of dealing with them. What we are suggesting is there will be a need to evolve this process. The first thing we need to do is put in this whole-of-government regulatory framework, which the Department of Mines and Petroleum will do, and develop these MOUs. But there is a whole lot of follow-up work that then happens over time between departments that makes sure that the system actually works as the public wants it to work. It is often about timely referral, clarity about the science, what are we certain about, what are we uncertain about and having a capacity to go back to industry, go back to the public, and work this stuff around. Martin, you have got a massive amount of experience in this area.

**Dr Matisons:** In terms of coming down to the detail in individual proposals, we will be working with the DMP to work out which ones do need to be referred to us, so we will be discussing it with them in terms of not every proposal will need to be referred to us because we hope to have a system in place whereby various risks can be looked at and checked out and if they are covered, that is fine. But there will be some right at the bottom where, say, guidelines may need to be calculated and developed; you need somebody with expertise to look at that and the health department does have that. So, it will be, hopefully, only a small percentage of any proposals that will need to eventually come back to the health department. We are certainly not looking at seeing every one; we do not see that as necessary.

**Hon BRIAN ELLIS:** I understand that once you sort out your MOU, then you will have your framework to work in. I have just one other question. Have you been asked for any advice in light of the fact that there have been about six or seven wells already put down in the Perth Basin? Have you been asked for any advice over any issues, not that I know that there are any issues? Have you been asked to give advice to DMP in regard to any of those wells?

**Prof. Weeramanthri:** My understanding is that they would be exploratory wells. Personally, I have not.

**Dr Matisons:** DMP has asked us to look at a few proposals and we have made comments on those to the DMP.

**The CHAIRMAN:** Dr Matisons, on that point—you might want to take this as a supplementary question—are you able to tell us what sorts of matters in relation to those wells were referred by DMP to your agency? What were they seeking advice about and how might it have impacted on public health?

[11.00 am]

---



**Dr Matison:** We were asked to provide general comment on them. Some of the wells, particularly the initial ones, were in fairly remote areas and unlikely to impact on any public drinking water supplies at all. We were looking at them to get a feel of what is happening and how the proposals came in. We are providing advice back to the DMP in terms of, okay, this is the information that was supplied, and whether we want to see more or different information. Other ones we commented on background testing and things like that. So, initially we have been providing just general comments.

**The CHAIRMAN:** When you have a remote area operation or an operation away from an immediately populated area, what are your main concerns?

**Dr Matison:** The concerns really arise as to where the closest public or population base is. If it is a long distance away or if it is not impinging on any water resources that they are taking, the public health concerns are quite minimal and we generally do not tend to provide detailed comment on them as with a lot of other mining proposals because it just delays processes.

**Hon SAMANTHA ROWE:** Professor, if I could just refer to your submission, on page 2 you have identified some key factors that need to be considered in relation to hydraulic fracturing. The first one is “good risk communications”. What sort of risk communication process would you like to see in place?

**Prof. Weeramanthri:** Thank you. Look, I think this is really fundamental because it is around public confidence in regulation and in the industry and also public confidence, for us, in water supplies. The more open and transparent the regulatory regime and the better the enunciation of what are the risks, but equally importantly how those risks are being appropriately managed and the level to which they are being managed—the public has to have satisfaction about that. You have seen that in other states and other places, if you do not get those things aligned, there will be calls for moratoria, and we have seen those in other countries and in other places in Australia and there will be unhelpful tensions where there need not be, because I think people actually are aligned to the same objectives. Maybe there are a few people who do not want industry to go ahead at all or something, but that is not for me to comment on. The government said this is an industry worth developing and so that is our policy frame. If you accept that, everyone’s objectives are the same, in fact, which is to allow this to happen but to absolutely minimise risk to the public and the environment. If we can agree on that and on what the risks are and we do not close our eyes to any of that—we have gone through and said in our submission to you that we have identified at first glance 195 chemicals and we want to know about them. We will go and do the work about what we know about them. The Department of Mines and Petroleum say all the companies will have to disclose what they are. That is what I am talking about in terms of risk communication. The openness and the transparency of the regulatory process is critical to that because once you have got that, then everyone can look at the same information and you can have a reasonable discussion. You may still disagree in the end about whether something is worth supporting or not; that is fine. You are going to get disagreements, but the government is doing its job and administrative agencies like ours are doing our job.

**The CHAIRMAN:** Professor, a great deal of the emphasis in your submission and in the discussion we are having just now notes the importance of water, whether it is our drinking water, our groundwater, the capacity of run-off to cause contamination elsewhere and all those sorts of things, and that is noted. I was wondering if I could ask you now to take a bit of time to contemplate other risks to public health that might become issues with this sort of technology. There is reference in some of the literature that you have provided and others have provided that asks about the release of radiation by the disturbance of the ground—something which presumably is a consideration in other mining operations so you have got some experience of it—and also about affecting the air pollution and the potential release of matter into the air, which may be harmful to public health. Can you discuss that scenario please?

---

**Prof. Weeramanthri:** I might start with the radiation issue because there is a well-established framework in Western Australia for the handling of that. As you know, we have got a mineral sands industry and have had for many decades and well developed regulation around that. Clearly, there is naturally radioactive material in the earth and that is where the particularities of the mining proposal are absolutely crucial. There is no kind of making a general statement about this. It depends where your mining, what you get; are you testing for radioactive material? Is that what you are intending to get or is it a kind of by-product? How are you going to handle it and monitor it? One of our suggestions is that monitoring regimes be put in place to establish whether there is any baseline level of radioactivity and if there is, you may need to monitor it over time. There is nothing that cannot be handled properly if you know about it and you kind of deal with it sensibly and you make the right kinds of risk assessments. We do this all the time and radiation is just one thing that needs to be handled properly and we have got a really great track record of doing that in this state. But if you did not have a kind of agreement that part of the baseline monitoring would be around radiation—for example, radioactive materials—then you are setting yourself up to be surprised later, which is just kind of silly. We can proactively look ahead and say that can be part of our checklist. We can monitor for a whole lot of things at baseline and then screen off certain risks as not being there —

**The CHAIRMAN:** Before you move on from the subject of the potential release of radioactive substances, deliberately or not, as a result of mining or drilling operations, have we already got the capacity to deal with any such issues that might arise from this new fracking technology or do we have to develop new regimes?

**Prof. Weeramanthri:** My understanding—I will defer to Martin—is that we have got the regulatory capacity and the technology to deal with it. That is my understanding.

**Dr Matisons:** From our radiation safety unit, that is my understanding as well. They deal with that specifically rather than just —

**Prof. Weeramanthri:** So there is another area of our environmental health which deals with radiation safety and if you require further detail, we would be happy to assist the committee in writing.

**The CHAIRMAN:** Right. Thanks for that. I interrupted. The other part of the question, of course, was about airborne contamination.

**Prof. Weeramanthri:** Okay. You are stretching my knowledge a bit. I will admit that. Clearly, what you are drilling for is natural gas, so methane is going to be a key component that is released. That is the whole point of it. There is potential for methane to be released into the atmosphere together with other gaseous elements that are in the ground. One of the key ways that can happen—again, I am not an engineer; I have no personal experience with this—is if the wellhead blows. Clearly, that is something that can happen and occasionally does happen, but which the engineers try to minimise absolutely because that is a crisis obviously for wellhead employees and you are going to get unmanaged discharge of materials into the atmosphere. But that would be a crisis situation, and you would not expect that there would be unregulated discharge of air pollutants other than that, but again you would—I would take advice on this—get advice in terms of what is the proper air monitoring that would have to be in place around the mine site to ensure that that is not inadvertently happening. I am not an expert on that; Martin, are you able to comment?

[11.10 am]

**Dr Matisons:** Yes. In terms of air quality we certainly have looked at that, and there are measures in place that deal with air quality from industry in general through the Environmental Protection Act and the Department of Environment Regulation, and we feel they are actually sufficient to be able to deal with air quality issues under that process. Certainly, some of my experience with international colleagues is that that is how they have dealt with air quality issues when we have

these sites close to communities. It is a fairly simple process to deal with; we have a process in place now that can actually deal with it. When a complaint is made, we go out and investigate and fix the problem.

**Hon PAUL BROWN:** I will just follow up on the Chair's previous comments about the naturally occurring radioactive materials. Most of those would be found in the flow-back water; is that not correct?

**Prof. Weeramanthri:** That is my understanding, yes.

**Hon PAUL BROWN:** Some of the new technology that the industry has developed is a water re-cleaning technology where it can remove the chemical additives from the flow-back; therefore, a lot of the water going into settlement or catchment ponds would be pretty benign or pretty clean. Do you have any advice or any comment you can make about the ability of the industry, with its new technology, to allay your fears?

**Prof. Weeramanthri:** I will just make a general comment, which is that we have to distinguish between the fracking fluid that is put in and the flow-back fluid. Again, our initial, kind of, read of the literature suggests that potentially even more chemicals flow back than are put in because of the interaction of chemicals with naturally occurring material in the ground, and so you actually have to then equally monitor what is coming back out and assess that. So, yes, there is an issue about knowing what is coming back out, including any natural radioactive materials that come back that may not obviously be in the fracking fluid to start with. I have no specific comment about how you would handle any radioactive material in the flow-back fluid, except I am pretty sure we can get you that information in writing. I am sorry; I will not try to give you a technical answer to that, but we do know how to store, handle and transport this material and there would be a series of safeguards around that.

**The CHAIRMAN:** Perhaps we could ask you to take that on notice. The exchange that has just happened will be in the transcript, but we would appreciate that further advice.

**Hon PAUL BROWN:** Just following on the technology theme: the industry has for some time now moved into—as part of their exploration—using 3D seismic survey technology to identify all the below-ground properties such as aquifers, gas pockets, fractures and faults. Referring to the comments you make in your submission about hydraulic fracturing activities being separated by a distance of 2 000 metres from private drinking water wells, 100-year flood plains and sensitive land use areas, with that advent of the 3D seismic survey technology and your comment that it should be 2 000 metres away from those sorts of activities, does that give you some sort of confidence that the industry is able to identify risks and that therefore the DMP and other regulators are able to assess those adequately?

**Prof. Weeramanthri:** I do not think there is any doubt that we can identify the broad risks. The key question then is: how do you identify the specific risks associated with any proposal? We do not pretend—this is why you need multiple agencies—to be experts on the technology, and there will be evolutions in the mining technology. But then equally if we say our broad risk as health people is around the contamination of water, we will say that we will also ask the water regulators what their views are about this because obviously they would know the details of the water flows et cetera. So our submission reflects the current policy position, which is that we as a state are fairly conservative—in a good way—around the protection of our public drinking water catchment areas. That is existing policy and we have existing buffers et cetera. As our starting position we support the water regulators in that, in that it gives us a degree of confidence in terms of potential public health risks. If new technology comes and materially changes the risk, that is going to have to be argued and it would have to be assessed by a group of people. I am not expert enough in any way to make a judgement on that, but I do know where we as a state are in terms of general policy around the importance we place on our drinking water, and we would support that.

---

**The CHAIRMAN:** I am going to start bringing this hearing to a close shortly, but there is an important area I did want to touch on, and it is almost the elephant sitting in the corner of the room in relation to this inquiry. Our inquiry, like any others, is a search for the truth. We have received submissions from multiple sources advocating very different themes and positions. One extreme is the view that fracking operations are so benign that they are almost good for you, right through to this mining practice poses a whole range of new risks that we have never had to contemplate before and that there is almost inevitably going to be extraordinarily serious and dire results. They are probably the extremes of what we have been receiving. We have received a lot of submissions with various colour, so we appreciate your professional advice as we try to sort that out. But there are a couple of specifics I wanted to put to you for your reaction, please. I am referring to a submission by the Public Health Association that was received by this inquiry and published that discusses the problems of methane being released into the atmosphere and posing a real risk of air pollution. It acknowledges, although does not necessarily state, claims that have been made that —

High levels of known carcinogens, such as benzene ... have also been attributed to fracking.

I think that is referring to the United States. I quote —

The large amounts of crystalline silica used as a proppant during the fracking process generate particulate matter that contributes to air pollution. Inhalation of this fine dust can cause silicosis and crystalline silica has also been identified as an occupational lung carcinogen.

Are you able to give us advice to as whether we are facing new threats as a community if fracking proceeds, or do we have the means to deal with these problems?

[11.20 am]

**Prof. Weeramanthri:** I do think we have the means to deal with these problems. I might just reflect the diversity of opinions that you are getting, which is kind of understandable, particularly in the context of where we are with this industry in this state. We are still at this early stage and understandably we are all getting to terms with this technology and the industry, and the benefits and risks associated with it, including august associations like the Public Health Association, which I am a member of. They have to come up with some kind of preliminary take on the issue, if you like. We go through a scientific process in terms of health-risk assessment and we are actually doing one that the moment. We look at all the various issues that could possibly be associated with this. We identify which ones we are particularly interested in and then we go through a process called hazard assessment, which, if you like, is what you are getting there in that submission. There are a range of potential hazards; it could be silica, it could be this other compound or it could be something else. You have to be aware of what experience and what science has told you is possible—what has happened in the world—you cannot close your eyes. There is a range of hazards and there are probably dozens of them.

Then you have to take a hazard assessment and you have to move it into a risk assessment. The risk assessment introduces other factors such as exposure to those compounds, the concentration of those compounds and how, as Martin will explain as a toxicologist, it is absorbed into the body and any safe limits for any guideline values. You go from a general, any-kind-of-hazard assessment to a more specific risk and exposure assessment and then you come to what the consequence actually is, major or minor, and the likelihood of the risk. That is what we did focus on in terms of either before any mitigation or after mitigation. If you had completely hands-off regulation and no proper monitoring et cetera, surely you would get risks that would be unacceptable to the Western Australian public, but if you put in place the right kinds of things, I am confident that we can have a public debate that allows confidence in getting the benefits of the industry and minimising any risk.

Yes, you are always going to start off with a very broad list of hazards, but you then have to have some kind of scientific process that moves through that and actually looks at the actual risks here

and how they can be mitigated. You might say, “Well, we have this concern about silica from the literature, what are we going to do?” We will put that into our monitoring regime or whatever it is and we will see whether it is an actual issue at this place, at this time with this fracking technology. You have to really narrow it down to particulars and people then have to be accountable for their decision-making within this framework. So, “Yes, we heard you; we have heard your concerns; this is how we have managed it and this is what we are going to do, and that may or may not be enough for you, but we are accountable for the process put in place.” Martin, you are a toxicologist; you deal with this.

**Dr Matison:** Certainly the process that Dr Weeramanthri has described is what we look at. We look at the hazards, work out the exposures, the concentrations and the risks that may be in place. In terms of three compounds you mentioned, we are aware of all three compounds and their hazards or potential risks. In terms of benzene, in the international community and also within Australia no benzene and related compounds, the BTEX compounds, will be allowed be added to fracking fluid, so the benzene you will get will be from the source gas coming out and from the soil or whatever else is there. We are not adding any new compounds into the process and we get that normally in gas and oil production anyway. The issues of methane we have already briefly alluded to, but there can be controlled standards set, and the issue of silica and how it is handled looked at as well, and if it is an occupational issue, there will be advice from occupational specialists about how that can be handled. We already know a lot about silica and occupational exposure and there are standards and practices out on how that can be handled, so they can be introduced. Yes, we can look at all of those issues and work out ways to deal with them.

**Hon PAUL BROWN:** Just following up on that one, have you, through your risk analysis of the industry, been able to compare or substantiate the public risk in a place like the United States and how that hydraulic fracturing industry there has increased the public health risk?

**Prof. Weeramanthri:** It is difficult. We have looked at all the case studies and what is in the literature. It is contested in the United States—the meanings. There might be an incident, but the cause of the incident and the meaning you derive from it in terms of the policy implications are quite highly contested. We are reading it a step removed from that. We say that it would be silly to say that there would be no issues with fracking in the United States—there clearly have been. There have been incidents and what you make of them is another matter. The question is not particularly what happened there and what was to blame, but whether there is potentially an issue and whether we have better managed here in Western Australia. If there was well blowout here, we would ask what our safeguards were against that. If there were issues with the integrity of well casings and we have a three-layered casing process we need regulations with much more cement or whatever it is that you are going to put in that to really shore up against that risk, which is good. It is kind of what we do with that. It would be silly to ignore it and there have been a number of case studies, but you do not want to make too much of them in a different regulatory space—draw the lessons you can, apply them here and learn as best you can from them. Martin, you have had a look at the case studies in more detail.

**Dr Matison:** In terms of looking at those cases we are certainly aware of where problems have occurred and where, even in some cases, industry has said, “Okay, these problems have occurred because of A, B and C”, and we can actually take that on board and make sure that things like that do not happen. Dr Weeramanthri gave the example of well blowouts. Overall in the United States, their industry certainly would be different to that in Australia in terms of the types of gas things they go for, they have a lot of coal seam gas, but they do have shale gas and tight gas as well. They also have a lot of production around communities—small communities and larger communities—and you can see sometimes the maps situated around the communities and it sometimes look like you have more wells than people in town. That may not be the case here in Western Australia in terms of the density of production around communities and the type of gas that we are looking at. We still have to take on board issues that have occurred and how we are going to go about trying to

avoid those issues in terms of well integrity, in terms of storage of flow-back fluid, disposal and closure of wells—they all need to be looked at in terms of past mistakes or problems that have occurred and how best to compensate for them.

**The CHAIRMAN:** We have gone a bit over; that is what happens. Gentlemen, I would like to thank you for your attendance today, for the other information you have provided, for some other information to take away from this session to provide to us at a later date and for your willingness to consult on other matters as they arise. Thank you very much and I bid you good day.

**Hearing concluded at 11.29 pm**

---