GENERAL PURPOSE STANDING COMMITTEE NO. 5

INQUIRY INTO COAL SEAM GAS

CORRECTED PROOF

At Sydney on Thursday 17 November 2011

The Committee met at 9.30 a.m.

PRESENT

The Hon. R. L. Brown (Chair)

The Hon. J. Buckingham
The Hon. R. H. Colless
The Hon. G. J. Donnelly
The Hon. S. MacDonald
The Hon. Dr P. R. Phelps
The Hon. P. T. Primrose

CHAIR: Before I commence, I acknowledge the Gadigal people who are the traditional custodians of this land. I also pay respect to the elders, past and present, of the Gadigal nation and extend that respect to other Aboriginals present. Today is our first public hearing in Sydney. We will hear from a number of key stakeholders, including the Government. Other witnesses include the NSW Farmers Association, Lock the Gate Alliance, Doctors for the Environment. We will also take evidence from companies involved in coal seam gas mining.

In addition to today's hearing the committee will hold two more public hearings at Parliament House and one public hearing at Bowral. The details of those hearings are on the committee's website. I want to make some brief comments about the procedures of today's hearing. In accordance with the Legislative Council guidelines for the broadcast of proceedings, only committee members and witnesses may be filmed or recorded. People in the public gallery should not be the primary focus of any filming or photographs. In reporting the proceedings of this committee, the media must take responsibility for what they publish or what interpretation is placed on anything that is said before the committee. It is important to remember that parliamentary privilege does not apply to what witnesses say outside of their evidence at the hearing. I urge witnesses to be careful about any comments they make to the media or to others after they complete their evidence. Those comments are not protected by parliamentary privilege if another person decided to take action for defamation.

Committee hearings are not intended to provide a forum for people to make adverse reflections about others. The protection afforded to committee witnesses under parliamentary privilege should not be abused during these hearings. I therefore request that witnesses focus on the issues raised by the terms of reference of the inquiry and avoid naming individuals. The committee is aware that people hold strong views about coal seam gas development. There is a great deal of interest in the issues being examined by the committee as shown by the 1,000-plus submissions to the inquiry. The primary purpose of this hearing is to give individual witnesses an opportunity to give their evidence before the committee. Although this is a public hearing it is not an open forum for comment from the floor. Only questions from the committee, and the evidence of witnesses, are recorded in the transcript.

Audience interruptions are not recorded and may make it more difficult for witnesses to fully express their views. Witnesses are advised that any documents they wish to table should be provided to members through the committee staff. A full transcript of what is said during today's hearing will be prepared by Hansard reporters. The transcript will be available on the committee's website in the next few days. In that regard, I ask witnesses to speak clearly and not too fast to allow Hansard to have an accurate transcript. I remind everyone to please turn off your mobile phones, as they interfere with Hansard's recording of the proceedings.

JAMES LESLIE BAULDERSTONE, Vice President, Eastern Australia, Santos,

ANDREW GEORGE KREMOR, General Manager Energy Business, Santos, and

SAMUEL JAMES CRAFTER, Manager, Community and Government Relations NSW, Santos, sworn and examined:

CHAIR: Do you appear as an individual or do you represent an organisation?

Mr BAULDERSTONE: I appear on behalf of Santos.

Mr KREMOR: I appear on behalf of Santos.

Mr CRAFTER: I represent Santos.

CHAIR: This session is allowed roughly one hour. The committee has an extensive list of questions. It probably has a lot of questions that have been generated by previous evidence given to the committee. If we run out of time, I ask that you take questions on notice?

Mr BAULDERSTONE: Certainly.

CHAIR: Are you prepared to respond to those questions within 21 days?

Mr BAULDERSTONE: Certainly.

CHAIR: Do you want to make an opening statement?

Mr BAULDERSTONE: Yes, sir. Honourable members, today Santos completes its acquisition of Eastern Star Gas. This acquisition will make Santos the principal coal seam gas [CSG] exploration and ultimately production business in New South Wales. We clearly have a big stake in the success of a new natural gas industry in this State. This is an industry that could ultimately generate a substantially new source of cleaner energy to power industry, farms and households. We absolutely agree that this huge opportunity for New South Wales must be nurtured in a safe and sustainable manner. Santos recognises the genuine concerns being expressed, particularly about the quantity and quality of water in rural Australia. This must be addressed. Santos is committed to demonstrating through scientific evidence that any adverse impacts will be avoided. In fact, given the chance we believe our operations will be shown to enhance rural communities in general and, in particular, the productivity of landholders who choose to work with us. I will briefly provide some important context for our discussions today.

First are the calls that have been made for a moratorium on all CSG exploration and development in New South Wales until more water study data is available. Let us be frank, many of those who oppose our industry know that stopping exploration now will stop the long-term development of this industry in New South Wales. Ongoing exploration activity provides the additional scientific data and knowledge of the geology and the water resources that everyone agrees is needed. Over the next three years Santos will invest $500 million to drill approximately 50 wells and associated surface water monitoring bores mainly in the Narrabri area. We are currently monitoring 180 existing agricultural water bores in the area. All of this information will be made available to the public. In addition to our own research Santos is contributing substantial sums to independent research, including half a million dollars to the Namoi Catchment Water Study. This is a clear demonstration of our commitment to obtain the necessary scientific information.

Secondly, Santos supports regulation that delivers certainty for all stakeholders through high standards for operators as well as strong environmental investment and broader economic outcomes. We are today announcing that Santos will seek to have the current Eastern Star Gas Narrabri project application considered under the new part 4 of the Environmental Protection Act. While that application is not told to be considered as a part 3A application, in the interests of maximum transparency, we believe that it is appropriate that the new part 4 process is applied. In addition, Santos will ask that each of our major project applications be subject to public hearings conducted by the Planning Assessment Commission. We welcome public access and input into the project review process.

Thirdly, there is clearly much interest in how we intend to operate on valuable farming land in the Gunnedah Basin. Our extensive operations in Queensland over the past 15 years have been developed in productive cooperation with landholders. We will use our experience to adapt those successful practices to the cropping land of New South Wales. Over the next three year exploration phase we will work with local farmers to develop on-farm operating plans. These plans will ensure CSG and farming can work alongside each other. Productive co-existence is an essential objective for us. We are well aware Eastern Star's Mullaley pipeline plan has been a divisive issue in the community. We are still reviewing all of Eastern Star's plans and are yet to settle our own commercial plans for that business. However, as an act of good faith we are committing today to withdraw Eastern Star's application for the current Mullaley pipeline route.

Finally no rational discussion about CSG can ignore the fact that the world is seeking to reduce carbon emissions at the same time that all nations are seeking to meet ever-increasing levels of energy demand. Natural gas is the most available, affordable and abundant fill for cleaner base-load energy production. If we are serious about taking affordable, practical steps to reduce carbon emissions in the foreseeable future then developing Australia's CSG resources is the single biggest contribution that Australia can make to that world effort. Santos is committed to working with the New South Wales Government, landholders and local communities on successful outcomes. We want our success to be measured against three key criteria: protection of the environment, community support and the economic benefits to be delivered. In our discussions today let us not forget that Santos' CSG production could create at least 1,000 new jobs in regional New South Wales and inject hundreds of millions of dollars of investment into these communities. This is in addition to the generation of approximately $3 billion in royalties for New South Wales over the next 20 years.

CHAIR: Would you repeat that?

Mr BAULDERSTONE: We are looking at creating over 1,000 jobs in rural communities and we will be injecting hundreds of millions of dollars into those same communities. In addition, we are looking to generate approximately $3 billion in royalties in New South Wales over the next 20 years. In the next few weeks, we will be releasing a detailed expert report on the economic benefits that could flow from our development of the CSG industry in New South Wales. We have three years' research to do before any significant development can commence. There is clearly time to work together on a good plan for New South Wales CSG, and Santos is here to do that. That concludes our opening comments and we invite your questions. Where appropriate, I will call on Andrew or Sam to assist me in that regard.

The Hon. GREG DONNELLY: As you are well aware there are divergent scientific opinions about key aspects of CSG mining. I will take two examples: the issues of fracking and the impact of CSG exploration and mining on underground water. How can Santos overcome the view that the positions that you put into the public domain on the science are not construed as the science that the company wants to advance its position? That is one of the common themes that has come through our consultation throughout New South Wales in general, not specifically to your company. The science produced by a company is essentially science to advance its position on this matter.

Mr BAULDERSTONE: Santos is in a unique position because it has a very long history of producing gas in this country. Santos has been producing gas for more than 40 years. We are very good at what we do. We have a large number of internal experts who help us to do. Similarly with CSG this is not a new industry for us. We have been producing gas in Queensland for more than 15 years and substantial portions of that gas. During that time there has been no environmental damage, no health impacts and no concerns from the communities who we operate within. How we handle the science through those processes is basically by three levels. We have a large number of experts in our own company who we employ, be they environmental scientists, hydro geologists, geologists or engineers who work up our detailed plans with us.

The second level is we obviously engage experts ourselves to assist and to provide additional information in regard to the science. Thirdly, we go out and we fund external independent research, such as the Namoi catchment, such as working with CSIRO and working with other independent bodies, and we are continuing to do that. Our challenge is to continue to get that information to the public domain. There will always be groups, no matter what we say and how we say it, who have an interest in putting the different side of things and trying to misconstrue what we say. Our job is to continue to act reasonably and put the data out there and, at the end of the day, we believe the science will prevail.

The Hon. GREG DONNELLY: A number of people who are either ambivalent about the proposals for coal seam gas mining or who oppose it argue the case that because what is at stake is so high, particularly with respect to the impact on water, that there needs to be a long-term perspective taken on the establishment of baseline data and analysis of that data so the science can be grounded on something quite solid. What is your response to that position?

Mr BAULDERSTONE: We absolutely support that. We have been doing a great deal of work across the eastern seaboard for many decades. We have a large body of that information, we have detailed models. One of the first things we do in any area such as New South Wales is to gather that baseline data. There are some 60,000 registered bores that give us a very good detailed understanding of the surface aquifers system. What is now needed to provide the data necessary is the aquifer systems that underlie the surface aquifers within the coal seams that we are targeting, and that is the next phase of work that needs to be done. That is why our pilot tests are so important. We believe once that information comes to the fore it can go into the public domain and people can see that what we are doing is safe and sustainable and we believe once that happens we will be able to proceed with a business in this State.

The Hon. PETER PRIMROSE: As you would be aware, many submissions have raised concerns about at least the initial interactions between coal seam gas companies and property owners. I was wondering whether you might be able to provide the Committee with a copy of a protocol that you may use in relation to those initial dealings with landowners and, secondly, a copy of a contract—not an actual contract, obviously, that has been signed but one with the, say, pro forma terms that are contained within a contract.

Mr BAULDERSTONE: Yes, certainly. Community engagement is extremely important to us. We have very good relations in all the States. We operate with a large footprint in South Australia, with a large footprint in Queensland and we have an increasing footprint here in this State. To some degree how we operate on community access issues is not to go through a legal process; we like to employ locals to talk to locals. I will hand over to Sam Crafter, who is in charge of that area and lives in Gunnedah himself, to describe the process. But the active engagement is an essential part of how we do business.

Mr CRAFTER: The process is that we have a discussion with people, there is a connection made, usually a face-to-face discussion, and we talk about the people who are interested in exploring the option of working with us, and what we have found so far through our exploration program that has worked very well for us is that we have got agreements in New South Wales with about 40 landholders that we have used and now we are proud to say that all of them are happy to keep working with us and have us back to do more work with them. That process then does evolve into a legal formal process. We give them an agreement, we then also talk them through getting their own legal opinion of that document and we cover the cost of that to allow them to do that.

It is very important for us that people are absolutely happy before we start anything. The worst result we could have is that we get an agreement and then further down the path people are not happy. So we go through a very thorough process through that agreement and get agreement around the terms, exactly what we are going to be doing, and then we work through that. Obviously the next part of it is a following on with the landholder ensuring that they are aware of what work is occurring, who is on and off their property, and there is a constant dialogue with the people whilst the new work is going on.

The Hon. PETER PRIMROSE: Can I just confirm that you will be able to provide us with a copy of those protocols?

Mr BAULDERSTONE: We will send it to the secretariat.

The Hon. JEREMY BUCKINGHAM: Mr Baulderstone, in your submission Santos states that its principal area of operation will be the Gunnedah basin. There has certainly been a lot of discussion in the community about the number of wells that will end up being in the Gunnedah basin that has created some uncertainty and disquiet about the number of wells and where they will be. Your submission says that the royalties that the Government can expect from this industry are somewhere around $3 billion over 25 years and up to $150 million a year. Further in your submission, on page 27, it says, "The Gunnedah basin project will involve drilling several hundred wells". How can the Government expect to receive $150 million a year in royalties from several hundred wells? Is it not the case that there will have to be thousands of wells, if not tens of thousands of wells for the Government to attract a royalty return of that magnitude?

Mr BAULDERSTONE: We are at a very early stage of our exploration activity. At the moment we are working out how much gas is caught in those seams, how much water is there and how we will end up producing them. Our current modelling and our current work establish that there will be in the order of a couple of hundred wells to develop the basin in its entirety to produce the volume of gas that would substantiate those royalty payments. What we will do to justify that is that as we get more data and we go through the next level of approval processes for the development phase, we will bring that to the Government and that will be scrutinised in public. The data in there is the information as we understand it to date, subsurface, and those wells are all needed to produce the gas that is required for this business.

The Hon. JEREMY BUCKINGHAM: That was unclear, Mr Baulderstone. You are suggesting that the Government will attract $150 million a year of royalties from a few hundred wells?

Mr BAULDERSTONE: That is what I am saying. I will hand to Mr Kremor, who is in charge of operations, to give you more detail, if you would like, about our development plans.

The Hon. JEREMY BUCKINGHAM: The detail I would like is about how a couple of hundred wells can produce $150 million a year worth of royalties to the State of New South Wales.

Mr KREMOR: The area has a unique geology; it is characterised by multiple coal seams throughout the sequence. In some areas they are very, very thick coal seams and the net coal package is many, many times thicker than in similar areas in Queensland, and also the geology lends itself to a lack of drilling technology, which is not always the case in Queensland as well. When we drill a well we can drill into multiple coal seams. So, in effect, one well is equivalent to several wells if you can imagine they are stacked vertically on the coal seams. That is why we think we will not need as many wells on the surface footprint.

The Hon. JEREMY BUCKINGHAM: Are you committing to less than a thousand wells in the Gunnedah basin?

Mr KREMOR: Our modelling at this stage indicates that it would be well less than a thousand. Clearly, we cannot be precise at this stage because, as James said, we have got three years of study to do. But our current modelling based on the information we have to date indicates that it is several hundred wells only. But the important fact is it is the geology that determines that.

CHAIR: Some concerns were raised by a landholder who had been approached by another company. The general complaint was that the State Government had issued exploration licences to companies who appeared to be, shall I say, not substantial. Santos obviously being a substantial company, so I guess you would have a competitive position here, do you think that the regime surrounding the issue of licences is robust enough in terms of being able to demonstrate that people who take licences and who therefore will be the principal party to any access agreement with a landholder are substantial companies?

Mr BAULDERSTONE: I think this is a very good point and the sort of discussion we should be having with Government around how that works. There is a clear difference between a pure exploration company whose interest is to get a licence, discover what gas is there very quickly and then spin it on to a company like ourselves in the development phase. There are different economic drivers there. Santos takes a very long-term view; we will spend the time and the effort and the money to get it right because we have a 20-, 30- or 40-year horizon. Other companies that are smaller and do not have our resources or our experience do it differently. Clearly, as you just said, we have an interest in a particular regime so I do not want to come across with any self-interest here, but yes, I think that is an area the Government needs to look at to ensure that anyone who has an exploration licence in any resource business has the skills and the capability to do it properly.

CHAIR: Would you like to comment on whether the current situation where you have speculative companies doing the drilling is an essential part of the industry? Could the industry survive and grow without the current, I will call it, ladder of involvement from what are called wild catters through to gas producers?

Mr BAULDERSTONE: Let me answer it this way: There have clearly been some poor practices by some companies. There is a reason why there is community disquiet and unrest and in some cases fear from what has happened. It is important for companies like Santos to be a leader in the industry and to do the right things and make sure we set the standard. We have been very clear that we want to set the highest standard possible to ensure everyone meets our standard, to ensure that we have our ongoing licence to operate. That said, there are some good smaller companies. I do not think we can throw out every smaller company to allow

the Santoses of the world to have the sole run. Key to me is making sure that a regulation is right. Without the right regulation communities do not have trust or faith in any industry, including ourselves. So I think it is very important that these sorts of reviews happen and improvements get made. Santos has been very open that we support strong regulation because it actually hits the bar.

The Hon. SCOT MacDONALD: This is a question probably directed to Mr Crafter. Many of the witnesses we heard from in the absence of data or evidence or whatever fell back on the precautionary principle as a mechanism to delay the industry or to hold it up or even stop it. Have you got any comments on the precautionary principle and how we should use that with this industry and this development?

Mr CRAFTER: I think the way we are approaching the industry, approaching our dealings with landholders, approaching our work with the community, is to build the scientific evidence that we need to be able to counter those concerns and work with the community. What we have committed to doing is to be able to work at a pace that allows us to do that and to gather that information. Obviously, part of gathering that information is our exploration program and the drilling of core holders to gather the data about that, whether it be some site testing originally or our pilot work, which gets into more of the specific concerns around the water issues and enables us to show that calibration data and the isolation between the shallow aquifers farmers are using and the coal seams where we are looking to attract water. I think our approach is to go about gaining the data that is needed to demonstrate to the community that they can have confidence in our processes.

The Hon. Dr PETER PHELPS: One question to take on notice and another quick question to answer now. On notice, can you indicate how many people employed by Santos and Eastern Star Gas identify as Aboriginal?

Mr BAULDERSTONE: Can I clarify: Is that broader Santos or just in this State?

The Hon. Dr PETER PHELPS: Santos and Eastern Star engaged in coal seam gas operations.

Mr BAULDERSTONE: Certainly I can get that information for you.

The Hon. Dr PETER PHELPS: The second thing is can you provide any assurance that the cumulative effect of vertical and lateral drilling of coal seam gas wells will not open up fissures within the Pilliga sandstone? Is Santos aware—and remember you are under oath—of any instance in Australia where there has been cross-contamination of highly saline waters with high-level aquifers?

Mr BAULDERSTONE: Let me take those in separate segments. As we have said a number of times, we are confident on the basis of our current knowledge of the Gunnedah basin, particularly in the areas where we have spent most of our time to date—we have only just taken over Eastern Star today so we are operating for the first time as of today. We will look at all that information and we will conduct further testing to establish there are no connections. Clearly, if there are connections our business does not work. If there are cross-connections then water will continue to flow, there will not be pressure to coal, gas will not flow.

So in some ways we are self interested in ensuring that our development does not hook into any ongoing aquifers, otherwise we do not have a business. That is the purpose of the next three years. In relation to your other question, I appeared before the Federal Senate inquiry, and at that inquiry it had been raised that there was an example in western Queensland where there had been an accusation of cross-contamination. I am not aware of the detail, but it has been examined in that report. I can say that on Santos properties and in our business over the last 40 years, and 15 years in Queensland, no examples of cross-contamination have occurred.

The Hon. RICK COLLESS: My question more or less follows on from the previous question, and relates to fracking. How can you guarantee that fracking will not shatter overlying and underlying strata and create the potential for cross-contamination of aquifers?

Mr BAULDERSTONE: Fracking is a discussion that I think needs to have a bit of the heat taken out of it. Santos is very experienced in this area; we do substantial fracking operations in central Australia, and have done it for many years, safely and sustainably. The difficulty we have as an industry is simplifying the quite high technical notions on fracking in general. You read about fracking in shale, and a lot of the information that comes from the United States, information that is in the public domain here, is about shale fracturing, which is very deep, kilometres, highly pressured sandstones, with more highly pressurised fracking techniques.

When we talk about fracking in coal seam gas—which is more akin to stimulation, as industry has called it in other parts—it is a much more low pressure operation. That really is, as I described in the field the other day, taking sand particles and, together with gel to make sure the sand particles are carried further into the coal seams, not to fracture but to open up the existing fissures and cleats that exist in the coal. That increases the surface area of those fissures, and the area we are talking about is grains of sand in thickness to let the coal gas flow. So in those sorts of techniques there is no violent fracturing, so there is no risk to cross-contamination of different aquifers that are often hundreds of metres apart.

The Hon. RICK COLLESS: What is the difference in the pressure required to do what you plan to do with the coal, for example, and what you would need to fracture rock? Are there orders of magnitude in difference?

Mr BAULDERSTONE: There are. The difference in pressure is five or 10 times, and you are talking very significant volumes of horsepower needed to drive water underground in shale and in coal seam gas. It is very low pressure that is required to get the water to open up the seams. Coal is much softer than rock.

The Hon. RICK COLLESS: In fracturing a coal seam is there any chance that the overlying and underlying strata being fractured as a result of that process?

Mr BAULDERSTONE: No, we believe there is not. But I think the government here is conducting a scientific assessment of fracturing. We believe that is the right thing to do. I think there is a report coming out that sets the framework for an examination of fracking, and Santos looks forward to having discussion on the science of fracking in the coming months.

CHAIR: Mr Baulderstone, I seek clarification. Could you explain the difference between a cleat and a fissure?

Mr BAULDERSTONE: I will hand over to Dr Kremor, who has a doctorate in this area and would be more scientific than I am.

Mr KREMOR: In geological speak, a fissure is really a joint that goes through the coal, so it is a very continuous feature of the coal, whereas a cleat is where the coal breaks up into small particles. So, in a sense, a cleat is a much smaller version of a fissure. Fissures are sometimes called joints.

CHAIR: We have had the geology of New South Wales coal seams described to us like a loaf of bread; that is, with vertical cracking. Are those what you would call fissures?

Mr KREMOR: Yes, that is correct, or joints.

The Hon. GREG DONNELLY: As the Committee has travelled around the State conducting hearings, time and again we have observed tensions and divisions in local communities over the nature of the annual payments associated with exploration wells on given properties. Often, that comes about because people do not know what the going rate is in the striking of an appropriate or reasonable figure for exploration being done on their properties. I understand that in principle you think the industry needs more robust regulation if it is to proceed. If part of that regulation were to include the setting of what would be a band of sorts for figures that might apply to, in the first instance, exploration followed by production, as opposed to the striking of a rate with the company on a case-by-case basis?

Mr BAULDERSTONE: I think we have a choice to go down a number of routes as far as compensation goes. There are stories out there—particularly in the early days of industry—that very low amounts of money were offered to farmers to access their properties. Santos has never done that. I do not think you would come across anyone who would be upset with how we dealt with it, either from an approach point of view or from a compensation point of view. In this State, at the moment we are in the very early stages, so we offer compensation around quite minor works. You saw our pilot; it is a small footprint. The farmers are very happy that we come on, because often we will do things like roads that they actually want done for them.

So a lot of the benefit that they get from our initial exploration work is our assisting them with infrastructure that they like and would not build themselves. Going forward, I think it is a very good discussion that again we need to have. I am passionate about rural communities having investment. I am from a rural community myself, and I know a number on the Committee are as well. We know that we need to create jobs in

those communities, we know that we need to create investment in those communities. How that investment is share and how the money raised is shared is something that the government and the companies need to discuss. There is a large amount of royalty payments about to be created. Whom that goes to is a discussion that I think we need to have.

The Hon. PETER PRIMROSE: A number of submissions we have received, and indeed a question earlier this morning, asked about the precautionary principle which is being advocated. As I know you would be aware, the precautionary principles are one of the requirements in New South Wales in the Protection of the Environment Act 1991. What additional regulation, as part of the regulatory framework, should the Government of New South Wales be looking at putting in place to ensure that that principle is actually adhered to, in particular relating to monitoring and safety requirements?

Mr BAULDERSTONE: I think it is important to recognise that this is a highly regulated industry. We are subject to many, many Acts, both State and Federal, and many, many regulatory processes. So there is lots of regulation. It is complex. There are many crossing-overs of departments involved. So I think one thing that would benefit everyone is not necessarily additional layers upon layers of regulation, but streamlining and bringing it together to have a single point of accountability for how the regulation process works. I think that would go a long way to giving the community confidence that the industry is regulated. Going forward beyond that, I think it is very important that you understand the processes that these projects go through.

There are many steps we have to go through. Mr Buckingham was asking are we going to drill 200 wells or a thousand wells. To some degree, I can sit here and say we believe it is 200 wells at the moment. If the science comes up and we believe that there need to be more wells than that, we have to bring that through a process; we just cannot go ahead and drill those wells. We have to do a very detailed process that puts out the science, that puts out the facts and puts out all the data that would support further development. If we do not get agreement from the government and the right agencies, we will not be going ahead. So there are lots of steps in the process where we can be stopped if we do not do it properly. I think that process works well.

The Hon. PETER PRIMROSE: Are there any additional obligations that you believe may be appropriate to impose on you?

Mr BAULDERSTONE: I think the most important thing is that government actually regulates this industry on the current regulatory framework. There are many, many tests we have to go through. And once we actually have an environment impact statement that would support a development, that environment impact statement would come with a whole range of conditions. It is very important that there are strong regulations in place to enforce those conditions. But I think the regulations are there at the moment, they can be streamlined, but I think enforcement and making sure there is confidence that all companies are held account is very important.

CHAIR: Given that statement, do you believe that the regulatory infrastructure, that is, the number of compliance officers on the ground, is either capable now or capable once these full production scenarios might be reached to be able to deliver certainty that those regulations are being adhered to, or would you see that government would need to make an investment in actual compliance of those regulations?

Mr BAULDERSTONE: I think at the moment—because, again, we are in the very early stages, and there is not a huge amount of activity—the regulation and the compliance officers are sufficient. Clearly, as the industry expands and grows in activity, government will need to invest in additional resources to ensure that the regulations in place are adhered to.

The Hon. JEREMY BUCKINGHAM: Obviously the issue of water is fundamental to the viability of the industry. It is a huge cost, and it will be a huge cost, and it is of huge concern to the community. Your submission says that you will produce somewhere between 5 and 7 gigalitres of water per annum of produced or incidental water, which is the water produced through the dewatering of wells. Recent changes have banned evaporation ponds, and so the industry is looking to reverse osmosis, and that process delivers an element of treated water that may have uses, such as re-injection into water aquifers, use in irrigation, and so forth. But still there is a significant quantity, gigalitres each year, of concentrated saline residue produced. In your submission, as in that of Eastern Star Gas, you say that Santos is undertaking a scoping study to consider the commercial and technical feasibility of brine disposal to refine these options. Is it not true that this adaptive management strategy that the coal seam gas industry has really is one where you have no idea at this stage what you are going to do with the billions of litres of hyper-saline solution that your industry will produce?

Mr BAULDERSTONE: I think one of the very strong advantages that Santos has is that we have been doing this for 15 years. I can take you to our areas in Queensland, where right now we are running those reverse osmosis plants, where right now we are injecting water into town aquifers, and where right now we are providing produced water to farmers to irrigate crops and some thousand head of cattle are feeding off those crops right now. So the reason we are so confident about these processes is that we actually do it now.

The Hon. JEREMY BUCKINGHAM: My question related to not the treated water but the concentrated saline solution. What are you doing with that now in Roma, and what do you plan to do in New South Wales with the gigalitres of saline water?

Mr BAULDERSTONE: In the Roma and Fairview areas it is being injected underground. We plan on doing the same here in New South Wales. Clearly, we need to do the science to establish that that can be done here, and that is part of our ongoing process. But, again, we do it in other States, and we plan to do it here. We need the science to make sure we can do it safely here.

The Hon. JEREMY BUCKINGHAM: Have you not done the science in Queensland to underpin that?

Mr BAULDERSTONE: Absolutely we have. You have to remember that each particular underground region is different and unique. That is why you need to do the science for any particular area.

The Hon. JEREMY BUCKINGHAM: Could you please table the science and the research you have done on aquifer re-injection of saline brine residues?

Mr BAULDERSTONE: We can provide access to the public environment impact statement document that provides all the information for GLNG, which runs to some 14,000 pages. So it is a very detailed submission in relation to that. It is on the public record. We can point you to the website if you like.

The Hon. SCOT MacDONALD: I take you back to your opening comments about the moratorium and your concerns about that—we have had some fairly opportunistic calls for moratoriums, if you like. What do you think a moratorium would do in terms of its impact on the price of electricity for families and energy security, and what is your attitude to what investment might be down the track if there were to be a moratorium?

Mr BAULDERSTONE: It is extremely important that we do not lose sight of the importance of natural gas to Australia—a fuel that has been providing energy safely and sustainable for 50 years in this country. Many industries rely upon it. Households rely on natural gas for their water and their cooking. That is the fact and as an industry it is concerning if that were to be lost. There is a huge demand for our product on the eastern seaboard, and from export nations as well, but the challenge for us all is to make sure that it can be developed in a safe and sustainable way. If gas cannot be developed then clearly there will be a huge increase in prices right across the eastern seaboard. People talk about what would take it over 100 per cent renewable in the next ten years—

The Hon. SCOT MacDONALD: When you talk about an increase in price, is that for the gas going to the homes and factories or electricity or both?

Mr BAULDERSTONE: Both, because remember that a significant part of Australia's electricity is currently produced by gas. We believe that, because of the cleaner burning nature of gas, as we convert more coal stations to gas we will get further emissions reduction but with that comes the challenge of making sure that gas is available. This State has never had a gas business; it has imported basically all of its gas from South Australia and Queensland. Historically we would be a position where this State would go from being an importer of gas to an exporter of gas. That would keep prices at the right level for consumers. It would also provide investment in jobs and the money that would flow from it into the towns, schools, hospitals that the State would require.

The Hon. Dr PETER PHELPS: One of the consistent features in our discussions with local government in relation to this matter has been that they feel whereas they can rate, for example, a coal mine or a goldmine or something like that, there is no capacity to rate coal seam gas production because of its size. Will you explain whether you feel your industry would be able to accommodate some sort of contribution to the

increased use of roads, for example, brought about by coal seam gas operations and what sort of community payments are already in place from Santos to local communities?

Mr BAULDERSTONE: I will tackle the broader question first and then I will hand over to Mr Crafter to give some detail of our experiences both in Queensland and New South Wales. This is a potentially significant industry. With the industry will come investments, as we have described, both in local businesses—whether it is manufacturing fence posts or pipelines to be drilled or the cars and various jobs that we give—and with that comes an influx of people. That is very good for local communities.

If you were to go to a place like Roma, for example, it has increased substantially in size over the past 10 years off the back of an industry such as ours. That is a positive thing. With that positive thing come some challenges, such as hospital beds, more roads, the need for more ambulances and those sorts of things. What we do as a company is work with the Government—the Government receives royalties on behalf of the population in the general State to invest back into those rural communities. We look to work with the Government to make sure that the right money flows back into those communities and, on top of that, Santos also provides some additional support, which Mr Crafter will address.

Mr CRAFTER: We are obviously in the early stages of exploration here in New South Wales but if you are looking at a longer term development some of the things in Queensland I can point to are, for example, that Santos has been involved in the redevelopment of the Roma airport and significant funds have been invested around that area. We are also doing housing projects in both Roma and Gladstone in terms of building new housing stock to help meet the growing demand.

The Hon. Dr PETER PHELPS: Is that real housing or is that just dominance?

Mr CRAFTER: That is real housing. It has been worked out with the various housing organisations regionally in and around Roma and surrounding areas, and also in Gladstone. The other thing we have done in that area is—jointly funded with Origin Energy—the rescue helicopter service. There was no rescue helicopter service in that region at all but we have been able to establish that for the region. Obviously that potentially has a use for us but it has a much broader use for the broader community day-in and day-out. We also support—through Eastern Star Gas at this stage—the Westpac rescue helicopter out of Tamworth, and we will continue to support it.

We have a range of community events and things that we sponsor on the ground. It is at a small level at this stage in New South Wales but as we grow we work very closely with the local governments in our regions. We regularly brief the mayors and the councils; we are engaged with them. We are keen to work with them as to the best ways to conduct those community investments. We want to make sure that we get it right and that we spread the money across the communities so it has real benefits. For us it is not really about a branding exercise in these things; it is making sure that our dollars benefit communities.

The Hon. RICK COLLESS: Given the substantial surface infrastructure that is required with coal seam gas operation and the intensive land management and soil conservation works on the surface with deep, black soil and high quality agricultural soils, is it appropriate that coal seam gas development be banned in some areas of very high quality agricultural country?

Mr BAULDERSTONE: I think the important thing in relation to sensitive land areas is that we continue to have a robust but reasonable discussion. I fully understand why farmers in those areas have a strong view, and they have that view because their livelihood depends on the water. One of the reasons we were keen to drill the Gladstone site was because it would give us data to start establishing where we could operate in those areas safely and sustainably. One of the good things about our industry is that it does not destroy the earth. We do not dig up the topsoil. We insert a well in a particular spot to extract the coal.

What we would like to do going forward in those sensitive areas is to ensure that wherever we place our infrastructure it is done in full agreement with the landholder. We will work with that landholder to make sure that we place a well in the best place. Again it is important to realise that we are not talking about thousands of wells patching the country; we are talking about wells that are one to two kilometres apart. There is a large distance between our planned developments. That said, I think what The Nationals put out the other day was a very good start for discussion. They put out a very rational policy framework: a five point plan. They hold the view that in areas that are sensitive more work needs to be done, and we fully support that.

The Hon. RICK COLLESS: Will you expand on what your company's response would be to farmers in those areas who say, "Sorry, we are not interested."?

Mr BAULDERSTONE: It is very important to realise that it is up to Santos to ensure that we get our message across. We have to continue to consult and put at ease some of the fear that has been created. There is quite understandable angst in the community, and I fully understand that. We spend a lot of time talking. Mr Crafter lives in the area. We will spend time talking to the locals. There will always be some who will not come over. Santos has made it very clear that we will not barge our way onto people's properties. We believe that over time the majority will see that that we are a member of the community, we are a good operator and that we can do it safely. We will work with those landholders who want to work with us in a very constructive and mutually beneficial way.

The Hon. RICK COLLESS: Some companies have threatened to take landholders to court if they do not comply. Has Santos ever used those methods?

Mr BAULDERSTONE: Santos has never taken a landholder to court. It is not our way, as the chief executive officer of Santos has said many times. It is not in our interest to do that. We are there for 20 or 30 years. Even if we actually used our legal rights to force a drill rig on to a site we have to have access to that site for the next 20 years, so it is in our interest to make sure we have a good relationship.

CHAIR: We heard from one of the landholders at Narrabri that he was concerned about any access to his property because of the type of property. That landholder was but one of a number of large producers of durum wheat, high-quality and high-value wheat. The information upon which the landholder based his fear was a map of his property, which had slopes on it and quite significant clay soils, was overlaid with a grid 750 square. When we were in discussion with your people we were told—and you have repeated the assertion here today—that when you plan your projects your wells are much further apart than the 750 square grid and that you try to put them on existing roadways or adjacent to fence lines. In fact another operator's method of operation is hampering your ability to talk to other landholders because it appears that they do not have the information that the method of production used by Santos is different. What do you say to that?

Mr BAULDERSTONE: That is absolutely correct. It is one of the reasons why I think at the end of the day we chose to take over Eastern Star. We believe from our experience in operating—

CHAIR: A point of clarification, I did not name the operation I was referring to as Eastern Star Gas.

Mr BAULDERSTONE: I understand that, but for Santos one of the reasons we took over Eastern Star was to ensure that we could bring the practices and operation experiences we have in other areas to this State. We have a large investment here. We need to make sure that we do it right and that we do it at the right pace. We believe that the practices that Mr Kremor has described can limit the footprint but it also relates to discussion around fracking as well. One of the reasons we would like to have a fracking discussion is not only about the increased gas flow from a particular well but also the more gas we can get from one well then the less wells we need to have on the surface. All those discussions do come together. That is why I think in the next two or three years it will be an important time for us to sensibly and rationally sit down and have a discussion. I believe it should be with all parties, including The Greens. I would very much like to spend time with you, Richard Waters and Bob Brown. We have an open invitation to take you through our plans and our thoughts—that invitation is always open to come and talk to us.

The Hon. GREG DONNELLY: I return to the issue baseline information. I am keen to find out your thoughts about the full range of baseline information that needs to be collected and the longevity of the collection of data on those different bases that needs to be collected before prudent judgements can be made as to whether or not to proceed with coal seam gas mining. I ask you to take that question on notice. My second question goes to the issue of the involvement of contractors in the industry, which has been raised by a number of people as we have travelled the State. Numerous instances have been reported to the Committee of contractors acting in a way at odds with what might be the policies and practices of the engaging company, ranging from simple things such as leaving gates open—which might appear to be a minimal issue but it is not necessarily—right through to the way in which they conduct drilling and the efficacy and quality of that drilling. Can you explain to the Committee how Santos ensures the absolute quality of the work that its contractors do to meet the standards that Santos says it has in regards to the conduct of its work?

Mr BAULDERSTONE: That is a very important issue for us. We do not hide behind contractors. We believe it is important to employ contractors because it often gives jobs in regional communities—whether it is fencing work or assistance with our operations. We believe it is an important part of job creation that contractors get the work. At the end of the day a contractor is seen as Santos and anything a contractor does that is not acceptable in the community will impact on us. We see that as an extension of us. We have a very rigorous assessment process and we have a very rigorous selection process at the end of the day as to who works for us. Our contractors are fully aware that they are acting for and on behalf of Santos; they represent our brand. We make it very clear that if there is any breach of our very strict requirements and guidelines they will no longer used. We have not had any issues with the people we have used, have we?

Mr KREMOR: We have not had any issues. There have not been any incidents with any of the contractors we have used in New South Wales since we have been operating here.

Mr CRAFTER: During any Santos drilling activities there is what is referred to as a Santos company man, and occasionally females as well, but someone in that role who is 24-hours on the site. They are in charge of the activities on the site. So the drilling contractor is doing the work but anything that is done is approved of by the Santos person on the site. So we have a very close oversight on the site.

The Hon. PETER PRIMROSE: Mr Baulderstone, is Santos prepared to push ahead with coal seam gas exploration and production prior to getting the science right?

Mr BAULDERSTONE: Absolutely not.

The Hon. PETER PRIMROSE: So you do support a moratorium. Thank you.

The Hon. RICK COLLESS: That is not what he said.

CHAIR: Thank you very much for agreeing to appear today. The Committee notes that you have just been verballed, but that is okay. Thank you for being so open. I am sure the Government will be most informed by your opening statements today and I am sure some members of the community who have expressed concerns to us over the past couple of days might also be quite surprised by your announcements today. I note that you have agreed to take questions on notice. We would like answers to those questions to be returned within 21 days of your receiving them.

(The witnesses withdrew)

(Short adjournment)

FIONA SIMSON, President, NSW Farmers Association, sworn and examined:

BRIANNA CASEY, Senior Policy Manager, NSW Farmers Association and

CHARLES THOMAS, Policy Adviser, NSW Farmers Association, affirmed and examined.

CHAIR: Before we proceed to questions would you like to make an opening statement?

Ms SIMSON: Yes. I would like to thank the Committee very much for the opportunity to give evidence today and for this inquiry's work to date, which has played such an important role in focusing Parliament's attention on community concerns about coal seam gas. NSW Farmers has been voicing concerns about the expansion of the coal seam gas industry in New South Wales for nearly two years on top of the many years of work on minerals and coalmining issues, many of which are very similar for our landholders. During that time we have consistently taken a proactive stance by not simply opposing the industry but by demanding a regulatory system which requires the industry to prove it will not damage our agricultural land and water and will not damage our local communities or our farmers' livelihoods before one more approval is given which allows this industry to grow.

The former Government did rural New South Wales an historic disservice when it covered nearly half of this State in petroleum exploration licences without any knowledge of or regard to the consequences of this action. When an exploration licence is granted it gives the holder the power to enter private land to conduct exploration, which may include drilling, fracking and extraction of contaminated water. To grant that power without first protecting affected landholders, their natural resources, their property rights and their ability to grow food and fibre is to my mind one of the biggest injustices our hardworking farmers have ever been dealt. As farmers we take our role as land managers and land stewards very seriously because a sustainable environment that can grow the best food and fibre for generations to come is the heart of every farm business. Knowing that we can be forced to spectate as gas companies are given the rights to enter our land without answering questions about the long-term effects of their actions has dismayed entire communities and left many farmers questioning their future on the land.

We have seen this played out very publicly this year with coal seam gas but it is something that mining-affected communities have known all too well for many years. In our minds, not enough focus has been placed on how the mental health and wellbeing of farm families, and rural communities more broadly, is being affected as a result of proposed coal seam gas development. Disempowered, uncertain, exhausted, under siege—these are words that I hear landholders use time and again to describe the way they feel. These are words we heard farmers using during the worst of the drought, and this troubles me greatly. As usual, of course, rural communities are rallying together and are supporting one another on this issue. But they just cannot live in this state of limbo forever. This is not a fact of nature like a drought, a flood or a plague, which our farmers are fairly hardened to.

The decision by the Government to exploit the resources under our land despite the cost to our businesses, our environment and our capacity to provide food into the future was as conscious as it was preventable. That really is the core of the anxiety we are seeing. Farmers feel like they have been sold out and that the Government did not stand up to protect them when they needed it most. Some coal seam gas companies appear to realise this. Recognising that the power the Government has given them goes too far, the big operators are now tripping over themselves to publicly state that they will not enforce the rights of access that they have been given against landholders, they will provide independent baseline data before undertaking work, and that they will make their chemical data publicly available. I commend those industry leaders for taking that approach, but we have to remember that there are still another 17 licence holders in New South Wales who have not and who are not required under current legislation to take these steps. This is where government needs to step in.

We said it in our submission and we continue to advocate for landholders to have the right to refuse access to mining and coal seam gas companies. We reject the notion that it is somehow fair to be told that your options are to "sign this document or we'll drag you through arbitration and have the arbitrator sign it for you". That is essentially negotiating with a gun to their heads and that is how our members feel. The industry often points to the fact that no coal seam gas arbitration has occurred yet in New South Wales and claims this as proof that the system works. If the system is intended to act as a deterrent to landholders who want to question the practices of coal seam gas companies or seek a fair deal, we agree that to date it has prevented every single one

of them from doing so. To protect our communities and ensure they are treated fairly and with respect, the most basic step is to put the ball back in their court. Give farmers some choice in this process. Investing in relationships with locals will become fundamental to the success of coal seam gas businesses rather than just a secondary consideration.

In order to have faith that the actions taken by coal seam gas companies are safe we need to see assessment criteria set much higher and we need independence in the science that underpins these assessments. If these companies were serious about gaining the trust of the community they would not be telling this Committee that everything is okay. They would be here en masse asking the Government to implement real protection for landholders, independent scientific assessment of their environmental approvals and the development of catchment-wide data for every location they intend to explore. They would also be working with the Federal Government to ensure that the National Industrial Chemical Notification and Assessment Scheme [NICNAS] tests the fracking and drilling chemicals they are using, and that these chemicals are publicly available on a national register in real time.

Instead they are continuing to advocate adaptive management, commonly known as the "suck it and see" approach. They want to press ahead, as they have done in Queensland, on the basis that they will be able to mitigate effects after or as they happen. I am delighted that all political parties now have drawn a line in the sand to say that this is not acceptable. We are waiting with bated breath to see whether the framework to be delivered in New South Wales will require the industry to prove its claims against stringent scientific scrutiny, even if that proof takes time and money to piece together. From our perspective we have only one chance to get this right. Without that proof, proceeding to jeopardise our water and some of our best agricultural and food producing lands is irresponsible at best and complicit at worst.

To put it simply, farmers do not want assurances from coal seam gas companies. They want assurances from the law. If these companies were genuine in their claims they would also be seeking the same thing. That is why this week we have taken the unprecedented step of writing to all petroleum companies that are active in New South Wales asking them to request the O'Farrell Government to write into legislation that farmers have a right to veto from exploration onwards, to support the public statements of the Santoses and the AGLs of this world that they will never force their way onto landholders' property if they do not want them there. Thank you again for the opportunity to give evidence today. We would be most happy to answer any questions you may have about our detailed submission or anything else relating to this issue.

The Hon. JEREMY BUCKINGHAM: My first question relates to an issue that has bubbled up in the past 24 hours or so regarding the blockade by the Caroona Coal Action Group at the Glasserton property and the suggestion by the Vice President of Santos, Mr James Baulderstone, that "our understanding was that if we backed away at Glasserton and provided we behaved reasonably we would have the support of NSW Farmers Association to proceed elsewhere". By proceed, of course, he means pilot production. I would like to give the NSW Farmers Association the opportunity to respond to that assertion by Mr Baulderstone.

Ms SIMSON: Thank you very much, Mr Buckingham. I have pleasure in responding to that assertion because I have had a lot of trouble trying to respond appropriately in the media. Unfortunately that statement is completely incorrect. In our role as the farmers' representative group we talk to the gas companies and their representatives. In that case we have been talking to Santos and AGL and also to Metgasco. We have talked to a number of the coal seam gas companies and we have also talked with the Australian Petroleum Production and Exploration Association [APPEA]. We continue to do that. The reason we speak to these companies on a regular basis is because, as I said in my opening statement, we have sought their support for some of the protections and amendments we believe we need in this State to ensure protection for landholders and for our natural resources before this industry continues to develop.

We have also hosted seminars across New South Wales where we have told landholders what their rights are in relation to this process. They have often been co-hosted by some of these companies, giving the landholders access to a one-stop shop for information, if you like, so that instead of landholders having a meeting just with a coal seam gas company we have been there to answer some of their questions and provide an intermediary between the gas company and the community. Unfortunately our involvement in the Glasserton situation was very high level and it involved no commitments at all to Santos as to anything at all. The discussions we had with Santos revolved around the usual situations of water testing, benchmarking and the need to do these in any and all situations they were involved in. I reiterated to Mr Baulderstone and Mr Crafter on the occasions that I spoke to them throughout the last couple of weeks that this was a decision for the

community and a negotiation for the community and that that was where they should take their questions and their discussion.

I was not contacted again until I was told by the Government that it looked as though we had a solution and Santos was offering to walk away. I responded that I thought that was a very good outcome. That is as much involvement as we have had; so, absolutely no deals, absolutely no commitments. We will continue to talk to Santos and work with Santos as we do with the other companies. We look forward to further discussions about their benchmarking and water testing, their regimes and their community consultation and how they can improve some of those processes. Certainly, no deals were done in this instance and no guarantees were given for access over one landholder in favour of another. It is impossible for me to give it and it is something I would not seek to do.

CHAIR: You might recall that during the discussions we had over the Brown and Alcorn versus BHP issue the NSW farmers Association at that stage was going to prepare some form of baseline pro forma access agreement for the benefit of your members. Have you done that?

Ms SIMSON: Yes. You might recall that the Act has a requirement that NSW Farmers and the Minerals Council confer regarding a template access agreement. Strangely enough the Petroleum (Onshore) Act, which governs coal seam gas, as I am sure you are all aware, requires the same thing. That is quite strange because in fact the Australian Petroleum Production and Exploration Association should be involved in those discussions as opposed to the Minerals Council. I might hand over to my colleague Ms Casey, to speak further on that because we are in the midst of developing that document.

CHAIR: Before you do that, under questioning this morning Santos agreed that they would provide a copy of their pro forma contract and the narrative behind that that instructs their legal or their negotiating representatives how to act. Once that document is developed, would you be able to provide the Committee with a copy?

Ms SIMSON: We would be very happy to. I think it is a good move for the coal seam gas companies to be providing their documents, because we have seen a huge range of access agreements—as I said earlier, about the 17 companies that are operating in New South Wales—not just through coal seam gas companies but also the mining companies. These agreements can range from detailed and reasonable documents to a half-pager which allows a mining company to come on to a landholder's property for an indefinite amount of time in order to carry out indefinite work. That is one of the reasons why we ended up agreeing that we needed to provide some basic level of template access agreement, which would be a minimum standard for landholders. I will ask Ms Casey to talk further about that because it is an interesting point.

Ms CASEY: I want to be clear that the discussions that we are having about a template access agreement for New South Wales landholders is specific to minerals at this point in time. So as far as petroleum is concerned, we have not commenced those discussions. It has only been recently that the Australian Petroleum Production and Exploration Association has been staffed to a point where we felt that we have been able to engage in these levels of discussion. We are in fact meeting with the Australian Petroleum Production and Exploration Association tomorrow about a range of issues and I would hope that we will commence that discussion about a template access agreement. What Fiona is pointing out is correct, we have travelled the length and breadth of the State in recent months to talk to landholders about what their legal rights and obligations are as far as access is concerned.

Charlie and I take all the calls that come in from farmers who are confused, concerned and upset about what their rights and obligations are. The more established companies seem to do a better job of educating farmers about their rights and obligations. The only word I can use to describe the behaviour of the newer entrants to the field is "appalling". They are turning up to landholders' properties unannounced; they are not advising landholders that they can seek independent legal advice; they are not advising them that they can have the costs of their initial advice recovered; and they are not advising them that they have 28 days to consider the agreement that is in front of them. What we want to see is not only a template access agreement but a change in the behaviour of companies in the way they engage with landholders.

CHAIR: Just to clarify, you will be proceeding to try to develop an access agreement from the petroleum industry in parallel with the one you are doing on minerals?

Ms CASEY: Absolutely.

The Hon. SCOT MacDONALD: I take you back to a discussion we have had about property rights. In your submission at page 31 you talk about a red light zone for strategic and cultural land where mining coal seam gas development would be prohibited. Let us take a property owner who might be in that orange zone or whatever, who is struggling with wheat prices at two thirds the cost of production and might be reaching the age of retirement. If we can give the assurances about no impact on aquifers, or no third party impacts and that sort of thing, how can we say to a property owner: Sorry, you cannot come to a mutual agreement with a coal seam gas company, you cannot get the fixed income that might tide you over. How do we address that?

Ms SIMSON: I came to a decision a long time ago that there is no silver bullet to fix all the problems that we are faced with in the development of this industry. That is why we have made 32 recommendations because the issue you are talking about is one of those issues where it is complicated, it is complex. It would be easier if we were wanting to stop everything or if we were wanting to proceed everywhere. But when you are seeking to have some up-front planning where you are seeking to give people property rights but also to protect the natural resources of the State, it becomes more difficult. One of the ways we are proposing that we deal with that issue is through the proposed new gateway process that is currently before the stakeholder reference group.

By applying a set of principles before an exploration licence is actually awarded, by actually having a look at the land—and this is all about up-front planning, this is all about assessment of the current resources we have and the current land use we have and the value of that current land use to the region and to the State—by applying that set of principles and having a good look at the biophysical resources of that region and the industry in that region, we can make a decision at a governmental level about the best use of that land for the time being, with the mining technical expertise that we have. It may be that at that moment it will not be locked in stone but it may be that at the moment, with the current mining know-how, and with the current technical expertise and the current impact of other developments in that region, we may not be able to go ahead with that and it may be in the best interests of the State to preserve that land for future generations for an indefinite amount of time.

There are 32 recommendations, it is not a silver bullet, it is not all about money and it is about preserving natural resources. I think most farmers that you talk to will recognise that there are areas in New South Wales where the land is so valuable that it is unique. If we look at some of the areas with very deep soils and very complex aquifer systems where impacts are not easily assessable and not easily measurable, there has to be a question asked: Is this valuable agricultural land that we should preserve into the future? You cannot make land like that anymore. I think most farmers would be sympathetic to that argument and would not seek to destroy some of this land. As we run out of land, the value of this land will go up.

The Hon. SCOT MacDONALD: So you are saying it may well be an "either/or" and that justifies impacting on property rights?

Ms SIMSON: Yes, I think it does and I think it is the policy of this Government that agricultural land and other sensitive areas exist in New South Wales where mining and coal seam gas extraction should not occur. I think that farmers generally are sympathetic to that argument and that is why we are seeing at this time huge unrest in areas such as the Liverpool Plains which are the great food bowls of New South Wales, where those farmers want to protect agricultural land. Just as the State seeks to protect some of its native vegetation, just as the State seeks to protect its marine parks, just as the State seeks to protect some of its very great resources, we believe that the State should also—and this Government is actively seeking to—protect some of its great food-producing lands. And I think that is the argument we have to have. Are we fair dinkum about wanting to preserve these lands and this water for future generations or is it all about money? I know what we think.

The Hon. Dr PETER PHELPS: A number of farmers who I have spoken to during the course of this inquiry have said that the native vegetation laws presented a far greater threat to the economic viability of their farms than does coal seam gas mining. Do you think that that is a reasonable position for them to hold?

Ms SIMSON: I think it depends where they are in the State and to what level their farm has been developed, and what ability they have to do it. But across the State, depending on whether you have coal under or coal seam gas under your property, depending on whether you have native vegetation on your property, depending on whether you are over at the coast or whether you have urban expansion or urban pressures, it is totally dependent on where the farm or the farmer is and where that farm is in its life cycle. We spend a lot of resources on native vegetation and at the moment we are putting in a submission about the review to the Native Vegetation regulations and at the moment coal seam gas is also impacting a large number of our landholders.

The Hon. Dr PETER PHELPS: Do you believe that a relaxation of the native vegetation laws, for example, would allow farmers to make greater use of the productive land that they have available to them and therefore would lessen their need for non-seasonal, non-farm income?

Ms SIMSON: I do not think I would call it "relaxation". What I certainly do recall—

The Hon. Dr PETER PHELPS: Would "wholesale withdrawal" be closer to it?

Ms SIMSON: I certainly would not be talking about relaxation. We will be making a detailed and specific submission about the need for new definitions about old growth forest and new growth. We think we need to have a focus on a landscape plan. I think, overall, if I may with leave say to the Committee that I think that coal seam gas, native vegetation, urban development, all these things need to be dealt with by government in an up-front planning process. We need to have some planning about the way that we are using parts of our State and how this impacts on landholders and we need to do this up front.

I do not think we have done this particularly well, as history shows, with over-allocations in the Murray-Darling basin and different things and having to adjust, I think we tend to do things and then try and fix it up afterwards. We need an up-front focus on planning. We will be putting in a detailed submission about the Native Vegetation Review because it is an issue that is impacting on farmers. I think it is also impacting on the outcomes that the environmentalists are seeking, because I am not sure that the current way that the Native Vegetation Act works is achieving the biodiversity outcomes that people are seeking either. I think we certainly need a review.

CHAIR: Order! I call to the attention of members and witnesses the requirement to address the terms of reference of this inquiry.

The Hon. Dr PETER PHELPS: With respect, Chair, the financial viability of a farm which has had native vegetation placed on top of it which makes it economically unviable when, prior to those laws being put in place it was potentially viable and productive, I think that is an important point. When you have to seek non-farm, non-seasonal income to make your property viable, that is an important point.

The Hon. PETER PRIMROSE: We are happy to have a debate, if you wish.

CHAIR: Order!

Ms SIMSON: Chair, if I can add to that, I think one of the issues that has come up with direct relevance to this Committee process is one of legislative inconsistency. A lot of the questions and comments that come in from our landholders are about the legislative inconsistency between what mining and coal seam gas companies can do as far as tree clearing and native grass cover et cetera and what landholders can do. And there is a real feeling that we have one set of rules for landholders and primary producers who rely on a sustainable land management regime and another set of rules for someone who is there for a relatively short period of time to extract a resource. So we want some consistency.

The Hon. RICK COLLESS: I congratulate you on your submission. It is good that we get submissions with sound recommendations in them such as yours has, it gives us a good idea of what you are after.

Ms SIMSON: I must also congratulate my staff on that.

The Hon. RICK COLLESS: Well done to all of you. With respect to your comments on page 28 about coexistence with cropping and taking on board what you have just said in answer to Mr McDonald's question about the red light or orange light and green light zones, your comments that current coal seam gas practices cannot coexist with cropping, the inference there is that coexistence is possible under a different regime of practices. Have you given any thought to how such coexistence might go forward and what sort of coal seam gas practices might be appropriate in some of those areas which are getting towards, I guess, the red light zone? And I understand that when we talk about zones, we are talking about lines on maps which I think you and I both agree is a difficult thing to do.

Ms SIMSON: Yes, I think to start with, this is all about the water and whether these farms depend on the underground water. First of all, for anything to work, no matter how the mine or the project is structured, we have to have confidence that it is not going to impact the water that that farm is dependent on. So I think that that is one of the underlying threads through our submission. Certainly, the physical infrastructure that is associated with coal seam gas exploration is changing and I have been to Wyoming in the United States, where they have coal seam gas exploration there and all the committee have seen pictures of Chinchilla, if they haven't been there themselves, where you see a grid pattern with roads, compressor plants, well heads and a set-up that would be impossible for broad-scale agriculture. I think the other question we have to nut out here is what we mean when we are talking about coexistence. It is a term we do not use because it is too difficult to know what is meant.

Is it coexistence on a property scale? Is it coexistence on a regional scale? Is it coexistence on a State scale? Our policy is balanced development. We believe that there are some areas in this State where this industry can exist. Does that mean that it can coexist on a property level? Not always. Farmers need to see proof that, in fact, well heads can be established in areas that are not going to impact on their large scale property prices; that are not going to impact on their GPS technology; that is not going to impact on their row spacing or their no-till technology. And in Queensland, the problem is that some of it does and some does not and I think we have to actually see some evidence of this and farmers have to be able to actually have confidence that the coal seam gas explorers are going to actually be able to do that on their property. With no rights for the farmers to negotiate access, and very little rights then to negotiate the wells, and the well heads as when we have talked to landholders in Queensland, it is very difficult for farmers to achieve that in some cases.

The Hon. GREG DONNELLY: I listened carefully to your opening statement and I want to make sure that I clearly understand you, and please correct me if I am wrong. Is it the position of NSW Farmers Association that all farmers should have an absolute right to veto exploration on their properties? I take it that that should be enshrined in law? Is that your clear position?

Ms SIMSON: The clear position is that currently the Onshore Petroleum Act provides for that right of veto on cultivated land under section 71 but only for production facilities, not for exploration. We believe that the legislation needs to be amended to enable that clause prior to exploration and to be widened to include agricultural lands.

The Hon. GREG DONNELLY: In effect, if this ultimately were enshrined in legislation it would provide farmers with that right to basically say "No, thank you very much. I wish to proceed with my farming activities. I do not wish to have coal seam exploration and/or production on my farm"?

Ms SIMSON: That is right, and it would provide a level playing field for farmers and for coal seam gas explorers to negotiate on. Currently at the end of the day, even if farmers pursue it right through arbitration and to the Land and Environment Court access must be awarded. That is why farmers feel so disempowered. We really believe that if we are going to talk about food security and we are going to talk about population explosions and we are going to talk about preserving natural resources and people's rights, we need to be serious about this. We need to enshrine some of these rights through legislation. Currently we hear a lot about food security. We hear a lot about food producing lands but we do not actually see any of it in any of these pieces of legislation that really threaten our industry and our farmers.

I think the other reason, and our particular stance, is that any of these planning activities do need to come up-front whether it is a gateway process or whatever we call it, it does need to be up-front before exploration. You hear the mining industry talk about sovereign risk by not proceeding with mining right across the State. What about sovereign risk to agriculture? How many farmers have exploration licences over their properties and have had them for many, many years? Some of our members have had exploration licences over their farms since the 1920s. What sort of a threat is that to agricultural investment?

If we look at the Liverpool Plains where we have coal seam gas and mining proposed at the moment that is one of the most valuable pieces of agricultural land in the State yet it is also one of the most advanced agricultural systems in the country. We have farmers who are at the cutting edge of technology there. How can they continue to invest in their farms if they have the uncertainty of exploration hanging over their heads? We really feel that we do need to make this decision and plan up-front for that. By giving farmers the right, as I say it is not a silver bullet, it is not going to fix everything, but it most certainly will level the playing field and put a focus for this Government on food security.

Ms CASEY: If I can add to the point about investment certainty, as much as I do not wish to defend or give ideas to our colleagues on the other side of the issue, it is about investment certainty for mining and petroleum companies as well. In the case of petroleum, section 71 does allow on cultivated land for the landholder to say "No" to production. Why spend millions and millions of dollars on exploration activities if there is no prospect of production? Enshrining that in legislation will give both the farmer and the company some investment certainty.

CHAIR: Is the position of the NSW Farmers' Association also the hypothesis that you put forward about changing the Onshore Petroleum Act carried through to the Mining Act?

Mr THOMAS: Yes, absolutely, the same principles apply.

The Hon. PETER PRIMROSE: If we do not get the science right in relation to coal seam gas what could happen to food production and obviously food prices in New South Wales?

Ms SIMSON: With so much of the State, and you have all seen the Mindi maps that do change quite regularly, and some of our most valuable productive lands currently under coal seam gas production—and looking at the experience of Queensland and America before us where these industries are better advanced, and as well as the shale gas in the States they also have large areas of coal seam gas—it worries me greatly that if we lose the water from some of these areas that it will absolutely decimate our food production. I think we have to have the science right and some assurances. Not all impacts are mitigatable. This is a time when we have to have some foresight and we have to plan into the future. We are going to be feeding nine billion people by 2050. In actual fact recently I attended an Australian Farm Institute seminar when we talked about the mining boom.

We were also talking about the agricultural boom because both industries offer huge opportunities to our State and country in the coming years. It would be very sad if the development of one industry meant that the other industry did not develop to its potential. I would say in New South Wales we are incredibly blessed as we have the opportunity to have both. It will definitely take some very careful planning to ensure that one industry does not mean that the other cannot function any more. I really think that this up-front assessment before any exploration licence is awarded is absolutely critical and then, of course, very careful legislative changes and legislative requirements requiring the science, the benchmarking, the water testing and the impact assessment is done as the project starts to be assessed.

The Hon. PETER PRIMROSE: As a consequence if we do not proceed with getting the science right and an appropriate legislative regime in place could we also be talking about significant price increases?

Ms SIMSON: Absolutely. If we look, as an example, at the Powder River Basin in Wyoming, it had fantastic and absolutely wonderful grazing land way back. Some members may have read the old books about it. That land has been sterilised. "Sterilised" is a very strong word but it means that it is sterilised for many, many years because there is no water underlying that land any more. The only water to which farmers now have access is the water that they bring in themselves. Yes, they receive money from the coal seam gas companies because they have the royalties over there but that does not make up for food production, for their rights and the fact that thousands of acres have been sterilised. That is exactly what could happen here and we do not want it to happen here unless we are very careful.

Ms CASEY: I want to point out what hopefully has come through all of the evidence that the committee has heard. Unfortunately in some instances in this State the best land and water happens to coincide where the best coal is and, as we are learning, the best coal seams are. We have got to get it right. If we look to the National Water Commission that is taking a very close look at this industry from a water perspective it is telling us that the CSG industry will extract 300 giga litres of briny water every year. That is more than 120,000 Olympic size swimming pools. To think that that is not going to have an impact on the potential of our farmers to grow the best food and fibre is nonsensical. We have got to get the science right. The issue about prices, unfortunately as we see, no matter whether it is a reform agenda or changes to anything in the operating environment that we have, farmers ultimately are price takers, not price makers. So whilst the prices may be driven up at supermarket shelf level, that is not necessary going to be the reflected outcome at a farmer level. So it is sort of lose, lose: they lose their production potential and do not actually receive any recompense.

Ms SIMSON: I might make another point about this issue. I know that Mr Macdonald has made some comments about our ability to produce food and how that may or may not be comprised in the future, and to what extent that can be. Fruit and vegetables can be grown quite intensively. They can be grown on small

acreages and in hothouses as well. Grains cannot. Grains have to be grown in large-scale tracts of land with water and in the right climate for the right temperatures and the right rainfalls. In actual fact less than 6 per cent of Australia is arable land. As my colleague just stated, most of that land is now covered by an exploration licence of one form or another. If we are not going to seriously threaten some of this land that actually produces the grains and is used for livestock production then we are seriously looking at threatening our ability in the future at some time to actually keep producing these large amounts of food. We are also not taking advantage of the opportunity that we could have in this booming climate to actually up our agricultural production and export more food to the rest of the world.

CHAIR: Ms Casey made a fairly bold assertion that 300300 giga litres of water extracted from 2,100 feet plus would impact on water security for people who use the surface. Will you provide the committee with the documentation about which you base that assertion?

Ms CASEY: Yes, we have referenced it in our submission. It comes straight from a position statement from the National Water Commission. They have a statement on mining and one on coal seam gas. It is also referenced. We have been very particular about only citing science when it comes to these issues. We are not interested in rhetoric. We want to make sure we have scientific evidence.

The Hon. JEREMY BUCKINGHAM: There is a lot of focus, quite rightly, on strategic or prime agricultural lands and predominantly those strategic and prime agricultural lands are the broad acre cropping areas that produce large amounts of grains and other produce for export and domestic use. I am equally concerned, and the committee has heard from a lot of farmers and communities who are also concerned about their agricultural enterprises that are not on prime agricultural land, but have other advantages, that is, they use cutting edge horticultural techniques, they have dairies that have survived rationalisation, they have got clean water, they are close to markets such as Hawkesbury or other areas around the Sydney Basin. Should we place equal importance on those lands? The NSW Farmers Association is involved in the stakeholder reference group regarding the strategic regional land use plan. What confidence do you have that these lands that are not considered prime agricultural land but still have value and produce a lot of high-quality horticulture, dairy, beef, in the Northern Rivers and those areas under the strategic regional land use process will protect those farmers and that produce as well?

Ms SIMSON: The word "strategic" agricultural land is one that we fought very hard, I have to say, to be included in the Government's policy. "Prime" agricultural land still sneaks in every now and again from everybody's rhetoric but in actual fact NSW Farmers Association is firmly behind strategic agricultural land. The reason that the association chose that word, and why it fought very hard to have it included, is because it implies the triple bottom line analysis. It is not just about the flood plains. It is also about what makes those flood plains valuable, for example, in terms of recharge areas, if they are underlain by aquifer systems.

It is also about, in the case of viticulture, the infrastructure and the access to the markets and access to rail et cetera. Viticulture is a great example of an industry that is located quite often on quite poor biophysical land. To us it is about a strategic analysis of what is important agriculturally—what is an important strategic agricultural industry to the region; it is about giving the community a say as to what sorts of developments they want in their communities, in their regions, what sort of balance they have and what that industry gives to the region. It implies a lot more than just a biophysical analysis of a floodplain.

The Hon. JEREMY BUCKINGHAM: Do you think that that is emerging in the strategic land use plan as it is available?

Ms SIMSON: It is something that many of the stakeholders around the table are very cognisant of and are fighting very, very hard to ensure that that remains the focus. We believe that that is the Government's policy that it brought into this election that it is now pursuing and we have heard nothing to say that the Government is backing away from that policy of preserving strategic agricultural lands. It is a very, very clear definitional difference in our minds for the very reason that you speak of. It is not just all about floodplains. Yes, floodplains are very important, but it is also about what is strategically important in a social sense, in a job sense and in an industry sense to the State and to that region.

The Hon. RICK COLLESS: Thank you, Ms Simson, for that answer. What you just pointed out to us is absolutely correct. Can I just go back to the issue Ms Casey raised about the 300 gigalitres of water? This was raised yesterday at Narrabri as well. I spoke to one of the water industry people privately yesterday and he said to me that if that 300 gigalitres ends up being treated by reverse osmosis, as indicated it will be, that realistically

could put another 150-odd gigalitres of water back into the water market. Do you see that that has the potential to provide opportunities for agriculture—and it does not get away from the fact that there are still another 150 gigalitres of treated water that still have to be disposed of—but certainly that possibly up to 150 gigalitres would be an advantage to agriculture, would it not?

Ms CASEY: I again come back to the point I made that we have to make this decision on the basis of science, and if we can get some rigorous, robust, credible science to indicate to us that the level of treatment of that water is going to be suitable for irrigation purposes or for cropping or for horticulture—for whatever purpose—not only in terms of its salt content but in terms of all the parameters that make water healthy, that is certainly something we would be willing to consider. But we are hearing from Queensland talk of reinjection, talk of evaporation ponds and talk of all these different ways to treat the water. The jury is out. We need some very strong, credible, robust science to ensure that anything that happens to our water is going to be to the benefit of not only the farming community but to the environment. We rely on sustainable land and water management regimes and if we do not have those then that is our business as well.

Ms SIMSON: If I could just add to that? To see some of the projects that have been approved in New South Wales, and in particular I reference the Gloucester project in this case, if you read the accompanying paperwork to that submission you will see that the project was approved with the absence of any long-term water management program and significant other lacks as well. I think that is a huge concern for us. We need to know these things beforehand. We do not want to suck it and see. If some of these things are inimical we cannot fix them up, and I think we need to have that scientific knowledge beforehand.

Mr THOMAS: There is also a lot of work to be done. If we are not going to be reinjecting that water we need to know that the lower pressure under the ground is going to be sustainable and that it is not going to lead to subsidence as well. So there is a lot of work to be done there.

CHAIR: Thank you very much for agreeing to appear before us today and thank you very much for the additional information you have provided. There may be some questions on notice that the Committee would like to put to you and we would like to have the answers to those questions within 21 days of them being issued.

(The witnesses withdrew)

PETER DREW HUTTON, President, Lock the Gate Alliance Inc., affirmed and examined:

CHAIR: Prior to our commencing questions from the Committee would you care to make an opening statement?

Mr HUTTON: Yes, I will make a short one if I may. For the benefit of the Committee, the Lock the Gate Alliance is an umbrella organisation of about 120 community groups, mostly in Queensland and New South Wales, but also extending to Victoria and Western Australia. Most of those groups are landowner groups, although there are some that are environmental or based in urban areas. I first became aware of the alarm felt among independent scientists about coal seam gas about 18 months ago. Underground water experts in the National Water Commission and Geoscience Australia, as well as the Federal Government's own water group, all warned that taking out very large volumes of water predicted for the Great Artesian Basin threatened the viability of whole sections of this great underground system, causing damage that might take centuries to repair.

Since then, many other experts have joined the chorus urging restraint: hydro geologists warning about aquifer drawdowns and inter-aquifer contamination; health experts, like those from the National Toxics Network, concerned about the chemicals used in fracking and the dangers to public health; and soil experts who felt the industry represented a threat to good agricultural land. These experts backed the views of an increasing number of Australians who wanted a far more rigorous assessment of the costs and benefits of the coal seam gas industry than it seemed to be getting from Government. Indeed, governments—State and Federal—abrogated their duty to apply the precautionary principle to these developments and allowed coal seam gas exploration licences to cover about one-quarter of Queensland and more in New South Wales. In Queensland's case they gave environmental approvals combined with the system of adapted management, which basically means "if you make mistakes we will change the regulatory system to accommodate you".

They also arranged to fill the enormous gaps in their knowledge by asking the companies to do the basic research as they went—what Fiona Simson has just described as the suck it and see approach—to chart the interconnectedness between the aquifers and work out what you want to do with all the water and salt you bring to the surface. I would like to warn people about that precautionary principle. The second sentence of the precautionary principle states: "In the application of the precautionary principle public and private decisions should be guided by (1) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and (2) an assessment of the risk-weighted consequences of various options. It is a very strong principle and one that should underpin certainly all major development. The landowners in Queensland looked on in horror—Queensland is my home State; I come from a place called Chinchilla—

CHAIR: A lovely place—we have been there.

Mr HUTTON: Yes, it used to be an even nicer place. The landowners in Queensland looked on in horror as this tidal wave of high-impact resource development swept across good farmland through closely settled areas, wiping out thousands of hectares of bushland, quite possibly promoting an ecosystem collapse in Gladstone harbour and threatening their water. In the absence of proper government processes in these rushed approvals, representatives from landowner groups in Queensland met in my office on the Darling Downs in September 2010 and we began the Lock the Gate campaign. This called on landowners to refuse to negotiate access by mining companies, including coal seam gas, to their properties. This sort of non-cooperation campaign was quite foreign to farmers, but we felt that even though governments might have given their approvals to these companies that communities have not. Therefore, we began a social movement that urged rural communities to stand up to these companies and to the governments that supported them.

This movement achieved such momentum that by mid-2011 the number of access and compensation agreements signed with landowners slowed in Queensland to a mere trickle. Arrow Energy, owned by Shell and PetroChina, has almost no landowners signed up in the Darling Downs and scenic route areas of Queensland, while QGC is at war with many recalcitrant landowners in their fields. The movement has spread to New South Wales. Despite the New South Wales Government insisting that what happened in Queensland would not happen here, exactly the same thing has happened. The previous Government handed out exploration licences willy-nilly across a quarter of the State, and the current Government has continued the full support of this industry. Approvals have been given for the go-ahead of coal gas seam developments at Gloucester and western Sydney, and various other companies are ramping up their exploration activities in other parts of the State.

Calls for a moratorium on all coal seam gas development have been ignored by the O'Farrell Government. Unfortunately for the companies in New South Wales, people in rural communities here had the chance of seeing all that is happening in Queensland and reacted by setting up community groups, joining the Lock the Gate Alliance and locking their gates in their thousands. Whole communities have refused to give access to coal seam gas companies, despite the fact that in New South Wales it is against the law to do so. Some will go further than merely locking the gate. The Caroona Coal Action Group has just ceased its blockade of a Santos drilling rig at Spring Ridge on the Liverpool Plains after Santos agreed to suspend its operations there.

I confidently predict this blockade will be followed by many others. Rural people are overwhelmingly conservative and reluctant to break the law or defy authority. But there is a wave of resentment right through the bush, and country people are now contemplating action that would have been unthinkable as little as 12 months ago. The New South Wales Government might be unwilling to impose a fair dinkum moratorium on coal seam gas until all the social and environmental issues have been properly addressed, but the bush thinks otherwise. They are imposing a people's moratorium on the industry, and politicians need to understand that although these will be strictly non-violent and polite to a fault, they still mean business. I am happy to answer any questions.

CHAIR: Those last two codicils you placed on that are very important: polite and lawful. That is great. We will proceed to questions now.

The Hon. GREG DONNELLY: Who would develop the science over what time frame to establish satisfactory proof for the Lock the Gate Alliance that coal seam gas mining is a safe extractive industry?

Mr HUTTON: The first response to that is that the people who should not be doing that are the companies themselves—that is what is happening now, basically. Fiona Simson has outlined very well just what is happening out there: They are doing the research as they go, and that is not the precautionary principle, that is not what should be happening. The other point is that you cannot get the precautionary principle enacted with proper science and with independent science without a moratorium. A moratorium has to be placed now so that governments can set up truly independent bodies, like the National Water Commission and State Water commissions, that are properly resourced to do this job well. Underground water is the key issue here.

There are other issues as well, like what you do with salt when it comes to the surface and what you do with the water, and the health impacts, but underground water is the key one, and we simply do not know enough about it; we do not know where the interconnectedness is. You can do a map of the Great Artesian Basin, for example, but it is an entirely different thing to know where the cracks are, where the interconnectedness is—both man-mad and natural interconnectedness—between aquifers to know to what extent water will move once you take out 300 gigalitres a year. That work needs to be done really badly. I am not an expert, I am not a hydrogeologist, so I have no real idea how long it would take. I would think it would take at least 12 months, but it could take up to two years. But the risks in not doing it, or doing it as you go, are far too great.

The Hon. GREG DONNELLY: Do you believe that the bodies that you have mentioned are sufficiently robust and independent to do this scientific work and the analysis to produce results in which we can be confident?

Mr HUTTON: I think they would have to bring in outside help, for sure. I do not know the National Water Commission well, but I know the Queensland Water Commission, and it is certainly nowhere near well enough resourced. Most of the good hydrogeologists are out there working for the coal seam gas companies, for a start. So getting the expertise is difficult. But it seems to me you also need a multi-disciplinary exercise. It is just not good enough to do test drills, core sampling and so on, and then extrapolate from that to try to work out the complex relationship between the different aquifers. You are going to need a far wider range of expertise than that. But it is there. All you need is the political will, and that is not there at the present time.

CHAIR: If government authorities were to undertake this work, who would you suggest they go to actually drill the holes—contractors?

Mr HUTTON: Yes, although they would need to be supervised. I get rung up or emailed all the time by drillers who tell me that what is going on out there is a shemozzle, that there are drillers out there drilling holes that are too narrow, or without proper casing, and all that sort of stuff. I do not know whether or not it is true, but I am certainly being told that. There needs to be proper supervision. And that does not always happen

by the way, despite what Santos said this morning. It does not always happen out there that the proper supervision is available.

CHAIR: So, irrespective of who was paying for it, you would have to use probably the same drilling contractors who are running round the country now.

Mr HUTTON: In many cases.

CHAIR: But they would have to be properly supervised by independent compliance people?

Mr HUTTON: Well, by government.

CHAIR: By government, yes.

Mr HUTTON: And with proper stakeholder involvement. The only stakeholders who tend to be involved are the companies at the present time. They are completely relied on for monitoring, and they are completely relied on to put their hands up if they do the wrong thing. Because of the Lock the Gate campaign, the environmental regulator in Queensland has been beefed up a bit and is doing a bit better job than it had done in the past. But it is still way under-resourced.

CHAIR: That was my next question. From your experience in Queensland, has the regulatory authority in Queensland been up to the task?

Mr HUTTON: They were woefully behind the eight ball when the whole thing started. It is part of the culture. The mining industry in Queensland historically has been so powerful that the phrase often used amongst environmental regulators is, "You don't say no to BHP"— where BHP is meant to represent the whole mining industry. So it is very difficult for regulators to even do their job against a big industry when they do not have the necessary skills at their disposal, and when they do not have the resources it becomes so much harder.

The Hon. SCOT MacDONALD: Mr Hutton, could I take you to pages 2 and 3 of your submission, where you make some statements that I do not think are factual, including, "Unlike all other users of water, coal seam gas companies are allowed unlimited take." And there are a couple of other dot points that are of that ilk: the coal seam gas industry is not subject to state water Acts; the coal seam gas industry is not listed in the NSW Acts. Then it says it is outside the National Water Initiative. Are you aware that from, I think, the 1st of July this year the Aquifer Interference Regulation requires new mining and petroleum exploration activities that take more than 3 megalitres—which is quite a small amount—from groundwater sources to hold a water access licence? We would like to think if we get a submission it is based on fact and will contribute to the argument.

Mr HUTTON: I do not have that section, but from memory it was mostly with regard to the Queensland situation and the Queensland Water Act of 2000.

The Hon. SCOT MacDONALD: With due respect, Mr Hutton, this is a New South Wales inquiry, and if you are going to put in a submission it should be based on our situation.

CHAIR: I remind members that they should not be argumentative.

Mr HUTTON: I acknowledge the July amendment to the Act in New South Wales. But the situation in Queensland is a cautionary tale for New South Wales: if you are going to give one industry beneficial regulations compared with others, like agriculture, that seems to me to be the wrong way to go. In Queensland the water that is taken out of the coal seam aquifer is regarded as waste under the Water Act.

The Hon. SCOT MacDONALD: Mr Hutton, water, as members have pointed out, is quite an important aspect to this. Under the National Water Initiative, water is supposed to be tradeable and it is supposed to be purchasable, and it does not change the overall entitlements. So, if something is going to a particular industry, that does not impact on the water sharing plan.

Mr HUTTON: I am not quite sure what point you are making.

CHAIR: I am not sure there was a question in that. Did you want to ask a question?

The Hon. SCOT MacDONALD: Do you acknowledge that in New South Wales with regard to the water purchase entitlements the coal seam gas industry now has to fall under that aquifer interference policy?

Mr HUTTON: I do not know your aquifer interference policy all that well, but I acknowledge that now they have to purchase water.

The Hon. JEREMY BUCKINGHAM: My question relates to water and to what is often termed "make good"; that is, that there is an acknowledgement that the industry will have an impact in a range of areas, and that the significant impact will be the number of bores drilled and being drilled through Queensland and into New South Wales. Looking down the track in terms of intergenerational equity, I would like your views on what is called "make good", and how government and the community or industry will maintain and make good tens of thousands of bore holes across the Murray Darling Basin in the coming decades.

Mr HUTTON: Well, you cannot make good an aquifer that has been contaminated or depleted, number one. You can make good in only two ways: one, you can pay money to land owners to compensate them for losing their water; or you can replace the water that they have lost with water that has been treated by reverse osmosis, and that is what several of the companies are doing in Queensland at the present time. But you cannot make good. What especially worries me is that this industry will last for 30 years, and at the end of that time the industries pack up and go and leave aquifers that have been depleted or contaminated and when there is no longer the capacity for reverse osmosis treated water to be given to land owners. As well as that, there is all the damage that has been created down below anyway from withdrawing that water. So, in terms of intergenerational equity, yes, there is a real problem with that. We are talking about 30 years. At best, what is most likely to happen is that farmers will be financially compensated where they can prove that they have lost water as a result of coal seam gas activities.

The Hon. JEREMY BUCKINGHAM: Often discussed is an assertion by the industry that coal seam gas is a clean, green, transition fuel. What is Lock the Gate's position on that assertion, that it is a clean energy fuel? Could you elaborate on your concerns surrounding fugitive emissions, and what research is underpinning your concerns about potential fugitive emissions from coal seam gas?

Mr HUTTON: Our primary concern is the effects on land and water—it always has been that. But a large part of the coal seam gas industry's argument that it is a sustainable industry and one that should be supported is that it is clean and green. I think its arguments for being green are pretty slim. As well as the water, in Queensland the rates of land clearing are quite enormous; we are talking about tens of thousands of hectares of bushland that will go down as a result of this activity. Already, on the Western Downs thousands of hectares have been cleared. But, in terms of it being clean, there has been a significant amount of research done in recent years on what is termed unconventional gas, which is usually shale gas or coal seam gas. The United States Environment Protection Agency, which has been doing some work for a number of years now, in 2010 put out a report that stated that the unconventional gas industry as a whole had in some cases greatly underestimated the amount of methane that escaped as fugitive emissions at various stages of the process.

For examples, they historically underestimated the amount of fugitive emissions from well makeovers by a factor of 8,000. Methane leaks, gas leaks—it leaks from wells, it leaks from connections, it leaks from the ground itself, and it leaks from compressor stations and pipelines. Professor Robert Howarth from Cornell University took up one aspect of the United States Environmental Protection Agency's work and looked at fugitive emissions from shale gas. He estimated that the extent of fugitive emissions from the industry as a whole ranged between 3.6 per cent of all methane gas collected to 7.9 per cent. That is quite a large range. At the top of that range, that would have given shale gas in the United States a much bigger carbon footprint for, example, than coal as an energy source.

Continuing research is being done in Australia. I think a lot of the research of the Australian Petroleum Production and Exploration Association for example is out of date as it uses methodologies that have historically underestimated the fugitive emissions especially. By the way, when you liquefy coal seam gas to liquefied natural gas for export—and a large proportion of the gas extracted will be for export, it is not for domestic consumption, not in Queensland anyway—that liquefaction process adds about 20 per cent to the carbon footprint; it is heavily energy intensive.

CHAIR: I repeat the request that all participants in the hearing turn off mobile phones, as I have now had a number of complaints from Hansard that mobile phones are interfering with the recording equipment. So please turn off your mobile phones or go outside the hearing room.

The Hon. Dr PETER PHELPS: Mr Hutton, are you aware of any incident in Australia where there has been cross-contamination between highly saline water from coal seam gas and alluvial aquifers?

Mr HUTTON: There is one that I am aware of just outside Dalby.

The Hon. RICK COLLESS: But in New South Wales.

Mr HUTTON: Not in New South Wales, no.

The Hon. Dr PETER PHELPS: Was the one outside Dalby investigated by Queensland's equivalent of the Environment Protection Authority?

Mr HUTTON: Yes, it was.

The Hon. Dr PETER PHELPS: Was it confirmed to have been caused by cross-contamination?

Mr HUTTON: That is my understanding. I do not know the situation.

The Hon. Dr PETER PHELPS: Would you take the question on notice and provide further details?

Mr HUTTON: Certainly.

The Hon. Dr PETER PHELPS: Thank you.

The Hon. RICK COLLESS: Mr Hutton, I want to go back to this issue of fugitive emissions. In your submission you state that fugitive emissions from coal seam gas range from 36 to 60 grams per megajoule, whereas in coal it is in the range of 30 to 32 grams of carbon per megajoule. Does that 30 to 32 grams in the case of coal include gas emissions that would come from the degassing of coal in an open-cut mining situation?

Mr HUTTON: Yes, it does usually. When you are looking at the research here—once again I have done the reading but I am not an expert in this area—a lot of this methodology is pretty poor, including degassing of mines or the amount of methane that comes from an open-cut coalmine. There is still a lot of work that needs to be done with fugitive emissions regardless of whether they come from coal mines or coal seam gas wells.

The Hon. RICK COLLESS: I am a little confused. You just mentioned the situation of a maximum of 7 per cent of fugitive emissions from work that was done in America—

Mr HUTTON: A maximum of 7 per cent.

The Hon. RICK COLLESS: I think you said that was shale, not coal seam—

Mr HUTTON: Yes.

The Hon. RICK COLLESS: —which is a completely different operation altogether.

Mr HUTTON: Not completely.

The Hon. RICK COLLESS: It is. We are talking about leaving the rock in place with coal seam gas whereas with shale you are fracturing the rock, which is quite a difference. But leaving that aside, I am confused as to how you end up with more gas emissions under a coal seam gas extraction situation where you are leaving the coal and all the carbon associated with it in the ground while you are taking the gas out. How do you end up with more carbon dioxide in the atmosphere as a result of coal seam gas mining than you do by removing the whole of the coal seam, burning the coal and the degassing of the coal which occurs once it is brought to the surface? How can that be right?

Mr HUTTON: The footprint of a coal mine is much, much more than the footprint of coal seam gas.

The Hon. RICK COLLESS: But the coal still comes out of the ground.

Mr HUTTON: Yes, and coal mines have a huge carbon footprint but the physical footprint of a coal mine is actually quite small.

The Hon. RICK COLLESS: We are not talking about the physical footprint; we are talking about the amount of fugitive emissions?

Mr HUTTON: Yes.

The Hon. RICK COLLESS: If you take one million tonnes of coal out of the ground then that one million tonnes of coal will degas—all the gas in that one million tonnes will go into the atmosphere?

Mr HUTTON: Yes.

The Hon. RICK COLLESS: Then you are going to burn the coal?

Mr HUTTON: Yes.

The Hon. RICK COLLESS: So how can there be more carbon dioxide in the atmosphere as a result of a coal seam gas mining operation compared with a coal mining operation?

Mr HUTTON: There would be methane in the atmosphere.

The Hon. RICK COLLESS: And that converts to carbon dioxide?

Mr HUTTON: Well, yes but it is a much—

The Hon. RICK COLLESS: Methane is not stable in the atmosphere; it converts to carbon dioxide.

Mr HUTTON: Sure but it is a much more potent greenhouse gas than carbon dioxide. I am sorry but I just keep coming back to it, the footprint of coal seam gas goes across one-third of the State of Queensland and it will go across a similar amount in New South Wales. So you are actually extracting water from down in the coal seam and up comes the gas with it. You are actually taking out gas from the coal seam across a much wider part of the State than you do from coal, which is actually a small physical—

The Hon. RICK COLLESS: So it is a quantum thing rather than a comparative thing per tonne of coal?

Mr HUTTON: That is right. With a coal mine you will get much more intensive methane emissions, yes.

The Hon. GREG DONNELLY: My question relates to discussions you have had with farmers in New South Wales. I want you to set aside for the moment your engagement with farmers in Queensland on this matter. Have farmers in New South Wales expressed to you a sense of a lack of legal rights in their dealings with coal seam gas exploration companies?

Mr HUTTON: I have not talked to one who has not expressed an opinion on it.

The Hon. GREG DONNELLY: I take it your answer to my question is yes?

Mr HUTTON: Yes.

The Hon. GREG DONNELLY: What have they specifically expressed to you about their concerns with their legal rights? Can you focus on what they have said to you, so we can have it explained to us?

Mr HUTTON: Most of them know either in their bones or by having read the Petroleum (Onshore) Act that it is illegal to refuse to negotiate with a coal seam gas company that wants to come on to your land and you have 28 days in which to do that, and if at the end of that time you cannot reach an agreement then they can take you to arbitration. Most farmers know that and they resent it greatly. Quite a few of them have pointed out

to me in no uncertain terms that in Western Australia that is not the case. They have what they call the farmers veto in Western Australia and I do not see an absence of mining in Western Australia.

The Hon. GREG DONNELLY: Are you in any position to explain to the Committee the farmers veto in Western Australia that you have just referred to? Do you know anything about it in detail?

Mr HUTTON: Not in detail. I just know what I have read in the newspapers and from what I have heard Colin Barnett—the Premier over there—say, which is basically that the relationship that a farmer and a mining company enter into is one between equals. There is no legislative provision for a mining company being able to force their way on to a farmer's land.

The Hon. JEREMY BUCKINGHAM: You have had decades of experience in environmentalism and activism and in dealing with social change and social movements. I think the Committee would benefit from hearing your view on where you think this issue will go and how it will evolve if a moratorium is not placed on the industry, with particular focus on civil disobedience. Do you expect to see more blockades? As you deal with a lot of these organisations, what is your sense of the sentiment in the community and how do you see that emerging in the coming months and years if we do not have a moratorium?

Mr HUTTON: If we do not have a moratorium then undoubtedly in the next few weeks or months—not in the next few years—any time a gas company attempts to come on to land they will be blockaded. The same as happened at Spring Ridge. There is enormous frustration at the fact that there has been such a mad gas rush going on. Normally very conservative people, as I said before, who would not even dream about breaking the law are going to commit civil disobedience to stop these companies coming into their communities. I know that is going to happen, and I think it is a good thing. I will be supporting wholeheartedly any community that wants to do that because the Government has to accept that it is just a Clayton's moratorium to say, "We will put a moratorium on all new applications" or "We will put a six month moratorium on fracking". They are Clayton's moratoriums. We want a moratorium on all coal seam gas development until the science is right.

The Hon. SCOT MacDONALD: I take you to that part of your submission where you talk about future energy needs and energy-demand management strategies. Are you aware that our peak load is still spiking but our demand is dropping off a little? You seem to be relying on renewables to fill the gap rather than gas. Have you got any evidence to substantiate that solar or wind can step into the base load and the peak load in the next 10 years when we are likely to be experiencing shortages—and we are likely to be experiencing serious shortages in about 2018-19?

Mr HUTTON: I think we have entered a period where it is simply a matter of energy economics and political will really. To try to muddy the waters by saying we should be going from coal to gas I think is simply saying we should be going from one highly polluting energy source to another. We need to do better than that. We need to develop an energy mix. Both gas and coal will undoubtedly be a part of that energy mix but we need an orderly transition to non-polluting forms of energy. We do not have a prescription for that. That is not the primary focus of Lock the Gate Alliance. Our primary focus is to protect the land and water. It seems to us to be ludicrous to be talking about minute savings in greenhouse gas emissions by going from coal to gas. Even if we are going to make those five per cent cuts that both parties in the Federal Parliament say they want to make, you are going to have to do better than that.

The Hon. Dr PETER PHELPS: Mr Buckingham raised your long history of activism. Can you think of a single time when you have supported any extractive industry development?

Mr HUTTON: I support all extractive industry development that is done properly.

The Hon. Dr PETER PHELPS: Have you any one specific proposal where you have publicly supported extractive industry development? Perhaps a coalmine, goldmine, or an antimony mine? Is there any time where you have ever supported a development?

Mr HUTTON: A mining development?

The Hon. Dr PETER PHELPS: Yes.

Mr HUTTON: Probably not but that is only because I—

The Hon. Dr PETER PHELPS: Thank you. That is all I need to know.

Mr HUTTON: I am being verballed again. It is because I get called in when there is a problem. That is my job. Plenty of good mining goes on.

The Hon. Dr PETER PHELPS: And there is always a problem, is there not?

Mr HUTTON: No, not at all. I have nothing against mining and Lock the Gate Alliance has nothing against mining. We are not an anti-mining organisation; we simply want mining to be done in a way which is sustainable.

The Hon. Dr PETER PHELPS: Is there any mine that you can think of which you support?

Mr HUTTON: There are several around the place that are doing quite good work. In the ones that I am aware off, which are mostly in Queensland, they are doing reasonable work in rehabilitation and the environmental management of their sites.

The Hon. Dr PETER PHELPS: Are you able to name those mines or will you take that question on notice?

Mr HUTTON: I will have to take it on notice.

The Hon. RICK COLLESS: I return to your earlier comments about hydrogeologists and the fact that we need to get the hydrogeology science right before any of this work goes ahead. I think you mentioned it might take 12 months to do so?

Mr HUTTON: Yes.

The Hon. RICK COLLESS: Do you not think that the many hydrogeologists who worked in the water resources department, the irrigation commission and all those previous organisations that managed the State's water resources, who worked for 40-odd years in some cases, would have a pretty good understanding and knowledge of the groundwater systems and the aquifer relationships and so on that exist in some of these areas?

Mr HUTTON: I have spoken to some of them and they say no. They have a pretty good idea about those water systems but the thing is that those water systems are largely in equilibrium. It is not a highly dynamic system. The water moves very slowly—two million years to cross the whole Great Artesian Basin. It is not a system where interconnectiveness has been a major factor until fairly recently. Those highly precise sorts of mapping are simply just not being done. We do not even know necessarily where all the recharge areas are. We tend to know where the discharge streams are but not the recharge areas. They tend to be at the bottom of streams, lakes and wetlands or whatever. We have a general knowledge but not a specific knowledge but certainly not the sort of specific knowledge that is needed here.

The Hon. RICK COLLESS: When we go about the business of accumulating that knowledge over a 12-month period, as you suggest it might take, how can we go about accumulating that knowledge without that—

Mr HUTTON: You can do test drilling—we have no problem with that. But you are going to have to do more than test drilling. There is test drilling, seismic studies and—

The Hon. RICK COLLESS: Is the seismic studies and the test drilling that the companies are doing now contributing to that knowledge base?

Mr HUTTON: Of course it is. I am not denying that for a moment. The problem is that that is part of a process that leads to the development of—they are not testing to find out where the problems are so then they will say, "We are not going to go into those areas because that could lead to problems down the track." They are just trying to find out where the gas is and where it can be most effectively and efficiently extracted. We need an entirely different set of parameters for the testing that needs to go on.

The Hon. RICK COLLESS: Can you suggest what sort of framework those parameters might take?

Mr HUTTON: That is testing me a bit. It would need to focus on what happens when you extract the volumes of water we are looking at here—we will say 300 gigalitres a year—from the system, from the coal seam aquifer, from the Clarence-Moreton Basin and so on. We need to work out what that is likely to do and where the interconnectiveness is. If we extract that amount of water what does it mean in terms of water movement? Where is it going to move to? What is the likely period of time we are looking at to see that water return? The National Water Commission has suggested that in some cases that could be centuries. All of those things would need to be looked at and you would need to come up with a formula that says you can safely extract coal seam gas in certain areas because you are not going to set up a disastrous new set of factors but you cannot extract it in other areas.

The Hon. RICK COLLESS: Surely highly trained and capable hydrogeologists in the hydrogeology industry, regardless of whether they are working for Santos or the Department of Water or whoever else, would be maintaining their scientific integrity and working with a whole range of different organisations within the industry to advance the industry?

Mr HUTTON: Mr Colless, I have been an academic for many years and the one thing I have learnt is that academics are no more immune from paying the piper than anybody else.

The Hon. RICK COLLESS: That is interesting.

Mr HUTTON: You need to have independence in order to be able to come up with outcomes that are free from taint.

CHAIR: The Intergovernmental Panel on Climate Change would support that argument.

The Hon. JEREMY BUCKINGHAM: Despite what Mr MacDonald said earlier, are you aware the Government's draft aquifer interference regulation creates an exemption for all holders of current leases and licences? Anyone with a current lease or licence is actually exempt from the aquifer interference regulation.

The Hon. Dr PETER PHELPS: Production lease?

The Hon. JEREMY BUCKINGHAM: "Authority" means a lease, licence, mineral claim or environmental assessment permit.

The Hon. SCOT MacDONALD: Point of order: I said "new licences". I was very clear. Mr Buckingham is not being honest.

The Hon. JEREMY BUCKINGHAM: Are you aware that any existing licences are exempt from the aquifer interference regulation?

The Hon. RICK COLLESS: That was put in place before the aquifer—

CHAIR: Order! Let the witness answer the question.

Mr HUTTON: I am aware of that. That is part of the frustration we feel—all regulations now relate to new developments. We want a moratorium on all coal seam developments, whether they are just starting up today or whether have been going for the past three years.

CHAIR: We are out of time. Thank you for coming such a distance to speak to us.

(The witness withdrew)

(Luncheon adjournment)

ROSS ANTHONY NAUMANN, Drilling Expert requested by Australian Petroleum Production and Exploration Association, and

MIKE ROY, Technical Expert for well construction and fracturing, requested by Australian Petroleum Production and Exploration Association, sworn and examined:

CHAIR: I will not be asking you for opening statements, but I might ask you in turn, Mr Naumann and then Mr Roy, could you give us the benefit of a bit of background on your qualifications and experience in the fields that you are discussing today?

Mr NAUMANN: Thank you for the opportunity to speak here today. My name is Ross Naumann, I am a qualified mining engineer with a Major in Petroleum. I have worked for my entire career in the upstream drilling industry. I have held positions with many of the major companies, including coal seam gas companies, Santos and Origin. I have been involved with coal seam gas since the start of the coal seam gas industry in Queensland in 1995 when I was the Drilling Manager of Oil Company of Australia, Origin Energy at that time. I am currently employed by Dart Energy as the Head of Drilling, which means I am operationally responsible for Australian drilling and also functionally responsible for international drilling operations.

Mr ROY: My educational background is in mechanical engineering. I have worked internationally for ten years with Schlumberger as the technical expert in fracturing and well construction. I have had 28 years experience in the gas industry. I first got involved in coal seam methane in 1988 in the Warrior Basin and also in Canada and then I came to Australia in 2000.

CHAIR: We will proceed directly to questions if I may and I may start off with a question to Mr Naumann. As succinctly and briefly as you can, and I know it is a highly technical subject, can you describe the construction of a coal seam gas well, one that, shall we say, is going down to 700 metres. How are they constructed, what are the materials used, how are the wells sealed and at what points do they need to be sealed?

Mr NAUMANN: The first stage in the design of a well would be to do an assessment of the potential hazards that we might encounter while drilling the well. When I refer to hazards, I am talking about drilling hazards—potential loss circulation zones where we may lose our entire drilling fluid; any potential for over-pressure, which is not going to happen in Australia; and any other geological difficulties that we might encounter in the well. Normally when we start the well we are in fairly soft sediments, so the first part of the well is simply to install what we call a conductor casing. We will drill a fairly large diameter hole to maybe six metres and grout that piece of pipe back to the surface.

The purpose of that conductor pipe is to provide a conduit back to the mud tanks and mud handling system for the rock that we are about to drill down on the next section. So the whole purpose with well construction is to drill a hole whilst making sure there is no ingress of fluids from the well and making sure we lose no fluids to the well. They are both related, for significant reasons. If you go back a step, drilling mud is the critical part of the whole drilling process. The drilling mud is used for three purposes. It is pumped down the centre of the drill stream at all stages it lifts the cuttings from the cutting device, the bit, and brings those cuttings back to the surface.

The secondary purpose of drilling mud, it provides primary well control. In Australia we have what are called normally-pressured reservoirs which means that the pressure at any point below the surface is equivalent to a column of fresh water, that is normal pressure so if we can maintain a column greater than water at all times we will have well control and prevent egress of fluids into the hole. The third purpose that drilling mud performs is to drive the motors that we use for doing directional work if we get into that later on. That is a special type of drilling versus rotary vertical drilling. Returning to well construction, we have set up the conductor, we have cemented that to surface, we have put on some pipes so that we can take the cuttings back to the tank. We then drill the next stage of the whole which will be a surface hole. Normally we work in inches, so I am not sure you are going to handle working in inches.

CHAIR: Go ahead, that is fine.

Mr NAUMANN: We normally drill 12-¼" diameter. We would drill that to roughly 50 metres past any surface aquifers. We then run steel casing and we would run 9 5/8 inch outside diameter casing, roughly nine-inch inner ball casing. We cement the annular space between the steel and the hole back to surface with

cement. That is a critical part of the well. We do pressure cementing with a non-return device on the bottom of the casing. We pump the cement down the centre of the pipe, put a wiper plug, a displacing plug on top of that, we pump the cement column down and back up to fill the entire annulus and the non-return valve holds that in place until it is set. After we have done that, we would install well control equipment which is commonly called the blow-out preventer. That is a device that has a series of hydraulic rams with plates that either seal around the pipe that we are going to be using or a CSO—a complete shut-off ram—so that the rams can totally seal the hole if there is no pipe in the hole and then a bladder device on top of that which is a big hydraulic element that will seal around any sized pipe.

So the pipe rams are the size for the main size of drill pipe that we are using, so they are specifically set to say, close on four and a half inch pipe. The annular will close on any pipe; the CSO will close on no pipe. We drill out the shoe track, we drill out the cement that is left inside the first string of casing. Firstly we pressure test the casing and the BOPs before we drill out, to ensure that it is all going to hold pressure. We then drill just outside the casing and do either a lick-off test or a formation integrity test. This is critical because in a well control sense, when we are drilling deeper into the well, if we manage to bring gas from a deeper depth, we could be transferring that pressure from that depth up to the surface but the weak point in the well is immediately below the surface casing tube.

So we have to understand what the strength of the rock at that point is, so we will pump into that rock until it leaks off and that will tell us how strong it is and the maximum pressure we are allowed to see at surface before we would have to divert. The secondary purpose of that is obviously that it confirms the integrity of the cement, because if we pump in and we manage to get to a pressure that is two or three times the normal pressure, then that is saying that we have got no communication back to surface. After that, we continue to drill down through the coal seams. Once we get to total depth, we would then retract the drill string from the hole and run a set of geophysical logs. They are instruments that are deployed into the well on Y-line and they measure the natural properties of the rock and tell us the porosity and the density of the coal, the natural resistivity, which gives us the properties of the rocks. We then cement another string of casing into the ground. Now you are talking roughly seven-inch casing or five and a half inch casing.

The Hon. RICK COLLESS: Inside the other one?

Mr NAUMANN: Inside, yes. I have skipped a step. We have set a 9 5/8 inch casing, we drill an eight and a half inch hole, we set seven-inch casing or five and a half inch casing—it depends on the final construction of the well that you are looking at. If you are doing a barefoot well, you are possibly using seven-inch casing; if you are doing a horizontal well where your well would become the target for a horizontal well, you would be running seven-inch casing. If you are fracking the well, you would possibly use five and a half inch casing. It depends on the application and the potential flow rate but the same sized hole. Then you would again cement the annular space from the bottom of the casing back to the surface. There is a little more involved in the wellhead side of things but each string of casing is suspended inside the other string of casing.

So there is a secondary set of seals at surface involved in the wellhead. The casing head itself goes on to the first casing, which is what the blow-out preventer sits on. The next string of casing, the seven-inch casing, sits inside the casing head, suspended on slips or a mandrel-type hanger but sealed and pressure tested into the first component. You finish up with a well with a reducing taper. Each string of steel is cemented into the ground. After that, it comes down to what your production technique is going to be. If you are fracking, you would perforate just into the coal and pump your frack treatment. If you were doing a horizontal surface intersection, then you would mill some of the casing out with a special tool and drill back through and intersect the well. There are quite a few different variations but that is the basic concept.

The Hon. JEREMY BUCKINGHAM: You have just said that the first string of casing, the 12 and a half inch casing, runs down to usually 50 metres below the first aquifer you run to and you cement that into place. And within that, you have a second casing, the five-inch or seven-inch casing that goes down. So in the well construction, typically you would have a double casing with the concrete or cement on the outside but also between the two casings within, but that would only occur down to 50 metres below the first aquifer and then beyond that, you have just got the casing and the cement on the outside. Is that correct?

Mr NAUMANN: Yes, that is correct. On the upper strings you have two strings and it depends on the aquifers. If you have a single surface aquifer, you will have the two strings of casing; if you had a secondary aquifer deeper down, you would run an intermediate casing string. Each well has to be designed specifically for the application. If there is an aquifer at 100 metres, my first 9 5/8 casing string would go to 150 metres and be

cemented back to surface. If there is a secondary aquifer at 450 metres, we would drill for 500 metres and then we would set seven-inch casing and cement that and then we would continue drilling in six-inch hole down to the coal and then a third string of casing. So each aquifer can be protected. It comes down to the strength. The section of open hole that I am prepared to drill comes down to the strength of the rock at that first point. If I knew that the strength of the rock 50 metres below the first aquifer would allow me to continue down, I would go down below the second aquifer with the first casing string.

The Hon. JEREMY BUCKINGHAM: My trade is as a stonemason and I do not know much about aquifers et cetera, but how do you concrete? In my experience you need it to go off and I am sure there are chemicals you can use to make the concrete go off. How do you assess the structural integrity of concrete at depths of say a couple of hundred metres, of concrete that is sitting within an aquifer? Because my understanding is, an aquifer can be a void, so it can be an actual body of water but it can also be a porous rock, so there is fluid there. How does that concrete set and how do you assess its structural integrity?

CHAIR: Before we proceed, would you be prepared to take that question on notice and provide an answer to the Committee?

Mr NAUMANN: What does taking the question on notice mean?

CHAIR: The Secretary will write to you with the question detail and then you write back with an answer. Is that acceptable to you?

Mr NAUMANN: That is fine, Mr Chairman.

The Hon. Dr PETER PHELPS: Do either of you know from your experience in Australia of any instance where there has been coal seam saline water cross contaminating with any aquifer above it because of drilling for coal seam gas?

Mr ROY: I personally do not know of any wells that have cross communicated in that manner. When the well is cemented, it is cemented back to surface. If there is evidence of cement coming back to surface, in addition to that, you will do what is called a cement bond log. In most situation you will go ahead and review or look at the integrity of the cement behind casing as well to ensure that the cement is at a height near surface, and that the integrity is protecting from below to above.

Mr NAUMANN: I have never seen any wells where there has been cross contamination. I have not seen any wells, or heard of any wells, where there has been an integrity issue basically.

The Hon. Dr PETER PHELPS: Over how long a period of time is that?

Mr NAUMANN: As I said I was involved with the early days of coal seam gas with the Oil Company of Australia in 1996, so 15 years.

CHAIR: Mr Roy will you provide the committee with a technical explanation as to how you carry out that assessment? What type of technology is used?

Mr ROY: Yes.

The Hon. GREG DONNELLY: In relation to the casing—the metal and the concrete combined—what is the life of it? In other words, is there a future point in time whereby the casing starts to deteriorate, weaken or break down?

Mr NAUMANN: I would say "no". We are working with a very strong standard which is American Petroleum Institute—API—5CT standard. We are effectively applying petroleum technology. The minimum standard of casing that is available under API gives safety factors in the range of 4½ to 8 for the installation of the casing into most coal seam gas wells. You really have no question about the structural integrity of the steel. You then have to look at the cement, and the cement quality. Degradation of cement only starts to seriously happen above 230^{o} Fahrenheit. Most of our wells in coal seam gas at less than 3,000 feet or 900 metres, you are lucky to get to say, 150^{o} Fahrenheit so you are not in the range of temperature degradation. The other issue with cement degradation is the water content of the cement when you pump the slurry.

When we pump cement we are not pumping concrete as in an aggregate and sand or cement power water mix, we are pumping neat cement powder at very high densities with water. You have got a very consistent, high strength uniform blend of cement going down the hole. All of the cement products are again according to an API standard which I think 10A and 10C so we have got very strong standards. The suppliers of those products have to routinely test those products to maintain their API certification. So you have got good quality products and good quality steel. The other issue you have obviously got to start thinking about is the life-of-well conditions. Are you going to see some corrosive environments? The answer again is "not likely". You have got no temperature, you have got no oxygen so you are not going to have the casing just rust away because you have got a casing string full of gas. For oxidation you need to have oxygen.

So you are not going to have internal rusting basically. If you are going to see any rust it would be on the top metre or two or the top 30 centimetres of casing that could be exposed to surface. You come back to your safety factor. You have a safety factor of five or six, which means you would lose 80 per cent of the wall thickness of that pipe before you started to even come close to the working pressure, so you have got lots of time. I do not think rust is an issue. You could look at other types like CO_2 corrosion, for instance. One of the reasons we do exploration is to work out whether there is CO_2 in the well because obviously we do not want to produce and sell CO_2 because we do not get any money for it. Also, it does mean you have to look at your material selection if you know that you are producing in an area where there might be CO_2 or you may have to have a corrosion treatment system basically.

The Hon. GREG DONNELLY: What is the situation in relation to the potential of earthquakes and earth movements on wells?

Mr NAUMANN: I am not sure that we are really considering earthquakes as a serious threat in Australia. I do not know that we have had any significant parameters in any of the areas in which coal seam gas has been undertaken. It is an issue that SPE, our professional society, is looking at as an overriding view but they are talking for deep high temperature oil wells rather than coal seam gas.

The Hon. GREG DONNELLY: That is not a matter for consideration as far as you are concerned?

Mr NAUMANN: I would see it as a very low risk.

Mr ROY: If I could add, the API casing that was referred to, for example, is rated to around 5,000 PSI for 5½ inch casing and the production pressure from a coal seam gas well is in the area of 40 to 50 PSI. That puts it in relative terms that these wells are over designed. That is for coal seam gas operators that are conforming to API standards. There are some companies that do not necessarily conform to API standards. They may use a mining standard which is different to API.

The Hon. GREG DONNELLY: What is API?

Mr NAUMANN: American Petroleum Institute.

The Hon. JEREMY BUCKINGHAM: The issue of fracturing is contentious. Will you explain to the committee what are the chemicals and fluids used in fracking? Why are they used? Will you give a range because I understand it includes biocides and guar gels and all those things?

Mr ROY: The fluids that we have used, myself as a fracking specialist, have gone as basic as fresh water and sand—sand being the prop that holds fracture open with absolutely no additives to obviously the more complex fluids, depending on the reservoir conditions. It is really the reservoir that will dictate what kind of fluid you need to design. If you have a well that has high permeability, which means the ability for water or gas to flow through the rock is quite high, then your fracture may not have to be too penetrating. You want to get through just a short fat fracture. If that is the case you would want to viscosify your water and by increasing the viscosity of the water you increase the efficiency and you can create a shorter fatter fracture essentially.

If your permeability is lower you may use a lower viscosity fluid—maybe in the neighbourhood of 10 to 15 centipoise—and it will give you a larger, more deeper penetrating fracture. When you look at those types of fluids your main ingredient is a guar gum viscosifier. Guar gum is an organic material derived from a plant and it is refined and used in the food industry as well. In addition to that, because guar is an organic starch as well—bacteria love it—you have to use a bactericide. That could simply be sodium hypochlorite bactericide or it could be something more complex that inhibits the growth of bacteria in the fluid. In addition to the

bactericide and the guar viscosifier, typically you have to add a pH adjuster, a buffer, in some means which will accelerate the hydration of the guar gel. That might be an acidic acid or a mild hydrochloric acid to adjust the PH within the water to give you the desired properties.

There are other properties such as surfactants, typically not used in coal seam gas, but they have been used internationally and that aids the flow-back of the coal seam gas water. If you want to take the viscosity that next step and increase it dramatically the base fluid is still the same but what you do is you add a boric ion and you complex fluid by cross-linking it. You do that by raising the pH to about 9 or 9½ pH and you will do that by various materials but one is sodium hydroxide to increase the pH. There are other more environmentally friendly additives that are currently being used than sodium hydroxide to raise the pH at 9 or 9½.

CHAIR: Will you spell the measure of viscosity?

Mr ROY: The centipoises - cp is the shortcut.

The Hon. Dr PETER PHELPS: When the transcript is published will you read it carefully because you have mentioned a lot of technical terms and it will be very useful because it will be an official record to make sure that what you have said is correct.

Mr ROY: Yes.

The Hon. SCOT MacDONALD: When we were in western New South Wales and Queensland the Great Artesian Basin was mentioned constantly. People are very concerned about and emotionally attached to it and with good reason. It is an ancient water system. My colleague asked you if there had been any breaches but it is different because a lot of that basin is at a greater depth than shallow aquifers. Do you have an experience in Queensland? Did you come across any adverse incidents that impacted on the Great Artesian Basin? Can you back that up with monitoring?

Mr ROY: First of all, when you are designing your well, and doing the well construction, you are going to look at the risks. The very last thing that a coal seam gas operator will want to do is have water ingress from the zone that you are actually not targeting. If you had water ingress, other than from the zone that you are producing water and gas from, that could be uneconomical. So from the well construction standpoint we want to ensure that those risks are minimised. The next step is to look at the fracture geometry. What will happen when you actually fracture the rock? Will the fracture grow vertically? Typically fractures grow vertically in nature. We do know in the Camden Basin we get what is called a T-shape fracture. We get a vertical fracture with a horizontal component which is between the top of the coal seam and the upper sandstone formation above it. From that fracture geometry then we can determine what risks there are to communicate with any aquifers and, to be quite honest, how close are there any beneficial aquifers?

If there is no beneficial aquifer within 200 or 300 metres the risks are very minimal. But it is important from a fracturing design standpoint that we understand the geometry of the fracture. Now that is not always easily done but there are diagnostic plots that you do in real time that indicates whether the fracture is growing vertically uncontained—in other words the bounding layers of rock outside the coal seam are not containing the fracture—or whether the fracture is contained. So in real time there are diagnostic methods to determine whether that is happening. In addition, there are a lot of technical things, for example, you can run a post fracture, you can run what is called a dipole sonic log and by running a dipole sonic log you can go in and actually look behind a steel casing using soundwaves and behind the cement and actually look at the fracture that you have created behind pipe. That is one method. There are other methods as well to map out that fracture.

The Hon. SCOT MacDONALD: The level of assurance on the Great Artesian Basin while maybe not 100 per cent is very high in terms of any possible contact?

Mr ROY: I am personally not that experienced with what is going on in Queensland. My experience level in fracturing is predominantly New South Wales. I am not probably the best person to answer questions. I can understand the industry would be very concerned obviously if they accidentally fractured into the Great Artesian because if you were to do that your well would be uneconomical. You would have to abandon it.

The Hon. RICK COLLESS: Is there a difference between the fracking that would occur in a coal seam gas situation compared to fracking in America where it is carried out in shale gas?

Mr ROY: I would be very happy to answer that question because it seems that it is the shale gas fracturing that has raised fears. To be truthful, shale gas and coal seam gas are both labelled in the industry as unconventional gas, and it is because they have been categorised as unconventional—meaning they do not come from a sandstone reservoir—that they assume that the fracturing techniques involve unconventional means and are similar, and they are not similar at all. To give you an idea—and I have that note in front of me here—in a horizontal well which you drill into shale, you may drill 1,500 metres horizontally within a well and they case that off and they will selectively fracture, starting from the toe of the well all the way back to the heel of the well, as many as 12 to 20 times. Each one of those fractures is roughly 1.6 megalitres of water. The amount of hydraulic horsepower required to stimulate the fracture and shatter the shale rock is typically between 25,000 and 30,000 hydraulic horsepower—it is massive. The duration to do a well is typically between 25 and 30 days to fracture stimulate a shale well.

To put that in context with coal seam gas wells, the amount of horsepower typically required to frack a coal seam gas well is 6,000 horsepower. The amount of water used may range from 200,000 litres—we are not talking megalitres—to maybe as much as 600,000 litres, depending on the fluid. If you use viscosity when you fracture then the amount of fluid required would be less, so you would be using less water. The duration is typically two days, maybe three days, in my experience to do coal seam gas wells. So it really is a magnitude less than shale. Obviously, the other thing is the depths as well. Coal seam gas wells, as Ross pointed out, are typically 700 metres, 900 metres within the coal plays. We are looking shallow rock, that I am aware of, shale at around 2,500 metres, but typically 2,500 to 4,000 metres deep, so the temperature and the fluids, the gas itself, the composition gas is totally different as well.

The Hon. RICK COLLESS: In your view is there any way that a company undertaking a coal seam gas fracking operation could inadvertently fracture the shale above it or below it?

Mr ROY: The lithology within a well varies from field to field. There are many fields where you have no shales.

The Hon. RICK COLLESS: Whatever the underlying material is.

Mr ROY: Yes, there is. If you have a sandstone there is a risk or a mechanism where the sandstone rock stresses are very similar to that of the coal seams and you can fracture. Because your fracture is typically vertical in nature it can grow vertically within that.

The Hon. Dr PETER PHELPS: To what sort of distance? Are we talking hundreds of metres?

Mr ROY: No, we are not talking hundreds of metres; we are talking tens of metres.

Mr NAUMANN: If I could make a comment here? The whole process of fracking, particularly in Australia, is very heavily engineered. You would start out by getting a geomechanical model of the entire section including the upper—the roof and floor material. That data can be taken from our exploration wells where we have taken solid core, and you can do triaxial testing and lab testing to get actual rock properties. Also you can take properties. When we do our geophysical logs, long-spaced imaging, for instance, will give you the strength of the rock. So you build the geomechanical model, then, on a simulator, you would simulate the frack design basically, and part of that simulation is you will get a pressure profile that you would expect to see if your fracture is stable within zone.

You also have to remember that when you are designing a frack you are trying to keep it within zone because you do not want to be paying for extra sand or chemicals or horsepower, as Mike pointed out, because horsepower is a direct correlation to dollars basically. So you are optimising your job. You have got a profile that you are expecting that fracture treatment to follow. When you are pumping the frack you have real-time monitoring and you will have surface and down-hole pressure gauges and everybody sits back in what is called the frack van and watches their little computer screens and sees what is going on. If you see a variation to your expected profile—say, for instance, a sudden dive in pressure that was indicating you were having additional fluid loss, which would say you were maybe breaking out of the zone, you can terminate your job immediately. You are never going to be in a situation where you are going to send a frack 300 or 400 metres up because you have the chance to stop it immediately.

The other thing to remember is that when you are pumping a frack you have what is called a pad, which is the part of the frack fluid that does not have any sand in it; that is what goes ahead. So you pump a pad with

just water or the gel and then once you have got your fracture initiated you start gradually increasing the sand concentration. The idea is you keep pumping, the pad is propagating the fracture, the sand is coming along behind and when you stop pumping the whole fracture closes. The proppant settles and sits there. If you terminate it early because you have seen a breakout, and it is likely you have only seen a pad, into the overlying formation, you terminate, and particularly if you are using water, a lot of that sand will simply settle to the bottom. So there is really a very small chance of setting any frack proppant up into an overlying zone. All of those processes are taken into account in the frack design.

CHAIR: Unfortunately we are out of time. I wish we could have arranged to have you here for an hour and a half. But we would like to do two things. The secretariat will send you a copy of the transcript and ask you to correct any technical terms that may be in there. The second thing is the panel may very well have a lot more questions—maybe they did not or I did not understand what you were saying. Would you be both prepared to take some questions on notice and return them to the panel?

Mr ROY: I would be happy to.

Mr NAUMANN: I am happy to, Mr Chairman.

(The witnesses withdrew)

ROBERT O'NEILL, Director, Water Policy and Planning, NSW Office of Water, Department of Trade and Investment, Regional Infrastructures and Services, sworn and examined:

MARK IAN PATERSON, Director General, Department of Trade and Investment, Regional Infrastructures and Services, and

BRAD MULLARD, Executive Director, Mineral Resources and Energy, Department of Trade and Investment, Regional Infrastructures and Services, affirmed and examined:

CHAIR: Before we proceed to questions, would any of you like to make an opening statement?

Mr PATERSON: No thank you, Mr Chairman.

The Hon. GREG DONNELLY: Does the New South Wales Government believe that the precautionary principle should be applied to the development of the coal seam gas industry in New South Wales?

Mr PATERSON: I think it is important that, given there is a range of potential interpretations to be given to the precautionary principle, I ask that you articulate that further before we respond.

The Hon. GREG DONNELLY: My next question was for you to explain what you understand of the precautionary principle as the principle that is guiding the New South Wales Government.

Mr PATERSON: You will have to define your first question for us to respond to it. If we pass over the first question then there is not a proposition for the second one.

The Hon. GREG DONNELLY: Is there a principle generally known as the precautionary principle that the New South Wales Government is following in terms of its consideration of the development of the coal seam gas industry in New South Wales?

Mr PATERSON: I do not think that I am here in a position to articulate on behalf of the New South Wales Government whether it adopts a precautionary principle in relation to its considerations. There are many potential definitions of the precautionary principle so I am not being obtuse; it is just that we are officers of a department not here to speak on behalf of the New South Wales Government in relation to its policy approach.

The Hon. GREG DONNELLY: You do not know if the precautionary principle is being applied by the New South Wales Government—

Mr PATERSON: I did not say I do not know; I said I am not here authorised to speak on behalf of the New South Wales Government on the principle that it might apply. You are asking us to respond to a proposition that you are not prepared to define, and I am indicating to you that until you identify what you mean by the precautionary principle I cannot respond to that question. I am not being obtuse; I am being cautious.

The Hon. GREG DONNELLY: Essentially what we are talking about is an approach that is a cautious approach with respect to the development of what is a new industry.

Mr PATERSON: If the question is, is the Government's policy in relation to coal seam gas adopting a cautious approach, then the answer is emphatically yes.

The Hon. GREG DONNELLY: But you are not prepared to comment about the general proposition about the precautionary principle which is applied to looking at a major initiative like this?

Mr PATERSON: What I have said is that because of the potential range of definitions of the precautionary principle, as you just articulated it I agree with you. If there is another interpretation or definition that you want to apply to the precautionary principle I am happy to respond to that. What I am not prepared to do is to respond without definition to a proposition.

The Hon. GREG DONNELLY: Does the department have a definition it is working with? Do you have a working definition?

Mr PATERSON: We do not sit with a definition called the precautionary principle defined as X in relation to how we deal with issues.

The Hon. GREG DONNELLY: So you are applying a principle which is essentially proceed with caution—

Mr PATERSON: Absolutely.

The Hon. GREG DONNELLY: —but not the application of what is the precautionary principle per se?

Mr PATERSON: The precautionary principle is articulated in planning legislation, which guides, obviously, decision-making in relation to planning, and to the extent that our activities impact on planning or planning-related decisions then we would be bound by that principle in relation to that piece of legislation and we would act accordingly. But because it is a general proposition I am cautious about how we respond to your question.

The Hon. GREG DONNELLY: As we have travelled around the State listening to various evidence and speaking to various people there is the emergence of very divergent and differing views on the science behind coal seam gas exploration and production. With respect to the fracking aspect of the mining or the issue of water or a range of issues, what role should the Government play in ensuring that there is a firm scientific basis for the future of this industry to be developed upon?

Mr PATERSON: I think the government should, as in all policy considerations, have due regard to the appropriate and current level of science in relation to any activity that it is looking at. Governments are required to take into account a variety of considerations, and understanding the science is but one of those considerations.

The Hon. GREG DONNELLY: Do you believe the Government should have any role to play in the development of that science to underpin this new industry?

Mr PATERSON: The evidence given immediately prior to our coming to this table suggests that the industry, certainly in Australia, has existed for 15 or so years. So is it a new industry? Is it new to New South Wales? Has the science changed since it came across the border? Government should be properly informed about the science of an industry or the development of an industry in the consideration of its policies. There are technical standards, which are generally developed and informed by the science, which would inform the advice that we provide to government and would in the majority of circumstances form the basis upon which a government would make decisions in this area.

The Hon. GREG DONNELLY: Are avenues in place for transmission of this science to government to be able to make these considered decisions?

Mr PATERSON: I certainly think that there are adequate avenues available for agencies within my portfolio or elsewhere to provide advice to government.

The Hon. GREG DONNELLY: So what is there at the moment, you believe, is adequate to ensure the transmission of this information to enable the best decisions to be made?

Mr PATERSON: The Government has not taken its final decisions in relation to all elements of the oversight of this industry. It has recognised that some chemicals, on the basis of current knowledge, should be banned in relation to fracking in New South Wales, and it has done so. So it has been informed by the science, and it has responded to that. I think there are adequate mechanisms to enable advice to be provided to government on the current state of knowledge of this industry and other industries where the impact of the science is important and relevant.

CHAIR: In an earlier submission one of the submitters mentioned that the New South Wales Government had a report on fracking and on fissures and on the action of fracking in this sort of industry. Are you aware of that report, or that such a report exists?

Mr MULLARD: We are currently looking at developing standards related to fracking as well as well integrity. Basically, these are looking at what is best practice globally and developing standards to ensure that what New South Wales has in place meets global best practice.

CHAIR: Do you have a time line on when that information is likely to be solidified?

Mr MULLARD: The reports are in preparation at the moment, and the plan would be to submit them to government before the end of this calendar year.

CHAIR: Thank you very much, Mr Mullard.

The Hon. RICK COLLESS: Gentlemen, there have been many petroleum exploration licences granted in New South Wales over the past number of years. What is the standard timeframe when a petroleum exploration licence is granted, and is it possible to not renew a petroleum exploration licence? If it is not renewed, is it possible to review and change the conditions under which that petroleum exploration licence is granted?

Mr MULLARD: Petroleum exploration licences can be granted for periods of up to six years**.** At the renewal stage, an assessment is undertaken regarding whether or not the company has met its work program commitments and abided by the conditions of title. If the company has not, it runs a risk of having the title cancelled or not renewed. So it relates—

The Hon. RICK COLLESS: Where there has been a change of government policy, such as the banning of BTEX chemicals for example, and a licence is being renewed, does that assessment take into account the revised government policy guidelines?

Mr MULLARD: Yes, it would, because government can impose new conditions at renewal.

The Hon. RICK COLLESS: New conditions for new licence applications were recently announced by the Minister. When petroleum exploration licences come up for renewal—and a number of them are coming up for review shortly—will those new conditions then be applied to the renewal of the existing petroleum exploration licences?

Mr MULLARD: Without being specific in terms of what conditions you are talking about, if you are looking at the banning of BTEX chemicals there are a number of ways in which that is being implemented. At the moment it is implemented, and that is because for any well that is planned to be drilled a petroleum exploration licence does not give a company the right to drill a well; the company actually needs a secondary approval. So, basically, a company would have to apply to drill a well, and to frack that well if it is planning to do undertake hydraulic fracturing, and we have implemented a policy of not approving any well or fracturing that involves the use of the BTEX chemicals. So it is implemented by that. But we are also looking at implementing it through either regulations or conditions of title.

The Hon. JEREMY BUCKINGHAM: My question is to Mr O'Neill. Is the injection of waste water into an aquifer an allowable activity under the Water Management Act?

Mr O'NEILL: Under the Water Management Act it would be called managed aquifer recharge, so we are developing a policy to handle that situation. But there would also need to be an approval under the Protection of the Environment Operations Act to discharge that water.

The Hon. JEREMY BUCKINGHAM: So there is no current policy that manages that activity?

Mr O'NEILL: It will be managed under the aquifer interference approvals, which will be in place next year.

The Hon. JEREMY BUCKINGHAM: The aquifer interference regulation does not mention that particular activity. Why is that so, considering that it underpins the adaptive management strategy that Santos and other coal seam gas companies have argued their industry will rely on? Why is it not mentioned in that regulation? And when will it mention that?

Mr O'NEILL: I assume, when you talk about regulation you are referring to the interim regulation, which is the regulation we have put in place to remove the exemption from having a licence for exploration activities above 3 megalitres. So it is not in that regulation, that is correct. It will be in the final aquifer interference regulation, which will be in place next year.

The Hon. JEREMY BUCKINGHAM: When you say it will be, will there be a provision in that regulation for discharge of waste water to aquifers?

Mr O'NEILL: Under the final aquifer interference regulation we will have to issue an aquifer interference approval for that process. That will deal with the water volume and water accounting side of it. But the water quality side of it will be dealt with under the Protection of the Environment Operations Act, and they will have to get an environment protection licence to discharge that water, and that licence will specify the water quality requirements.

The Hon. JEREMY BUCKINGHAM: These are things that will happen. But, right now, a company cannot be licensed to do that?

Mr O'NEILL: You can be licensed to do that under the Protection of the Environment Operations Act because it deals with water quality issues. Under the Water Management Act you will not get any credit for the volume of that water. We are trying to put in place, under the aquifer interference approvals, the mechanism to get credit for the volume of that water, so that volume can also be managed and accounted for.

The Hon. JEREMY BUCKINGHAM: The question I have now relates to the Government's own submission, which says at page 13, "CSG is likely to have lower fugitive emissions intensity as compared to natural gas or LNG." My first question is: On what research is that statement based? Does the Government, in terms of investment, perceive fugitive emissions to be an investor risk, with potential for significant fugitive emissions to emerge and be accounted for? Does the Government perceive this to be a significant risk to the viability of this industry?

Mr MULLARD: In terms of why coal seam gas generally is regarded to have lower fugitive emissions intensity compared to natural gas or LNG, it relates to a number of technical factors. This, really, is based on experience of production. So, if you are asking me for research papers, I cannot give you research papers at the moment. The word used here is "likely" because it will vary. It varies because a lot of coal seam gas does not contain a lot of CO_2**;** it is actually a relatively pure form of natural gas, virtually pure methane. As a result, less energy is required to process that gas. Whereas quite often with conventional petroleum or conventional gas wells there is actually a whole mixture of different gases; quite often there are higher hydrocarbons.

The Hon. JEREMY BUCKINGHAM: Mr Mullard, the question related not to the processing of that gas but to the fugitive emissions, so the leaking of emissions.

Mr MULLARD: Fugitive emissions cover a whole life cycle. It is not just what leaks. So, basically, if you are defining what is leaking, that is a different definition from the definition of fugitive emissions that we normally apply. Fugitive emissions apply to compressor stations and the way you process. When you process gas you do get fugitive emissions because you are actually attracting CO_2. There is not a 100 per cent separation. So you do get some methane whilst you have got high CO_2 as part of that process. So these all add up to your total fugitive emissions. It is not just what leaks out of the gas pipeline, if that is what you are referring to.

The Hon. JEREMY BUCKINGHAM: I accept that. But you do not have any research on which to base that assumption?

Mr MULLARD: I personally do not have that. That does not mean it does not exist.

The Hon. JEREMY BUCKINGHAM: But the Government prepared this submission. On what basis did it make that calculation?

Mr MULLARD: Basically, on an understanding of the way gases are processed. The word used is "likely" because it will vary on the composition of the gas. We do know that when you are processing gas the higher fugitive emissions you have the more processing you need to do.

The Hon. JEREMY BUCKINGHAM: On the outside chance that it does have a higher than expected fugitive emissions intensity, is that seen as a risk to the viability of this industry?

Mr PATERSON: Mr Mullard has given evidence on the basis of experience in dealing with coal seam gas and the processing of other gas forms. An incident where the likely proposition was not borne out in reality would not necessarily of itself be enough to suggest that there was a problem in relation to the industry. You would need to have a look at the industry as a whole and at what the circumstances were, and that would be a factor that government would need to take into account in its policy settings. But the potential for that proposition to not hold water in the majority of circumstances is a factor that would need to be taken into account. But is it influential of itself? No.

The Hon. JEREMY BUCKINGHAM: So it may have to be taken into account, but it has not been taken into account?

Mr PATERSON: No. It has been taken into account, because we have put forward the proposition to this Committee in the submission that has been put forward that coal seam gas is likely to have lower fugitive emissions intensity as compared with natural gas or liquefied natural gas. So we have put forward that proposition. That is but one small part of the overall series of considerations that a government would need to take into account.

The Hon. JEREMY BUCKINGHAM: But in the unlikely circumstance that it has a higher fugitive emissions intensity, has the government done any modelling or assessment of whether or not the industry therefore is a viable proposition?

Mr PATERSON: No. We have not modelled an unlikely proposition to inform the Government's decision-making.

The Hon. SCOT MacDONALD: Gentlemen, could I bring you to page 17 of the submission: Without bringing reserves into production or expending interstate capacity, potentially significant price rises could be expected to flow on to large gas consuming industries as well as smaller commercial and residential consumers. Can you expand on where you think coal seam gas fits into our suite of energy, now and into the future, and any possible impacts on family energy costs and electricity prices in particular?

Mr PATERSON: I will make some observations, and Mr Mullard might like to comment on that question as well. Currently, in excess of a million households in New South Wales and industries use reticulated gas. New South Wales produces from indigenous supplies six per cent of our current gas consumption and demand. Therefore we import 94 per cent of our currently consumed gas, predominantly from the Moomba fields and from Victoria—about 20 per cent comes from Victoria and the remaining 74 per cent or so comes from Moomba. Those sources of supply are by no means guaranteed either in relation to quantity of supply or price over time and with a million households reliant on reticulated gas for heating, cooking and the like, and industry reliant on gas for power generation and industrial processes, interruptions to that supply can be significant. Do we see coal seam gas as having a potential role in providing supply to domestic industry and to households, the answer is yes.

The Hon. SCOT MacDONALD: Does that help with security into the future, if those other gas fields are in decline or not available because they have been exported or whatever?

Mr PATERSON: I thought that proposition was relatively self-evident from the answer. We only produce six per cent of our current consumption at the present time. If there is a question in relation to uncertainty in supply from either of those dominant sources or questions in relation to price then there is an automatic flow through. Gas is also seen as a transition fuel. As we move, in power generation terms, from a strong dependence upon coal-fired power generation there is an expectation that one of the key transition fuels in relation to that power generation will be gas. If that gas comes from existing sources it could interrupt supply to the million or so households and businesses that are on reticulated gas unless alternative supplies are able to be used.

Mr MULLARD: I would like to make the important point that as we increase the proportion of renewable energy sources as part of our energy mix—I am talking about wind and solar—gas becomes an extremely important component of that energy mix because the more gas you have as part of your energy mix the more renewables you can have. The reason for that is because gas can come onstream very quickly with gas

turbines. If you get days where it is overcast or the wind is not blowing then gas is an extremely important component to make up those shortfalls very quickly. Otherwise you run the risk of blackouts and brownouts because coal-fired power stations cannot be ramped up or run up quickly.

The Hon. SCOT MacDONALD: I will look forward to The Greens support on that.

The Hon. Dr PETER PHELPS: My questions are best answered by Mr O'Neil. Does the Office of Water have a program for assessing alluvial bores across the State, specifically in petroleum exploration licence areas? How extensive is that program, if it exists? To what level of detail does it go to? Does it go down to issues of water quality, water pressure, below surface height? Will you outline the sort of program that the Office of Water has in that regard?

Mr O'NEILL: When you are talking about bores, are you talking about water supply bores or monitoring bores for watertable depth or water quality?

The Hon. Dr PETER PHELPS: Essentially monitoring bores?

Mr O'NEILL: Yes, we have an extensive network of monitoring bores. They monitor a range of things from water pressure, watertable levels and water quality. We monitor them closely and report on them on a regular basis.

The Hon. Dr PETER PHELPS: The Committee has been travelling around the State seeking baseline data about issues concerning alluvial water supplies. How far back would that data go with a degree of reliability?

Mr O'NEILL: I do not know that figure off the top of my head. I will have to take that question on notice.

The Hon. Dr PETER PHELPS: Are we talking five years, 10 years?

Mr O'NEILL: No, it would be in the order of decades.

The Hon. Dr PETER PHELPS: So you have decades of baseline data—

Mr O'NEILL: In some areas, not all areas. We do not have comprehensive monitoring in every square inch of the State but certainly in some areas we would have many years of background data.

The Hon. Dr PETER PHELPS: Do you have a relationship with a comparable government agency in Queensland?

Mr O'NEILL: Yes, we have a strong connection with them. I know many of the people who work up there personally. We certainly communicate with each other and try to learn from each other about lessons we have both learned. We exchange knowledge and experiences together.

The Hon. Dr PETER PHELPS: Is there anything from their experience which you believe is of such an urgent nature that it needs to be taken into consideration in relation to coal seam gas activities in New South Wales?

Mr O'NEILL: We are communicating on a number of fronts. Obviously Queensland is different to New South Wales. The groundwater up there tends to be shallower and of a different salinity to ours, so the challenges posed to them are different to ours, and we have certainly talked about some of the things they have learned in that regard. We have discussed issues relating to evaporation ponds—they face challenges up there. We have discussed issues in terms of revenue raising. As you would know, the Queensland Water Commission has been established. We are looking into those sorts of things and discussing those with them.

The Hon. Dr PETER PHELPS: Are you aware of any instances in New South Wales or in Queensland where there have been negative effects on alluvial water bores because of coal seam gas activities?

Mr O'NEILL: No, I am not aware of any. I cannot speak about Queensland but in New South Wales I am not aware of any examples of that.

The Hon. Dr PETER PHELPS: Would you be able to ask your colleagues in Queensland if they are aware of any and get back to the Committee with a question on notice?

Mr PATERSON: I am not sure that a question on notice about somebody else's experience is an appropriate course of action for us to take. I would ask for a ruling from the Chair on that. We can express a point of view in relation to our knowledge in response to questions but—

CHAIR: We can do our own research on that. Thank you.

The Hon. Dr PETER PHELPS: Do you have bore water data for the area around Camden?

Mr O'NEILL: Yes, we do.

The Hon. Dr PETER PHELPS: Has there been any change of any significance in the Camden bore water data that can be ascribed to coal seam gas activity as far as you are concerned?

Mr O'NEILL: When you say "data", what are you referring to specifically?

The Hon. Dr PETER PHELPS: Either in quality, pressure or depths?

Mr O'NEILL: No. Camden takes approximately in the order of three to five mega-litres of water per year so there are no perceptible changes as a result of the Camden gas fields in our bore monitoring data, certainly no changes above what we would consider as acceptable.

The Hon. Dr PETER PHELPS: Are you satisfied that your office is sufficiently resourced to provide an adequate network of data collection points in areas that may well become production fields in these petroleum exploration licence areas? Sorry, I should not ask you if you would like more money.

Mr O'NEILL: I would love to have some more money; we never have enough. In a lot of the monitoring we place those requirements on the proponents of activities, so that is actually their expense. They report that data to us and we certainly analyse it. We will also be looking at raising revenue through charging for aquifer interference approvals, which will help cover our costs in a number of activities related to those approvals. As best we can, we are resourced to do the task ahead of us.

The Hon. Dr PETER PHELPS: Do you have any concerns that the data being given to you by proponents is in any way incorrect, fudged or fixed for the benefit of the proponents?

Mr O'NEILL: We have no evidence that that is the case. Through the planning assessment process for the major projects, and any other projects that come before us, we rigorously assess the data that is provided and inquire of the proponents as to the sampling regime and the depth of the bores. We ask to ensure that they have adequately spatially represented the bore sampling, both vertically and horizontally. We work with the proponents to get adequate bore monitoring data and, as far as I am aware, we have never had instances where there has been intentional deceit, no.

The Hon. Dr PETER PHELPS: Do you have the power to request that test research bores be established by proponents?

Mr O'NEILL: Yes.

The Hon. Dr PETER PHELPS: Have you exercised that power?

Mr O'NEILL: Yes, of course. It is part of the process of informing the move to full assessment. We put in place a bore monitoring program as part of all the projects to ensure that we have the data to assess the impacts on water adequately.

CHAIR: By way of clarification, does your department have a list or a map that shows the locations of all your monitoring bores in New South Wales?

Mr O'NEILL: I have not laid eyes on it personally. I have certainly seen geographic information system [GIS] layers of water supply bores. I am not sure if we have a GIS layer of water monitoring bores. I can take that question on notice but I would expect that we would have.

CHAIR: Will you take that on notice and if such a document is available will you make it available to the Committee?

Mr O'NEILL: Of course.

CHAIR: Do you monitor any deep aquifers or do you only monitor alluvial and normal agricultural type bores?

Mr O'NEILL: No, we are monitoring—water exists in three dimensions down to over thousands of metres deep. We do not have bores thousands of metres deep but down to around the 1,000 metre depth we would have knowledge. The Great Artesian Basin in many instances is several hundred metres deep.

CHAIR: Are the data loggers in your monitoring bores permanent installations or do you send staff around on a regular basis to do monitoring?

Mr O'NEILL: We have a mixture. We are trying to move to automation as best we can, with telemetry and all that sort of stuff, but historically we have many that are just sampled by physical visitation.

CHAIR: Do you test the data that is supplied to you by proponents? In other words, would you send in an officer to do your own tests to check the data that has been supplied by proponent or not?

Mr O'NEILL: We have done that in the past but it is rare. We have the power to do that; we can exercise that power.

CHAIR: Proponents are aware that you have that power?

Mr O'NEILL: Yes.

CHAIR: On page 28 of the Government's submission there is a note that the land access provisions under the New South Wales Petroleum (Onshore) Act were significantly amended in 2010 in consultation with stakeholders. Could you provide the Committee with information on what amendments were made and why they were needed?

Mr MULLARD: There was a range of changes that were implemented. One of the significant changes—and the reason why these were required—was that there was a court ruling as a result of a legal case that actually determined that the landowner or the property that most people would assume to be the landholder under the mining Act and the petroleum Act—

CHAIR: I am well aware of that case.

Mr MULLARD: —basically defined everyone who had an interest in the land, including banks and easement holders, and a whole range of different parties. That was the main reason for the changes. But as part of the changes that went through there was a tightening up of the way that agreements were done with landholders, including the requirement that previously there could have been no written agreement, a hand-shake agreement, but now all land access agreements have to be writing. There was agreement regarding companies to look at paying legal fees if landholders wished to seek legal advice on it, and there was provision put in to allow for that. So there was a series of amendments designed to actually improve the process but to also clearly identify that the landholder or the person who actually owned the land was the principal person who was negotiated with, not the banks or other bodies.

CHAIR: That followed the Brown and Alcorn versus BHP case?

Mr MULLARD: That is right.

CHAIR: The Petroleum (Onshore) Act had amendments to it as well as the mining Act?

Mr MULLARD: That is correct.

The Hon. GREG DONNELLY: In the Government's submission there is some discussion about the development of a template agreement for access to properties. As the Committee has travelled the State problems and issues associated with this has come up time and again, as well as the serious conflict between the position of a farmer who does not want an explorer coming on to his or her property and the position of the actual company. How far down the track are we with the finalisation of this template agreement?

Mr MULLARD: The template agreement came out of the court case we were discussing before. We worked with both the farmers association and the minerals council to look at developing template agreements for landholders or for companies to use. There was a previously agreed form for access arrangements that I think was negotiated between the Minerals Council and the farmers. What was being looked at and is still taking place—there were meetings as recently as last week—is principally between the Minerals Council and the NSW Farmers Association to develop a form of contract. There is an advanced contract and I think they are still discussing a number of aspects, but work is happening and I think both parties are confident of reaching agreement in the not too distant future, but I do not have a time line on that.

The Hon. GREG DONNELLY: You are probably aware that one of the areas of disputation about access arrangements are the fees or payments that the property holder would receive for the wells drilled on their site, particularly when there are confidentiality clauses in agreements whereby one property owner is not able to share information with another property owner. People have said to the Committee they feel like they are being played off against each other in some cases. That has led to real tension between neighbours to the point where they are almost not talking to each other. In the development of the template agreement that is still being worked on will it in any way deal with the issue of fees or payments to property owners who allow exploration on their properties?

Mr MULLARD: I cannot comment specifically because I have not been directly involved in those discussions but an access arrangement would normally deal with the issues that would be compensatable under that agreement. There could be a range of issues that might form the compensation payments including physically accessing the property if they require access to water and what disturbance they might do to the land. Those would be factored into an access agreement. The amount of money may vary depending on the property and what it is like, what it is being used for and the impact the activity would have.

The Hon. GREG DONNELLY: Does the department have a view about whether it is appropriate or not to have confidentiality clauses in those types of access agreements?

Mr MULLARD: We do not have a particular view. The access arrangements are normally commercial arrangements between the parties. However, I am aware that some landholders want the information kept confidential for personal reasons. Obviously these are financial arrangements, commercial arrangements between parties. Some parties might be happy to disclose it and I know some companies are happy to do so but some landholders are not necessarily happy to disclose that information. It does vary but it is a matter between the parties.

Mr PATERSON: It is not unique to coal seam gas. There are other land access arrangements and compensation arrangements that are of a commercial nature that the parties to those arrangements choose to keep to themselves. Access to wind turbines springs to mind as but one other example of land access arrangements.

The Hon. GREG DONNELLY: Going back to Mr Mullard's point, essentially the Government's position and the department's position is that it is really a matter between the parties as to what they settle on as the terms and conditions of the agreement they strike.

Mr MULLARD: That is correct. We are not party to those agreements.

The Hon. GREG DONNELLY: I appreciate that. It is a matter of their resolving it to their satisfaction. Does the department as it is currently configured and with the staff it has believe it has sufficient numbers of scientists and experts who are able to fully understand and interpret the science associated with the coal seam gas mining industry? I say that with the greatest respect to the employees, scientists and experts you employ at the moment. It is not a reflection on them but if the industry takes off there could be a need to look at quite a bit of information, interpret it and provide advice. The issue of having staff to be able to cope with that is a relevant question.

Mr MULLARD: We have specialist staff. When you look at the industry in terms of our role you see it is a compliance role. It is safety, so we have highly qualified technical safety staff who are very experienced in both the petroleum and mining industries and who are engaged in those. We have environmental scientists who are engaged in a lot of the environmental assessments associated with the coal seam methane wells. We also have highly qualified experienced geologists, including petroleum geologists, who are involved in looking at the geological aspects of the coal seam gas industry. Government departments do not necessarily need to have every single expert in every single area.

The Hon. GREG DONNELLY: I am not suggesting that.

Mr MULLARD: If we need to we go to outside experts for a lot of the highly technical stuff. We draw upon a much broader expertise by engaging specialists in highly specialised areas, such as fracking, for example. If we needed highly technical experts we would seek independent advice outside as required depending on the question before us.

Mr PATERSON: We also have hydrogeologists and geomorphologists and the like within the Office of Water that apply a similar approach. To reinforce Mr Mullard's point, we cannot engage on a permanent and ongoing basis experts in everything in every field of potential endeavour across the portfolio. We engage external expertise as and when required to develop policy advice for government on a whole range of matters, not just in these areas. Technical specialists in this field are engaged if required. We do not leave gaps in the advice we provide just because we do not have the people on staff, nor could we ever pretend to hold specialists in every field on an ongoing basis. We have a broad range of technical and scientific specialists across a very broad range of activities and we engage external consultants when we need them.

The Hon. GREG DONNELLY: Surely you are aware from the work you have done that in the communities being affected right now by these proposals there is concern about the issue of the science behind coal seam gas mining. Those same people, for one reason or another, in many cases harbour concerns as to whether the information they are receiving from the companies is objective. On many occasions they have said to us as we have travelled around that they very much look to the Government to provide the information to enable them to be properly informed about this new industry. There is in the community a great sense that the Government has an important role in the provision of information and helping people understand that information.

Mr PATERSON: I think that is both a quite natural and quite common experience. People turn to governments and departments like mine to be a resource and a font not of all knowledge but certainly of specialist knowledge in key areas. It is unfortunate that much of the anxiety in the community has been generated by ill-informed speculation, people watching movies that speculate on circumstances that may have occurred in entirely different situations in other countries and trying to translate that to New South Wales. What we have tried to do both in our submission and our evidence is put forward views that are based on proper professional experience and a scientific base.

The Hon. GREG DONNELLY: Can I clarify something you said a moment ago—that you believe the concerns of people in the communities are essentially based on their interpretation of issues that happened overseas.

Mr PATERSON: I said some of their concerns, and I think some of those concerns are reflective of experience elsewhere. There is no significant coal seam gas industry in New South Wales. Therefore, much of the experience or the views that are held by people come from fear of the unknown, uncertainty or experience that they may be trying to translate from some other marketplaces.

The Hon. JEREMY BUCKINGHAM: Queensland.

Mr PATERSON: It could be Queensland or it could be gas extraction from shale that was reflected in the *Gaslands* movie. It could be any number of experiences, but there is no meaningful, significant long-term coal seam gas industry in New South Wales. Therefore, in the main, the experience and the fear come from some other marketplace.

The Hon. RICK COLLESS: Mr O'Neill, what is your background? Are you a hydrogeologist by trade?

Mr O'NEILL: I am a qualified civil engineer. I also have a masters degree in water engineering and I worked in hydrology, so I was a hydrologist for about 10 years and I have moved into the policy area in the last seven years.

The Hon. RICK COLLESS: This morning hydrogeologists came in for a bit of criticism from one of the previous witnesses for not having a sound knowledge of subsurface structures and relationships between aquifers and so on. How many hydrogeologists does the department employ and what sorts of experiences do they have in relation to deep structures and aquifers?

Mr O'NEILL: I cannot tell you the exact number of hydrogeologists in the agency but it would be in the order of 10 to 20. We have some of the best hydrogeologists in Australia and they are well recognised around the world. They are well regarded by industry and eminent experts. They are members of the International Association of Hydrogeologists. We believe we have some of the best technical expertise within our agency.

The Hon. RICK COLLESS: Do hydrogeologists who work in private industry also contribute to the association of hydrogeologists?

Mr O'NEILL: Yes, I believe that association has members from both government and the private sector.

The Hon. RICK COLLESS: Do those private hydrogeologists share the information that they accumulate on an industry basis?

Mr O'NEILL: Yes, very well. I recently attended a conference of the International Association of Hydrogeologists which went for three days in total, I believe. I was there for a whole day and a number of members of private companies presented the findings of studies they had been doing to the conference, so it was publicly available information. We presented to the group as well; I was one of the presenters. It is a reasonably good exchange of information in that regard.

The Hon. RICK COLLESS: What sorts of methods would they use to come up with their findings particularly in relation to studies such as the Namoi groundwater study?

Mr O'NEILL: They would use a range of methods from monitoring and analysis and expert interpretation of data through to the most detailed three-dimensional hydrogeologic modelling to do sensitivity analysis and analyse different scenarios.

The Hon. RICK COLLESS: When they are confronted with having to give expert advice on some of those deep coal seams, the water contained in those seams and the integrity of the aquitards above and below those seams would they have a working knowledge of those issues?

Mr O'NEILL: Absolutely. I know some of those people and in private industry as well there are a number of world-renowned hydrogeologists that get hired by companies to do that analysis.

The Hon. RICK COLLESS: Mr Paterson, you may be better equipped to answer this question. You might recall the recent well-publicised sale of a property near Bowral for a coal project where the vendor did not know it was being sold to a coal company. Is that of concern to the Government and what can be done to ensure that that situation does not arise again?

Mr PATERSON: I do not know that I am well qualified to respond to that nor do I think my colleagues are qualified to respond to, firstly, what was in the knowledge of a particular vendor. Certainly from a personal perspective, I am only aware of what I have been reported and I have no firsthand knowledge of the circumstances. My past experience would suggest to me that one should exercise a degree of caution in responding to issues when the only information that you have is from the popular media.

The Hon. JEREMY BUCKINGHAM: Mr O'Neill, the Sydney Catchment Authority recently put in a submission regarding a modification to a development application for Apex Energy to drill for coal seam gas in the special catchment areas and that submission was that they were opposed. Does the Government support coal seam gas mining in the special catchment areas?

Mr O'NEILL: I am not familiar with the Sydney Catchment Authority's submission and our agency's role is not a legislative one in those special catchment areas, so we have not formed a position on that issue. That is our agency's position; I cannot speak on behalf of the broader Government on that issue, I am sorry.

The Hon. JEREMY BUCKINGHAM: The interim aquifer interference regulation only makes provision for new authorities. Why is that the case? Why does it not capture existing authorities?

Mr O'NEILL: The interim aquifer interference regulation requires new applications for exploration activities that will take more than three mega litres a year to obtain a water licence. That licence will be put in place so that we can put appropriate monitoring and reporting mechanisms in place to inform the move from an exploration activity across to a full development activity. We took a position that it was going to apply to new activities only.

The Hon. JEREMY BUCKINGHAM: Why did you take that position, if you consider that a third of the State is covered by PELs? Most of the State is already covered by the licences and mining and petroleum exploration licences across the State, what relevance does that have if most of the State is already under existing authorities?

Mr O'NEILL: It was a decision taken in the interim aquifer interference regulation to take that position. It is a position we are considering further in the development of the final regulation.

The Hon. JEREMY BUCKINGHAM: So it may be that the Government decides to apply that aquifer interference regulation to existing authorities?

Mr O'NEILL: It is a matter for consideration. I would not want to speculate on what the final decision would be in that regard. It is a position that has to be determined.

The Hon. JEREMY BUCKINGHAM: My final question relates to royalties. Obviously in New South Wales there is a five-year royalty holiday for coal seam gas mining. The submission from Santos this morning to the Inquiry was that they expected to be delivering to the Government $150 million per annum from their Gunnedah project. Has the Government done any modelling on what sort of royalties it expects to have delivered to it from coal seam gas and what sort of number of wells would they expect to be rolled out across New South Wales?

Mr MULLARD: We have not done the modelling. At this point in time, as Mr Paterson has said, the industry is actually still in an extremely early stage of development. The industry in New South Wales is in an exploration phase. The number of wells and how many might end up in terms of production fields we really will not know until a lot more exploration is done or the exploration that is currently under way is undertaken. At the moment there is really only one production field for coal seam methane, which is around the Camden area. There is a small amount of production occurring near Narrabri for local consumption generally at this point in time.

The Hon. JEREMY BUCKINGHAM: That Camden project delivered $400,000 in royalties in the last financial year based loosely on about 100 wells. According to Santos, if the geology is the same, for $150 million you would need something around 20,000 to 30,000 wells to deliver a comparable royalty rate, which is similar to the situation in Queensland where they are looking at 30,000 to 40,000 wells. Are those sorts of numbers of wells across the State something the Government is modelling?

Mr MULLARD: Your initial question about what royalty was paid, I do not know what royalty was paid and in fact I know that information is not available, so I am not sure where the royalty number you have for the Camden project came from.

The Hon. JEREMY BUCKINGHAM: It was in the Treasury figures, it was in the Budget—$432,000.

Mr MULLARD: I am not sure about that.

The Hon. JEREMY BUCKINGHAM: Well, I am sure.

Mr MULLARD: That's fine but we have not done any modelling.

The Hon. JEREMY BUCKINGHAM: You have not done modelling on how many wells may roll out across the State?

Mr MULLARD: We will not know that until the exploration is undertaken and the companies start to look at what are their projects and what their projects begin to look like.

The Hon. JEREMY BUCKINGHAM: Do you accept that, if Santos is making in their submission a claim for $150 million in royalties to the Government, that that may equate to upwards of 10, 20, even 30,000 wells across the State?

Mr MULLARD: No, I do not accept that because it will depend on how each well performs, whether or not they are horizontal wells, and the technology used. I do not even know at this point in time—and I am sure the companies also do not necessarily have an understanding of it—which areas will be productive or not. It is still at an early exploration stage.

Mr PATERSON: And nor would we accept, as a matter of course, an extrapolation of a proposition that Camden produces X dollars on the basis of X number of wells, so if somebody else speculated on a payment figure that you would have an automatic line of sight between the two, we do not accept that proposition.

The Hon. SCOT MacDONALD: Mr Mullard, we talked about energy and access to energy. Is it a fair comment to say that if this opportunistic—as I call it—moratorium got legs and we did not have access to coal seam gas, will New South Wales have a greater reliance on coal? Will there more than likely be more coalmines needed? Will our dependence on coal stay up around that 80-odd per cent? Is that a fair comment to make, if we do not have access to New South Wales coal seam gas?

Mr MULLARD: I would not like to speculate that that means more coalmines or not because I do not know. What I can say is that gas is seen as very much a critical fuel, as a transitional fuel, and when you talk about energy security, energy security translates to availability, meaning what energy is available and effectively affordability, meaning what you can afford. Obviously, the decisions about whether new coalmines are needed or not will depend on the economics, the carbon tax and how the energy mix translates. But effectively, gas is very important for energy security, as I pointed out. It is important in terms of ensuring that if we have greater renewals as part of our energy mix, that gas is needed to provide that flexibility in supply. It is one of the lowest cost options for new generating capacity, particularly intermediate and peak. As more people get air conditioning, we are seeing a summer peak, so it is important from that point of view. Without it, we would need to carefully consider what options New South Wales has, in terms of ensuring that we have reliable and affordable energy.

The Hon. SCOT MacDONALD: Is one of those options—and I will not hold you to more than that—continued heavy reliance on coal?

Mr MULLARD: I probably cannot comment on that but people do need energy and that would be a matter for government to actually examine, or the proponents to examine, in terms of energy supply. I am not a person who is involved in that policy space.

The Hon. Dr PETER PHELPS: A question to Mr Paterson. Given that there is a general concern in the community about a lack of objective information, would you be prepared to speak with your Minister and perhaps in association with DPI, give consideration to running a Government information campaign which, if not necessarily broadcast, at least could be narrowcast to people who may have concerns about key elements of the coal seam gas industry?

Mr PATERSON: If you are asking me to have a conversation with Ministers about that, I am happy to have that conversation.

The Hon. GREG DONNELLY: My question follows on from the question of Dr Phelps. In the Government submission it is noted that, "New enhanced community consultation requirements have been introduced as a condition of exploration licences." What are the new requirements and in particular, what is involved in the requirement for public comment on the new exploration licence applications?

Mr MULLARD: Previously, when a company wanted to apply for an exploration licence for petroleum, there was no process whereby a community person or a landholder could lodge an objection or lodge issues that needed to be taken into consideration as part of that application. One of the key elements of the Government's reform has been to introduce a process whereby, when applications are received, members of the public can lodge a submission. The application is advertised, submissions are invited and members of the public can lodge issues that can be considered as part of the grant process.

In addition to that, there are new community consultation conditions that are going to be imposed or are being imposed as part of exploration licences. This applies not only to new licences but also as part of the renewals process, to require companies to have greater consultation, to have a community consultation program in order to make sure that the community is informed about what activities companies are undertaking. This is designed to make sure that when companies go into an area with an exploration licence, that there is much greater transparency about what the companies plan to do, communities and landholders are kept informed about what activities are to take place as part of the exploration process.

The Hon. GREG DONNELLY: That information about the type of consultation process and how it is to be conducted, is that information currently available?

Mr MULLARD: The detail is currently being developed as part of the regional land use policy development and will be going through that Department of Planning process that has been organised. So that is being developed. The conditions that will apply will go through that committee which includes a reference committee of various stakeholders.

The Hon. GREG DONNELLY: In July Mr Hartcher announced an extension to 31 December 2011 on the moratorium on the use of fracking during drilling exploration licence applications. What activity has been under way to assess the safety of fracking and whether to extend or lift the moratorium?

Mr MULLARD: There has been a series of activities undertaken, the most important of which is really developing standards for well integrity. As was given in evidence previously the most important thing ensuring that you are not contaminating aquifers is to ensure you have well integrity. Guidelines and specifications are being developed for government which will apply to ensure well integrity. New guidelines for fracking are being developed by technical experts. The idea behind that is that when the moratorium is lifted there is much greater regulation and controls to ensure that we do have appropriate standards for well integrity and fracking.

The Hon. GREG DONNELLY: Given we are approaching 31 December very quickly is there any information about whether the moratorium will be continued?

Mr MULLARD: I do not have any information at this point in time but I do know that the development of the two policies is at a very advanced stage.

CHAIR: The committee has a number of questions it wants you to take on notice. Are you prepared to take them on notice and provide answers to them within 21 days? Is that acceptable to you?

Mr PATERSON: Subject to when we receive those questions.

CHAIR: Twenty-one days from receipt of the questions?

Mr PATERSON: Yes.

(The witnesses withdrew)

MARION GRACE CAREY, Doctors for the Environment Australia, sworn and examined:

HELEN REDMOND, Doctors for the Environment Australia, affirmed and examined:

CHAIR: Do you appear before this committee as an individual or do you represent an organisation?

Dr REDMOND: I represent Doctors for the Environment Australia.

Dr CAREY: I represent Doctors for the Environment Australia.

CHAIR: Do you want to make an opening statement?

Dr REDMOND: Yes, I want to make an opening statement. Doctors for the Environment Australia [DEA] is a voluntary organisation of medical doctors working to address the diseases caused by damage to the earth's environment. Thank you for the opportunity to contribute to the current inquiry. I am Dr Helen Redmond, a rehabilitation physician from New South Wales and with me is Dr Marion Carey, a public health physician from Victoria and a member of the DEA national executive. DEA considers the current level of assessment, monitoring and regulation of coal seam gas exploration and mining activities in New South Wales to be inadequate to protect the health of current and future generations of Australians.

There is the potential for public health to be affected directly and indirectly through coal seam gas operations through contamination of water, air and soil, through diversion of water and land away from food production and from mental health impacts on communities who have had environmental changes imposed upon them. Contamination of drinking water supplies is the greatest concern with the chemical additives used for drilling and hydraulic fracturing, degradation products and also the compounds that are mobilised from sediments during the mining process. These chemicals include toxic, allergenic, mutagenic and carcinogenic substances as well as methane. Wastewater coming to the surface may contain volatile organic compounds, high concentrations of ions, heavy metals and radioactive substances.

Effects on human health from chemicals depend on many factors, including the dose, the route and the duration of exposure. Health effects may be immediate in onset with symptoms such as headache, dizziness and nausea but can also develop later, even with very low levels of chemical exposure. Long-term effects may include hormonal system disruption, fertility and reproductive effects and the development of cancer. There is insufficient information on the use and mobilisation of these chemicals to make adequate health risk assessments. One of the biggest problems is the lack of public transparency around the chemicals used, the majority of which have not been assessed for safety.

Mining companies misleadingly infer safety of all chemicals because some are components of household products. However, just because we may have hair bleach or antifreeze in the cupboard does not mean it is safe to drink. Some compounds, such as the BTEX chemicals can present a risk to health even in minute concentrations. For example, the Australian Drinking Water guidelines for benzene, a known carcinogen, state "no safe concentration for benzene in drinking water can be confidently set". So the guideline is set at below the level of detection which is one part per billion, the equivalent of one drop of water in a swimming pool. New South Wales currently has no uniform mandatory requirement for coal seam gas companies to treat or even test their produced water.

It may be held in storage ponds where contaminants may be washed over surrounding land and waterways during a flood event or become dust during a drought. Air pollution can occur locally around coal seam gas wells, transferring volatile chemical pollutants into the atmosphere. These can contribute to ground level ozone, a respiratory irritant which can inflame lungs and reduce lung function. Finally, water and air pollution, water shortages, permanent degradation of productive agricultural land and the loss of livelihood and landscape all have mental health consequences for communities living in a gas field. The coal seam gas process can divide previously close knit rural communities, increasing tension and disharmony, impact on local economies and threaten other industries such as beef production, viticulture and tourism.

Therefore, Doctors for the Environment Australia recommends full mandatory disclosure of the composition and quantities of chemicals used in all coal seam gas operations, including public information on potential health effects and that these chemicals are assessed for this use by the National Industrial Chemicals Notification and Assessment Scheme [NICNAS], our national chemical regulator. We also recommend

comprehensive independently audited water and air quality monitoring and reporting near coal seam gas operations, independently audited monitoring and reporting of volumes and contaminants of wastewater produced and disposal methods, that the Great Artesian Basin aquifer water and productive agricultural land should be protected, and that landholders should have greater legal protection against involuntary intrusion on their land by coal seam gas operations.

Health impact assessments should be part of all unconventional gas project assessments under nationally developed guidelines. Finally we recommend a moratorium on new coal seam gas operations until the health and environmental consequences are adequately understood, and the appropriate monitoring and regulations are in place to protect human health. In summary, protecting the health and wellbeing of the citizens of New South Wales should be the priority. Coal seam gas poses unassessed and potentially serious health risks to the community. New South Wales should not proceed until there is proper assessment and regulation of the impact on public health and vulnerable communities.

The Hon. RICK COLLESS: Your submission refers to the impact of methane on human health. On page four you say that coal seam gas, like all fossil fuels, contributes to greenhouse gas emissions and, therefore, climate change. As such, it contributes to the globally increasing burden of ill-health due to climate change. Is that a very long bow to draw?

Dr REDMOND: Not at all. Climate change is estimated to claim the lives of approximately 300,000 people per year globally, and seriously affects more than 300,000,000 people at the current time. Those figures are increasing and they are being documented internationally.

Dr CAREY: The World Health Organisation recognises already, and has for some time, the links between climate change and impacts on human health. The *Lancet Medical Journal* which is one of the most prestigious medical journals has called climate change one the greatest threats to health globally.

The Hon. RICK COLLESS: When you refer to climate change in those terms are you talking about an increase in average global temperature?

The Hon. JEREMY BUCKINGHAM: In the absence of the Chair, I rule that this line of questioning is outside the terms of reference for this inquiry. Will you confine your questions to issues relating to coal seam gas operations?

The Hon. RICK COLLESS: I refer to the Doctors for the Environment Australia submission.

The Hon. JEREMY BUCKINGHAM: Your questions should relate to coal seam gas.

The Hon. RICK COLLESS: As opposed to the submission. Is that what you suggest?

The Hon. JEREMY BUCKINGHAM: Yes.

The Hon. Dr PETER PHELPS: Point of order: How is it possible to conduct a valid committee hearing unless the assertions made in the submission are able to be discussed in detail with the people who made the submission in the first place?

The Hon. JEREMY BUCKINGHAM: I believe the line of questioning is outside the terms of reference. The committee is dealing with coal seam gas and in the limited amount of time available I think we should inquire into coal seam gas rather than climate change. I am more than happy to have a climate change inquiry a little bit down the track.

The Hon. RICK COLLESS: Are you aware that methane is arguably the most abundant organic compound on earth?

Dr REDMOND: That would not surprise me.

Dr CAREY: A lot of that methane is actually locked up, not necessarily available in the atmosphere, if you look at the methane hydrates in the north and so forth. Again I do not think we are really here to talk about that. I think that is probably outside the scope of what we are talking about but certainly we know it is a potent greenhouse gas. We also know that there is increasing evidence that the footprint of coal seam gas may not be as

low as we had originally thought because issues such as fugitive emissions and so forth need to be taken into consideration. I understand that that is an evolving area. But again we are actually here to talk primarily about health.

The Hon. RICK COLLESS: In relation to BTEX chemicals to which you referred in your submissions are you aware that they have been banned in New South Wales?

Dr CAREY: If you could clarify that. Is that banned in hydraulic fracturing fluids or how?

The Hon. RICK COLLESS: Any use.

Dr CAREY: Any use?

The Hon. RICK COLLESS: That is the use in fracking for coal seam gas, is it not?

Dr CAREY: As I understand that has also occurred in Queensland.

The Hon. RICK COLLESS: But the Queensland situation is outside the terms of reference for this inquiry which refers to New South Wales.

Dr CAREY: I am just talking about the industry, if you would just allow me to continue that point. The issue with BTEX chemicals is that they can not only come from the drilling fluids but they can also be mobilised from the coal seams themselves. There are a number of compounds within the strata. We understand there is good evidence they can be mobilised during that process. Of course also where you are putting chemicals down into a situation with water there are existing chemicals there and there can also be chemical interactions occurring. Just because you have banned BTEX chemicals from the drilling fluids does not necessarily mean that you will not be finding any BTEX contamination in any of your sites.

The Hon. RICK COLLESS: In that regard the BTEX chemicals are also present in coal and are released in the coalmining operation itself—open-cut coalmining, underground coalmining and so on. They are also present in oil and are known to exist in diesel fuel.

Dr CAREY: The seam petroleum compounds.

The Hon. RICK COLLESS: Do you think there will be an increase in BTEX chemicals that may come out of the coal seam gas operation, knowing they are not going to be used in the fracking process, compared with what concentration is in the environment now as a result of other fossil fuels?

Dr CAREY: When you talk about the environment I think you have to differentiate between what is in the air, for instance, and what is in other areas. We know we have BTEX chemicals, like benzene, in the air from the use of petroleum products in motor vehicles in our cities—that is well documented—and we also know there is a health risk associated with that. To date we have not really examined what the risk might be of BTEX chemicals in drinking water from aquifers, I do not think, but we are now in a situation where we may be increasing that risk. But the issue is we do not know what those risks are because the information does not seem to be collected and there does not seem to be a system to require that to be collected so that we can assess these risks. So it may well be that there is no increased risk, but we would say surely the onus is on the industry to provide the evidence around that and that evidence should be collected.

The Hon. RICK COLLESS: We heard from experts this morning and this afternoon that there has been no cross contamination of aquifers as a result of coal seam gas operations or exploration operations. I put it to you that that has not happened, that there has not been the contamination of drinking water aquifers by BTEX chemicals as a result of coal seam operations in Australia.

Dr CAREY: I am very pleased to hear that if that is the case. I am not entirely sure how we can be so completely sure and I would like to be able to find that publicly available information that gives us the evidence that points to that. My understanding from talking to hydrologists is that sometimes contamination can take years to decades to become evident and that water within aquifers moves extremely slowly. So I am not quite sure how we can be so completely happy there is not a problem. I might point you to a situation in the United States. I understand there are differences between coal seam and shale gas, but only this week there was a report of an investigation of the EPA in the United States that found fracking chemicals in a drinking water aquifer in a

town in Wyoming. I can provide you with all the chemicals that were found there, which did include benzene, and the EPA did their investigation and concluded that there was no obvious other source such as agricultural chemicals and also they found methane and the methane was tested to be that with a thermogenic signature, suggesting it was coming from a deep source rather than a surface source. So the evidence there, collected by an independent authority within the United States, suggests there is certainly the capacity for that sort of contamination to occur.

The Hon. RICK COLLESS: Was that from within shale beds or coal beds?

Dr CAREY: That was within shale, but it was a fracking process not dissimilar to, I understand, what can occur in Australia.

The Hon. RICK COLLESS: We heard from the experts straight after lunch that there is no similarity between the fracking process in a coal seam and a fracking process in a shale operation.

Dr CAREY: If I might speak on behalf of the issue of the fracking chemicals, we certainly have information relating to that from the United States because there was a United States representative committee that looked into that. They requested information from 14 companies and found that of those 14 companies over a number of years—I think it was four years—they used something like 2,500 products comprising 750 chemicals. A lot of those chemicals have been analysed by independent persons and there are a number of similarities between those sorts of chemicals and the chemicals which are used here, and we have the list of the 45 chemicals listed here by APPEA, although they are obviously not complete. So I think to say that there is no similarity is not entirely—

The Hon. RICK COLLESS: I was not referring to the chemicals being released, I was referring to the actual physical process of fracking the shale as opposed to fracking the coal.

Dr CAREY: I understand there are differences. I am a doctor, I am not a hydrologist, but I understand there are differences in terms of the depth and the technologies and so forth, but I would suggest to you that there are also a number of similarities such that there are some lessons that can be learned from those situations, which are cautionary for our situation here.

The Hon. GREG DONNELLY: I am looking at your recommendations on pages 5 and 6 and I would like to ask you a couple of questions associated with the recommendations you make. On the issue of the auditing or the monitoring associated with coal seam gas mining you are very clear about the need for independence associated with that procedure. Do you have a concern that there may not be or do you anticipate that there may not be plans to have such independent checking procedures put in place? Is that why you are stating it there? Do you have any evidence that it is not being done independently or do you just want to assert a position that it needs to be done independently?

Dr CAREY: I think as doctors one of our prime concerns is the quality of drinking water because clean good-quality water is a determinant of good health, and from my experience in terms of drinking water and health the sorts of protections that are put in place require some sort of independent process to assess either risk management plans for water authorities or that the sorts of monitoring activities that go on are of an appropriate quality and that is not entirely reliant on self-regulation. I think where we have a situation where—I know we are not supposed to be talking about Queensland—but certainly we know there are situations where coal seam gas produced water can be injected into drinking water aquifers and if people can be ingesting this water then we need to have a situation where there is some certainty for the public that this really is an appropriate quality and it is not left to industry self-regulation.

The Hon. GREG DONNELLY: In terms of the nature of the conducting of the independent audit or the monitoring do you see that it is a role for government or a government body to conduct that?

Dr CAREY: It could be by a government or it could be that government contracts that out to an independent agency. I think it could work either way. I think the main thing is that we are not totally reliant on industry figures.

The Hon. GREG DONNELLY: Could I take you to your recommendation number 12 about a nationally consistent health impact assessment process? Could you please elucidate on that idea and why you think it is so important?

Dr REDMOND: It is something that has to be thought of as a national process because, of course, coal seam exploration and also coalmining and other things that have impacts on human health occur all around Australia and it is important to have these sorts of policies basically uniform so that some States do not get the benefit and others do not. There is a capacity to have it as part of an environmental impact statement, but that has not really been utilised currently. It would highlight and be a means for the sorts of concerns that our organisation has to be brought forward, to be examined and for there to be transparency and public consultation before these projects go ahead, which put human health at risk.

Dr CAREY: The issue about being nationally consistent is important. For instance, if you look at the sorts of systems we have for controlling air pollution, we have a national set of standards which is based on evidence and well researched science and then we have legislative processes at the State level that reflect those standards. So it would seem that that will be a better way to go than to have each individual jurisdiction have different sets of rules and processes.

The Hon. GREG DONNELLY: My next question goes to the issue of the mental health implications of coal seam gas mining, and I guess, more broadly, extractive mining. Could I take you through your understanding about the potential impacts of coal seam gas mining on the mental health of individuals and communities, based on evidence that you are aware of?

Dr REDMOND: There has been good reporting of some of the mental health impacts and community impacts that are occurring with a well-established unconventional gas industry in the United States, and of course it is a slightly different industry but it has also got a lot of similarities. Those reports are basically of an industry that has been present for 10 or 20 years and in rural areas and areas where there has been a massive change from agricultural and those sorts of industries, tourist industries, to an industrial process that affects the daily lives of all those people who live there. We are also starting to see this in exploration areas in New South Wales, such as in Gloucester, and it has been well documented by a retired psychiatrist who lives up there, Dr Robertson, who has watched this process from before he retired to the present time over the last five years, and I believe he has made a submission to this Committee as well.

The Hon. SCOT MacDONALD: And appeared.

Dr REDMOND: And appeared? Good. Mental health is like the final common pathway to so many different things. Economic impacts can lead to mental health impacts through people losing their livelihood or having their cost of living going up because a whole lot of external workers are coming in and the rents are going up. So there are economic factors. Then there are factors related to conflict that can occur in small communities when a new industry comes in. Some people think great, it is brilliant, it is going to be great for them, and other people are worried. Communities that are cohesive can become divided and this can be reflected in local government or even just walking down the street and saying hello or not, or not talking about the issue, having to be careful to not talk about it—don't mention the war—because it is just too difficult.

So there can be situations of economic winners and losers; there can be increased conflict and increased tension; and of course people are concerned about their own land, which they are investing their whole life's work into, and there is the threat to its purity, its ability to produce food and also its visual effects, noise, pollution and the intrusion that comes with that industrial process; and also the powerlessness that comes when the companies say you do not have the right to say no, the Crown owns what is on your land, and this is happening whether you like it or not. The other issue is land values. People who live in the country often have everything tied up and invested in their land; so that it is their superannuation as well. If they can see massive amounts of value wiped off their land, even just when there is a petroleum exploration licence over their land, and with no recourse—these people have no recourse—and powerlessness and helplessness are the preconditions for depression.

CHAIR: Could I seek clarification from you, Dr Carey? In your evidence did you say there was evidence of contamination of a drinking water supply in Queensland?

Dr CAREY: I was talking about Wyoming in the United States.

CHAIR: I am sorry. I thought you said Queensland.

Dr CAREY: There have been in the past media reports, which I have not been able to verify, of BTEX chemicals being found.

CHAIR: In drinking water?

Dr CAREY: Not necessarily in drinking water; in water monitoring bores.

CHAIR: In Queensland or in Wyoming?

Dr CAREY: In Queensland.

CHAIR: Thank you.

Dr CAREY: The example in Wyoming was in drinking water, and that report only occurred this week.

CHAIR: Dr Redmond made comment about one aspect of public health that you highlighted at the start of the summary, which is that it caused mental health impacts in communities. The first dot point in your submission says that Doctors for the Environment Australia regards the development of coal seam gas mining in Australia as a significant threat to public health. Coal seam gas mining is a relatively new industry, generally speaking, compared to say coalmining. Do Doctors for the Environment have a position on coalmining and its impact on public health? And have you done any work on windfarms? I notice that in your documentation you talk about the impacts of noise, the condition of helplessness, et cetera. Some of those considerations have been put to previous committees that discussed windfarm technologies. Have Doctors for the Environment done any work in any of those areas?

Dr CAREY: Both, and we do have positions on both. Coalmining has its own set of problems, which are huge and probably are the subject of much more documentation both here in Australia and internationally. Yes, we are concerned about the public health impacts of coalmining, and in particular open-cut coalmining, and the increasing intensification of that process in New South Wales.

CHAIR: And windfarming?

Dr CAREY: We have a policy on windfarms. We have done some literature review, and we have also given evidence to the inquiry held in South Australia. The issue around windfarming is that the scientific evidence of which we are aware relates primarily to audible noise for a minority of people. I believe studies, primarily from Sweden, state that approximately 6 to 9 per cent of people who are exposed develop annoyance in relation to noise. While annoyance is not a medical condition in itself, it can lead to issues of sleep problems and other issues. It is really a risk-benefit issue. The good thing about windfarming is that it does not have the air pollution issues that are generated by coalmining and coal combustion; basically, it is not polluting underground water supplies, it is not having far-reaching effects that the coal seam gas industry has the potential to have, and you can take the structures down.

We already have a regulatory process which says that a certain decibel level is not to be exceeded, and there are constraints on the way in which windfarms can be operated, and action is to be taken if the decibel level is exceeded. So there are certain protections already for people. As you would be aware, in Victoria there are limits on how close these installations can be to domestic houses, unlike coal seam gas because there is no restriction on where you can put a coal seam gas well or have a coalmine. At Anglesea, not far from where I live in Melbourne, you can have a coalmine and a coal-powered plant within two kilometres of a primary school. I hope that answers your question.

CHAIR: Thank you.

The Hon. JEREMY BUCKINGHAM: Just for clarification, I understand that in Wyoming it is coal bed methane, so very similar to the Australian geology and involves similar processes. The contamination in Wyoming is in a very similar geology. My question relates to a key issue, and that is the toxicity of the compounds used. I would like to get your views on this issue, because it is often put that these are household chemicals. However, their toxicity relates largely to frequency and dose. I would like you to expand on the issue of toxicity as it relates to frequency and dosage.

Dr CAREY: I might start on that. I think the way to assess the effects of chemicals is very clearly set out. There are Commonwealth guidelines on how to do risk assessments on chemicals, and I am quite familiar with those. Primarily, you look at the hazard, which is the toxicity of the chemical, but you also look at the dose and exposure. So we are looking at how much is in the water to which you are exposed, for instance, and we are looking at how you are exposed to it—whether the exposure is by breathing it in, absorbing it through your skin or drinking it, because each of those exposures has different effects on the end result. And there is also vulnerability. If you are a tiny baby, you have greater vulnerability to these chemicals than has a fully grown adult. Generally, when we are doing risk assessments, all those sorts of things are taken into consideration. In order to do a proper and adequate assessment of the effects of chemicals on human health you need all that sort of information.

As Dr Redmond mentioned in the opening statement, only two of those chemicals involved here have been assessed by a national regulator, and those have not actually been assessed for the circumstances in which they are being used: 2-butoxyethanol and the persulfates are the ones that have been assessed. Those assessments say these chemicals are hazardous, that they are not supposed to be inhaled or ingested, and that in the case of sulphates they can precipitate allergic reactions and so forth. There has been a lot of concentration on the BTEX chemicals, and I can understand that because benzene is a carcinogen and people are quite rightly worried about cancer. But there are a whole range of other chemicals that have potentially serious consequences.

We are concerned that the way in which the information is provided by the companies is not particularly transparent in pointing out what the risks might be. It is very difficult to ascertain what the risks might be when we do not know the dose at which it is being delivered, we do not know how much of it is being delivered and in what sort of volume, what comes back and what people are exposed to, or by what means. We would hope systems will be put in place to develop information about these chemicals so that people can make an adequate and scientific risk assessment to inform them on some of these questions. I have been giving a number of examples with chemicals, but I will hand over to Dr Redmond.

Dr REDMOND: I just wanted to remind the Committee that only between 15 and 80 per cent of the hydraulic fracturing liquids that are forced down into the coal seam come back up. So these chemicals are being released into the environment permanently; it's goodbye and see you later. The concern is that they are being used in this way when none of them have been assessed for that purpose. There is evidence that there can be connectivity between the coal seams and overlying and underlying aquifers. So when they are released and do not come back, there is potential for them to get into aquifers that are used for livestock, agriculture and domestic purposes. This is the risk that we are very, very worried about.

Dr CAREY: If I could give the Committee one more example. A submission to this Committee by one of the very prominent coal seam gas companies basically starts by trying to say that BTEX chemicals are common and therefore we should not worry about them. It says that BTEX chemicals have been found in up to 50 parts per billion in soft drinks. This is actually quite misleading. I have looked this up. There is information publicly available through Food Standards Australia New Zealand [FSANZ], the food authority for Australia, which says that some higher levels were found in the United States, not here, some years ago and as a result of that FSANZ tested soft drinks here in Australia and found that 90 per cent of them were fine, that there were slightly raised levels in a few of those, and that FSANZ had worked very actively with the Australian Beverages Council to get this down to the point where none of the products tested in 2010 exceeded the actionable level.

So, first of all, that statement in the submission is misleading. Secondly, it is a false premise to say that we are exposed to lots of these chemicals daily so therefore a bit more will not worry us. If we were seeing patients who said, "I am smoking one cigarette a day," we would not tell them, "Oh, well, you might as well smoke 50, that's fine." You are not going to do that because, for instance, with benzene the lifetime risk of leukaemia is roughly 1 per cent for citizens of New South Wales, and that is doubled already by exposure to the sorts of levels to which we might be exposed by driving in a car every day through fossil fuels. The risk relates to the lifetime exposure. So we should be saying—and the World Health Organisation actually does say—we should be trying to minimise any additional risk that there is, not say: Oh, we're exposed to it, therefore it's fine to go ahead and put these chemicals into the aquifer. That is just one example; I can give the Committee a lot more.

The Hon. JEREMY BUCKINGHAM: For clarification, there has been a case of cross-contamination in Dalby. That has been acknowledged by government departments and companies there.

Dr CAREY: The issue is that once it is there you cannot take it back. You cannot fix it. No amount of money can recompense people for not being able to drink from a water supply that should be lasting us hundreds of years.

The Hon. Dr PETER PHELPS: Going forward, presumably we will be looking towards regulation in some form or another. Can you point to any of the extractive industries in Australia which Doctors for the Environment consider operate on a best practice system in relation to public health?

Dr REDMOND: By extractive industries, do you mean any sort of mining?

The Hon. Dr PETER PHELPS: Yes.

Dr REDMOND: Not just fossil fuels?

The Hon. Dr PETER PHELPS: Any sort of mining.

Dr REDMOND: I am afraid I do not know the answer to that question.

Dr CAREY: I think you might misunderstand what we do, in the sense that we look at situations where we believe there is good evidence that there could be a risk to public health, and investigate those. We do not investigate every single industry and see if we can find a public health problem. We look where there is good evidence to suggest that action is incomplete, and we contribute our skills to understand the health problems in those situations.

The Hon. Dr PETER PHELPS: But you have investigated coal as in open-cut coal, have you not?

Dr CAREY: We have looked at some of the risks associated with coal mining and combustion. Primarily, the issues are not only with mining but also with combustion. There is a world of literature on the health effects of burning coal, although that is not in dispute. If you go to the American Heart Association and any of the eminent associations and you will find statements about air pollution from fossil fuel burning. Our interest in that area links back to the known health impacts.

The Hon. Dr PETER PHELPS: What about uranium mining?

Dr CAREY: We have a relationship with the Medical Association for the Prevention of War, and we work in cooperation with that association. We feel they may be the key medical personnel to deal with those sorts of issues, so we focus primarily on other issues we felt are not being given a medical or health voice.

The Hon. Dr PETER PHELPS: Would it be fair to say that your organisation does not believe there is a single extractive industry in Australia which does not pose a public health risk?

Dr CAREY: No, I do not think it would be fair, because we have not looked at all the extractive industries in Australia. As I have just explained, that is not what our business is about.

The Hon. SCOT MacDONALD: If you are rejecting coal seam gas as a transitional fuel, and you have rejected it for a number of reasons including emissions data, which I think you are saying is incomplete, I think that is still contested. There is some data out there that does suggest it is a lot less than from coal. But you reject it as a transitional fuel. If we do not go to nuclear energy, if we do not dig more dams, and if renewables are a decade or two or three away from being competitive, do you accept that there will be implications in continuing to be highly reliant on coal, and that we will have to deal with all those issues that you talk about, all that coalmining neighbourhood stuff and all the particulates and whatnot? Do you accept that great reliance on coal comes at a cost? Do you have an alternative? You say you do not have to come up with alternatives but you are addressing a Committee that cannot avoid the subject?

Dr REDMOND: Certainly. We need energy. We need a reliable energy supply and we need to make that as carbon efficient or as minimum of carbon as we can going ahead. Most of the coal that we mine is mined for export—75 per cent to 80 per cent of the coal that we mine is sent to overseas markets. We do not mine it because we need it. Yes, our stationary energy grid is largely fueled by coal but renewables are increasingly competitive and photovoltaic cells are getting cheaper by the day. In fact, our own production plant out at Homebush has closed partly because the dollar is so high but also because a lot of photovoltaic cells are being

made out there and the price has fallen rapidly. These things are not 10 years away. They are available now. They can be utilised now. Of course no renewable energy source is completely without its own carbon footprint and its own sort of problems that need to be dealt with, but we have a choice.

Like Queensland, we can invest tens of billions of dollars in a coal seam gas industry when we know there are risks and we know there will be impacts on food production and on water in this very dry continent. We also know that we have the technology and we can go ahead and invest in renewables instead. If I was a farmer and a representative from a coal seam gas company came up my driveway and said to me, "You have great coal seam gas here. We would like to put a gas field in." and the next day somebody from a wind farm said to me, "What brilliant wind. I want to put 10 turbines on your property." I know which one I would prefer. When you put the risks of each side-by-side it is a no brainer.

The Hon. SCOT MacDONALD: Have you got any evidence that there will be an impact on food? I have looked at this. I cannot find any evidence to substantiate the claim that the extractive industries are having an impact on our food security and on our future supply.

Dr REDMOND: Are you talking about the extractive industries or the coal seam gas industry?

The Hon. SCOT MacDONALD: I am talking about any extractive industry? I have looked high and low and I cannot find anything. People make that statement fairly glibly but as far as I can see there is no evidence. If you want to take that on notice I am happy to be directed about that later on.

CHAIR: I am not sure that there was a question there.

The Hon. SCOT MacDONALD: I am asking for evidence for the comment about food security.

Dr REDMOND: I will make one point about that. The soil on the Liverpool Plains is four times as productive as any of the soils in the surrounding areas.

The Hon. SCOT MacDONALD: I do not dispute that.

Dr REDMOND: We have got areas that are highly productive of food and where there is coal seam gas exploration going on, where there are petroleum exploration licences current. I think it only makes good sense to be protecting our capacity to produce food in this country. We are exporters of food at the moment. With an increasing world population we feed a lot of people who do not live in Australia. We have lots of productive land globally but due to climate change effects, as well as population growth, we are going to need as much productive agricultural land as we possibly can have.

The Hon. SCOT MacDONALD: I suggest to you that that is a subjective statement. If you have got some evidence I am happy to see it.

The Hon. Jeremy Buckingham: Forty per cent of the agricultural land in the Hunter Valley has been lost to mining and residential development. There is some evidence.

The Hon. SCOT MacDONALD: Viticulture, thoroughbreds. I do not eat horses.

The Hon. Jeremy Buckingham: Point of order.

CHAIR: Order! This is not a debating session. We heard evidence earlier from the Government representatives that even if we did immediately move to 20 per cent renewables—being the current technologies of wind and photovoltaic solar—we would need rapid response peaking stations. The only way we can get those is with gas because coal-fired coal stations are not capable of being run up and down fast enough. Do you concede that if you accelerate the need for renewables and the installation of renewables you may need to have gas available for gas-fired peaking power stations?

Dr REDMOND: I am not a technical expert in energy production. I hear your question but I do not think I can answer it.

The Hon. Dr PETER PHELPS: Does your organisation support economic growth?

Dr REDMOND: We do not have a position on economic growth as far as I am aware. Dr Carey?

The Hon. Dr PETER PHELPS: Your website talks about steady State economics where there is qualitative development but not aggregate quantitative growth. Does that not tend to indicate that you are opposed to economic growth?

Dr CAREY: I think there may be a lot of things on our website that may not necessarily be our formal policy. Lots of people write articles for the website. As far as I am aware we do not have a specific policy on economic growth. I think what we are saying is that growth should not come at any cost and that development should have a sustainable component, because we are worried not only about our current generation but also about generations to come, their health now and the health of people into the future.

The Hon. Dr PETER PHELPS: Certainly that is the qualitative development part but the second part —and this is a direct quote—"but not aggregate quantitative growth". Is it the position of your organisation that you do not support aggregate quantitative growth?

Dr CAREY: With due respect we have just answered that question.

CHAIR: Thank you. The witness has answered the question. Dr Carey and Dr Redmond we are out of time. I know you have had to travel a long way to be here and the Committee appreciates your evidence. If the Committee has any further questions would you be prepared to take them on notice and provide an answer, where you can?

Dr CAREY: Certainly.

Dr REDMOND: Yes.

CHAIR: Could you do so within 21 days?

Dr CAREY: Certainly.

Dr REDMOND: Yes.

(The witnesses withdrew)

(Short adjournment)

MICHAEL MORAZA, Group General Manager, Upstream Gas, AGL Energy Ltd,

SARAH MCNAMARA, Government and Community Relations, AGL Energy Ltd, and

JOHN ROSS, Manager, Hydrogeology, AGL Energy Ltd, sworn and examined:

CHAIR: Mr Moraza, would you or either of your colleagues like to make an opening statement?

Mr MORAZA: Yes. I have an opening statement that will take approximately two minutes. AGL Energy welcomes the opportunity to appear before the Committee today following a submission that we made to the inquiry dated 8 September 2011. I can confirm that we have no amendments to make to that submission and we are happy to take questions about it. As some of you might be aware, AGL is Australia's leading renewable energy company and the largest private owner, operator and developer of renewable generation assets in this country. We have major investments in hydro and wind as well as ongoing developments in key renewable energy areas including solar, geothermal, landfill and gas.

We also operate a retail business, a merchant energy business and an upstream gas business, which I run, and we have over three million customer accounts in the country. About 1.2 million of these customers are located here in New South Wales. I am saying this to make a point about our company. In particular, the company has had a long history of providing energy to customers in this State. We are not a fly-by-night company, we are not a share market promo company and we are not interested in making dollars quickly and moving on. We have been operating in this State for almost 175 years; in fact we are 175 years old next year. As history has shown, we stick around and work with the communities we service.

We are participating in this inquiry today because we believe the Committee's deliberations should be informed by a broader understanding of how the coal seam gas industry has operated to date in both New South Wales and across the eastern seaboard of Australia. We believe that natural gas will play an important role in the transition to cleaner energy sources in this country as we move to reduce our greenhouse gas emissions. This principle is particularly pertinent to us in New South Wales as we currently important more than 90 per cent of our natural gas from other States. This means that security of supply for New South Wales customers, homes, businesses and the like will be put at risk if the exploration for and production of natural gas in this State is halted.

The gas market as a whole is an industry in which AGL has had a long history and we are very concerned about the impacts of some of the Queensland-based coal seam gas to liquefied natural gas projects, particularly on the gas supplies into New South Wales. It is fair to say that we understand the liquefied natural gas projects will begin exporting from about 2015 and that will result in consumption and demand being driven for gas supplies from central and northern parts of Australia and these supplies may have, and have traditionally, flowed into New South Wales and other eastern State for domestic use. However, we appreciate that the development of new gas reserves to replace traditional supplies must occur against a backdrop of effective and robust regulation and best practice industry management. AGL is supportive of the New South Wales Government's policy positions in relation to coal seam gas development.

I turn now to water. We have heard many concerns about water impacts raised by communities. Nobody, especially AGL, wants to cause damage to agricultural lands. That is why we have multiple levels of protection in place at our gas wells. We have identified the importance of understanding and monitoring the interaction of coal seam gas on groundwater and we have employed a full-time senior hydrogeologist, John Ross, who is here today to take some of your questions. Our projects include groundwater monitoring networks to monitor the water level and water quality characteristics of shallow aquifers which are used for water supply and to identify any changes during exploration and production programs. Mr Ross is here to talk about this topic.

I refer now to community engagement. We are firmly committed to engaging with the communities in which we work and providing them with factual information about our projects. We have regular community meetings, newsletters, web sites are updated regularly and we are members of community consultation committees. I am a member of the Hunter community consultation committee and I am happy to talk about that later. We look forward to hosting this Committee at our Camden site on 9 December. I will be attending and hosting that meeting. I look forward to demonstrating to you all the co-existence with residential and farming use. That coexistence has occurred quite successfully over the last 10 years. I think the Committee will also

appreciate seeing the Rosslyn Park gas plant, which has been supplying this State with approximately 5 per cent of the natural gas consumed for the last 10 years. I look forward to any questions the Committee might have for AGL today.

The Hon. Dr PETER PHELPS: Mr Ross, before I get to the substantive part of my question could you outline your background and your experience as a hydrogeologist especially in relation to the coal seam gas industry?

Mr ROSS: I have been in hydrogeology for 37 years. I have a geology degree from the University of New South Wales. I started my professional career with the New South Wales Water Conservation and Irrigation Commission and was with the government department for 21 years. I left there in 1994 when I was the principal hydrogeologist. Since then I have been consulting, firstly doing contaminated site work, but since about 2000 I have been doing more water resource work and work for industry, particularly coal seam gas in recent years. I ran the New South Wales Government emergency water supply groundwater program for the Sydney Catchment Authority from 2004 to 2009. That gives me a very great understanding of the geology and the groundwater systems in the Sydney Basin. Before that time I worked for Sydney Gas and coming off the back of that program I worked for the upstream gas group in AGL. I have been a full-time employee with AGL since May 2010, so I have been with them for the last 18 months and I am across all their groundwater issues within the business.

The Hon. Dr PETER PHELPS: Thank you for that comprehensive answer. In your professional experience are you aware of any instance where the highly saline water from coal seam gas has inadvertently because of coal seam gas drilling made its way into a high level alluvial aquifer in Australia?

Mr ROSS: My knowledge and investigation is primarily in New South Wales and a little in Queensland. I have no knowledge or firsthand experience of any impact on alluvial water resources. The groundwater systems are very deep and isolated naturally and when they are developed and that water is brought to the surface every care is taken to make sure they remain in pipe and in tank and are taken away and do not impact on the local landscape.

The Hon. GREG DONNELLY: One of the issues that have come up on a regular basis in our visits around the State are problems landholders experience with respect to how they go about negotiating payments associated with exploration on their property. Can you explain to the Committee how AGL goes about this process of negotiation with property owners and the successes or problems you have experienced in those negotiations?

Mr MORAZA: The history base is on the back of the Camden project, the Gloucester project and the Hunter project, in which we have had the most activity in the last few years in New South Wales. It is fair to say that each and every one of the discussions or negotiations we have is assessed on the facts and the unique circumstances that surround them. For example, a negotiation with Elizabeth Macarthur Institute at Camden is not the same sort of negotiation we would have with an individual landowner in, say, the Gloucester Basin. First, the negotiation takes place with AGL putting forward a proposal, which is a specimen document containing the terms of access and compensation. We typically ask the landowner to comment on its framework and its application to that landowner's situation. We invite the landowner to discuss with us where they would like activities to take place, if any, and where they would prefer activities not to take place. The purpose of that is to try to get some idea of the impact and areas that might be set aside temporarily during activities in order to come at the question of compensation.

When it comes to the monetary amounts we have a guide because we have approximately 130 agreements already in place and have had for many years. For example, at Camden at last count we had in the vicinity of 32 agreements that are on foot and have been negotiated at arm's length. The compensation packages that are put forward pay tribute to the nature of the land, the type of application or use of the land when we arrive and the amount and extent to which we interfere with the landowner's use of that land. As I say, each is a unique case. There is rural land and there is some higher value agricultural land and the like. We have a guide and we put forward a proposal to the landowner which contains sums of money. Then of course we invite the landowner to go away and seek professional advice. That professional advice is typically done through a law firm which has had experience in this area and that firm will give independent advice to the landowner. We take it from there.

The Hon. GREG DONNELLY: Is that a law firm you recommend to them?

Mr MORAZA: No, it is a law firm that the landowner is able to select at their discretion. We would seldom recommend a law firm to a landowner and it is commonplace for a landowner to talk to other landowners in the area who have had experience with AGL, for example, and get some recommendations and suggestions about the law firm they might use. Those fees are paid, again under the legislation of this State, and we reimburse the landowner for those fees.

The Hon. GREG DONNELLY: Do the exploration agreements that you strike with landholders contain a confidentiality provision that binds the individual not to release that information or make it available to anybody?

Mr MORAZA: Yes they do. That is a commonplace part of a compensation agreement, terms of confidentiality. By the way, it is often the case that landowners want that to be kept confidential because their preference is for the nature of compensation to them on an individual basis not to be in the public domain. It is a two-way confidentiality agreement in the sense that neither the landowner nor AGL discloses its contents.

The Hon. GREG DONNELLY: Are the actual amounts of the payments a matter of negotiation with AGL?

Mr MORAZA: Absolutely. It is always a matter of negotiation with AGL. In other words, AGL does not go in and declare and put down a position and say that this is a non-negotiable position. We put forward a proposal and we invite negotiation to take place. Often times the compensation package contains non-monetary amounts. I mean by that that while we are doing work on the premises a landowner might ask us as a favour, as it were, "Can you extend the road a few hundred metres in this direction? I have had a problem with that gate and that fence for some years now. While you are here putting up some of your own fences could you do that fence for me?" These things happen all the time. Non-monetary compensation amounts also are put forward.
We may, for example, drill a turkey nest dam for occasional use of water handling and that dam might be lined and it is typically always lined by us but it may also be that the landowner says, having dug that dam, it is convenient for you to leave it there once you have taken the lining away. That happens and is a form of non-monetary compensation.

The Hon. PETER PRIMROSE: If a landowner wished the confidentiality clause to be removed from the agreement, would you agree to sign that agreement?

Mr MORAZA: I think philosophically we do not have a problem if a landowner wants to release that information to a community area, there is nothing philosophically that AGL is opposed to for the release of those items to the community. From an AGL perspective, it is our preference to keep the terms confidential but we are not fundamentally opposed to disclosing specimen access and compensation agreements, for example, to community groups and the like.

The Hon. PETER PRIMROSE: On that basis, can I ask you for two things—I have asked other companies for them. Would you consider giving to us firstly, a copy of any written protocols you may have about approaching landowners and secondly, a copy of a standard offer document?

Mr MORAZA: A standard proposal for accessing compensation?

The Hon. PETER PRIMROSE: Yes.

Mr MORAZA: If you could assist me with some information on the type of land use. Do you mean a rural farm in a rural area, as opposed to, for example, some more urban areas that we are involved in with the Camden project?

The Hon. PETER PRIMROSE: Thank you for asking that. I was not aware that you made different types of offer documents. Could we have a sample of each of them?

Mr MORAZA: Yes, I will provide you with one that we have used typically in and around the Camden area and one for a more rural setting. Could I, by leave, table that with the Committee in about 14 days time?

The Hon. PETER PRIMROSE: That would be very helpful. Just talking about Camden, can you tell me how many wells have been dug as part of the Camden gas project to date?

Mr MORAZA: We have not dug any wells but we have drilled approximately 132 wells and of those, at last count we had approximately 86 wells in production. I have been corrected, it is now 138 wells, not 132.

The Hon. PETER PRIMROSE: Yes, that is my information but not knowing the difference between drilling and digging, I was not about to correct you at this stage. Prior to fracking being no longer permissible, can I ask you how many of those 138 wells were in fact fracked?

Mr MORAZA: I was about to say that we have fracture stimulated approximately two thirds of the wells at Camden. I am trying to do some mental arithmetic. Can I take that question on notice and table that with our response in 14 days?

CHAIR: Yes.

The Hon. PETER PRIMROSE: Thank you very much.

CHAIR: Does your company use this horizontal well method?

Mr MORAZA: Yes, we do. The Camden project is interesting in the sense that, at its infancy it relied solely on vertically drilled wells in and around the Camden area. For reasons associated with lessening the surface impact and indeed running out of surface locations, it became both convenient and appropriate for AGL to start using what we call the surface to in-seam technique. Surface to in-seam is just a trendy way of describing starting off initially vertically down hole but then deviating and eventually becoming a horizontal well drilled within the seam. Within the seam we can continue—as we are doing at Camden now—some one to two kilometres in seam.

The Hon. Dr PETER PHELPS: How wide is the seam?

Mr MORAZA: The Camden seams are two: One is called the Bulli seam which ranges from about three to four metres in height, about the height of this room. The next seam, below the Bulli seam, is called the Balgownie seam and that is a similar height, about three to five metres. So we are, as it were, swimming inside that seam—swimming in a loose sense—with a horizontal well that goes for about 1.8 kilometres. Returning to the question, Camden is now being exclusively drilled with an SIS arrangement. SIS wells have the advantage where you need less surface footprint and a further advantage is that you do not need to do any fracture well stimulation. The well can flow gas because you have opened up a lot of hole within the seam.

CHAIR: When you provide answers to the question on notice about the fracking, could you tell us how many of those wells—are they called foot fracking or short fracking, based on the vertical well?

Mr MORAZA: Sure.

CHAIR: And since you have been doing the horizontal drilling, how many wells have since been fracked on the horizontal?

Mr MORAZA: None. I think I was trying to make the point that if we elect to go down a surface to in-seam by horizontal drilling, we will not need to do any fracture well stimulation.

The Hon. SCOT MacDONALD: I think AGL is one of the bigger electricity and gas suppliers in New South Wales. Can you tell me what would be the impact of a moratorium on coal seam gas on family and business, energy security and prices over the next ten years, if that option for New South Wales was turned off?

Mr MORAZA: Could I ask you what you mean by the term "moratorium"? Do I read "moratorium" to be cessation of activities under our exploration permits?

The Hon. SCOT MacDONALD: Correct, yes.

Mr MORAZA: Because we are having a moratorium, as it were, at the moment in respect of fracking.

The Hon. SCOT MacDONALD: It is probably a bit of a thought bubble, the bill that was put up, but in essence, that is what it means.

Mr MORAZA: If there was a cessation of exploration drilling in this State henceforth, what would happen is that this State, from about 2015 onwards, would run into a deficit situation with natural gas because that is the period at which legacy contracts run into decline, many of which are held by AGL. I remind the Committee that we are the largest supplier of natural gas in this State, as we have been for decades. The contracts that we hold run into decline from 2015 onwards. These were contracts signed with Cooper basin producers such as Santos and Gippsland producers such as Esso BHP. In the absence of extending those contracts—which we are certainly talking to those producers to do, without much success at the moment, but we are certainly talking to them—we would face a situation in New South Wales where we would be in deficit for natural gas from about four years onwards.

If I were to project the situation out ten years, there would be a material increase in energy prices in this State, because this State would be wholly reliant on importing natural gas from other States. If I am not mistaken, natural gas is the fuel of choice to transition us into a renewable future and the fuel of choice for power generation in the future. So, absent domestic access to natural gas, we would be importing all of our natural gas, as we were doing prior to about ten years ago. That would increase prices. The secondary impact is that the security of supply situation in this State would be materially diminished. The natural gas industry relies on off-shore/on-shore gas processing facilities, it relies on compression facilities, it relies on long pipelines to move natural gas around the country.

It is not uncommon and I can think of four situations in the last ten years where there has been a major disruption of natural gas supply. In the State of Victoria, the disruption to the natural gas supply that occurred at Longford resulted in some 10 to 14 days of nil supply of natural gas. People were taking cold showers and that went on for a couple of weeks. The security of supply, absent domestic gas in New South Wales, will be materially diminished and I do not think that is a good thing, especially from the point of view of an energy supply company like AGL. There are therefore two impacts: Energy prices up; security of supply will be diminished.

The Hon. JEREMY BUCKINGHAM: Mr Moraza, you said that you had 138 wells drilled in the Camden gas project and 86 are producing. What is the situation with those 52 wells that have been drilled and are not producing?

Mr MORAZA: The reason why wells have been drilled and are not producing is associated with the fact that they were wells drilled in the early infancy of the Camden project at a time when the geology and the well completion technique was not well understood in the sense of what works the best. So, in the early days of Sydney Gas' drilling, there were wells drilled in areas which, on reflection, were not ideal places to drill wells, from a coal seam gas quality or a coal seam gas movement or production point of view. Put simply, wells were drilled which are now shut in, abandoned and pending plugging because they are wells that are not able to produce natural gas.

The Hon. JEREMY BUCKINGHAM: So those wells are no longer producing?

Mr MORAZA: Correct.

The Hon. JEREMY BUCKINGHAM: AGL has the longest operational coal seam gas industry project in New South Wales, given your production figures, in your experience when, in terms of year of production, are these wells hitting their peak?

Mr MORAZA: We will typically see a coal seam natural gas well ramp up from early production and then, we call it plateau—it plateaus and stays at that level—at about the two, three or four year mark. It typically plateaus for a period of about five or six years before it goes into natural decline, which is simply that the amount of gas that is left starts to decline and they decline on 10 to 20 per cent per year thereafter.

The Hon. JEREMY BUCKINGHAM: So those wells that were drilled in the early 2000s are in decline now. So is it the case that the industry requires continual expansion, that in order to maintain that supply you will need to continually expand and obviously you have got your proposal for the 72 new wells at 12 locations around Camden. Is it not the case that the industry requires continual expansion, continual

development of new fields, and what would be the future of the Rosalind Park gas plant if those 72 wells at the 12 locations around Camden were not approved?

Mr MORAZA: First of all, there are a lot of topics you have raised. I will try to be brief. You are correct in describing the need for the industry to continue to drill new wells in order to add production to what are wells in production decline. However, I might say that once a well goes into production decline and eventually ceases production, it will be plugged, abandoned, cut off below the surface and there will be a total rehabilitation of that location to at, or better than, the condition prior to our arrival. So I think to describe a project with a number of wells in production as just keeping increasing and increasing is probably a wrong portrayal because, in fact, wells come on but others stop and are abandoned. So the actual number of wells that at one time are in production and active does not simply keep being multiplied.

The Hon. JEREMY BUCKINGHAM: I was not suggesting that, but you would have to find new wells so the quantum may remain static but it is an issue of having to find new locations.

Mr MORAZA: That is correct, new locations have to be found to bring wells on. You have mentioned our Camden North expansion project and you have mentioned 72 and 12 in the same sentence. I will note that when we initially proposed the Camden North expansion, we proposed to drill at 20 surface locations and the reason we did that is that we were still thinking that an appropriate way may have been to drill some vertical wells in addition to surface to in-seam. What we have elected to do to minimise the surface footprint, is to reduce the number of wells at Camden North from 20 to 12 and it is those individual 12 locations we will use to step off up to seven underground well trajectories into the seams. So in the absence of adding to the Rosslyn Park gas plant's production, the Rosslyn Park gas plant will go into production decline and get to a point where it will be uneconomical to keep running that plant and, therefore, we will close the plant. We will close the plant and we will abandon the site. By the way AGL is likely to do that at some time in the future once we have run out of surface locations to drill and produce gas in the wider Camden area.

The Hon. SCOT MacDONALD: The committee keeps getting the assertions that renewables can fill the gap, and they will be the same price of coal or gas and yield the same sort of energy. As an energy supplier will you give the committee some background and looking 10 years ahead?

Mr MORAZA: First of all I can give some undeniable clarity that the cost of producing renewable energy bears no resemblance to the cost of producing electricity from coal. We know that because we are an investor in both of those fuel commodities. Renewable energy is far more expensive by a factor of in excess of two than convention fossil fuels. Yes, the relative economics may change in the future with the reduction in the cost of producing renewable energy. I think indeed aspirationally we hope as an energy supplier that that falls to a level where it could become mainstream and affordable by the community.

One of the things that I also wanted to make clear for the committee is that our experience in the renewable energy industry is such that wind, for example, which is our mainstay renewable energy supply that we have in the portfolio today, other than what we have in our hydro assets, is notoriously unreliable. It is unreliable in the sense that it is not available at all times of the time, night, weekends or at times of high supply. Wind typically has a capacity factor which is a term which gives an indication of how often it runs in a continuous sense of between 30 and, say, 40 per cent. The implication therefore is that if the community wants firm supply of electricity we have to firm up the supply of wind. I can assure you that we are doing that by adding to our portfolio fleet gas fired power generation peakers.

It is inevitable as we move into a renewable future that has a bias towards wind which appears today to be the most obvious way of supplying renewable energy in the absence of solar hydro geothermal filling the same size and gaps that wind is filling at the moment, that we are going to have to firm up the supply of that electricity by building gas-fired peaking generation stations. Indeed, AGL, as you may be aware, is in the process of seeking approval to build a plant such as that at Dalton in New South Wales. In some ways gas-fired peaking power stations will go hand in hand with a build out of the renewable energy industry.

The Hon. SCOT MacDONALD: To accommodate that peak challenge?

Mr MORAZA: To accommodate the intermittency of wind. Wind is not available all the time. When it is not available the gap has to be filled with something and that typically will be gas fired generation.

The Hon. SCOT MacDONALD: What is the impact of price of renewables on energy?

Mr MORAZA: You have asked me to have a picture 10 years down the track which is difficult to do because there is a cost curve that is moving in renewables downwards. Today renewable energy from a cost of production point of view is typically in excess of the comparative fossil fuel gas and, say, coal by a factor of over 200 per cent.

The Hon. GREG DONNELLY: Communities are concerned about the development of coal seam gas both exploration and production. A lot of the concern is around the issue of the science particularly with respect to the potential impact of mining on underground water. As the committee has travelled the State and spoken to different communities and groups there is almost a cynicism in the minds of some that the data or the information produced by companies is "of course what they would say". In other words, they have some doubt about the material, information and data produced by companies. How do we overcome this cynicism in the community about information associated with the science of coal seam gas mining? How do we address those concerns and try to inform people that there is a way in which we can get to understand the science with some high level degree of certainty?

Mr MORAZA: I want to comment ever so briefly but I will also ask John Ross to comment because typically the science that I think you are talking about is science associated with impact on aquifers and the water resources of this State. It is fair to say that the industry needs to do a much better job, and we certainly are moving in that direction now post haste to inform, to communicate and to provide high-quality information to the communities in which we operate. We are doing that through our websites, facts sheets, seminars and the like. We are also working closely with Apia, the industry association from which you may have heard from today or will shortly. Apia also has a role to play in informing the preparing, as it were, industry information. I will ask John to comment from a water perspective what are his views.

Mr ROSS: Groundwater science is a very complex area. As you travel around the State there are very many different groundwater systems. Typically coal areas are in sedimentary basins and those areas where there are not any sandstones generally have very poor water quality, and that is not widely known. People just assume groundwater is groundwater and that is all usable. That is not necessarily the case. As Mike said, we have got to put a lot more effort into it. Collectively the industry not done that very well in the past five to 10 years. AGL is very much of the opinion of getting base-line studies done, getting them done early, getting the information out there and being transparent with as much of this information as we can.

The reports can be very thick and that is another difficulty for communities to be able to digest them. What does it all mean? We do a lot of community consultation, try to break it down to those groups, and messages, posters and plain English type documents so they can take away facts sheets, on our website and things like that. We are also heavily involved in a peer review process now. We are getting experts from universities that are not associated with AGL in any form to take on board our studies or get involved right at the early part of our studies. How do we design our monitoring networks? What information do we collect? We have got ideas on what they should be but we are getting it peer reviewed and challenged early and getting that communicated to local communities.

Hopefully that sort of process will give people a lot more confidence. We have had great success in the Hunter using a professor from the University of Newcastle to help us through that process. That has worked very well with the Bulga and the now Hunter Community Consultation Committees up there. They have confidence in Garry Willgoose to provide that independent information. We are doing more of that information going forward.

The Hon. Dr PETER PHELPS: In Taree the community representatives from Gloucester spoke about their concerns about the value of their land because of coal seam mining activities. They were very down on it. They assumed that there was going to be a very large drop in the value of their properties should they wish to sell out. Has your company done any investigation into claims about massive reduction in the value of land in the areas in which you have been operating?

Mr MORAZA: That is an interesting question because indeed that concern has been expressed to us several times by the communities in which we operate. It is something about which we are genuinely concerned and want to inform ourselves and the communities about. I will stick to what I know is the factual situation at, for example, Camden. We have been operating in Camden for 10 years. Last week we visited Camden with the Hunter Community Consultation Committee when that very question was asked while we were there. What is the experience in that area for degradation in land values? In fact, the best example we have about that being

factually incorrect or not the case is that one property in the Camden area that has now been bought and sold not once, but in fact twice. I believe that property has three coal seam gas wells on it. It has met or exceeded the vendor's expectations on both of those transactions.

We have not simply seen any evidence that there is a degradation in land values associated with the participation or presence of coal seam gas wells but it is something at which we are certainly looking in the project areas. We have heard that concern from the Gloucester community and we are genuinely investigating that. We have recently, in the past nine months, prepared an RP Data assessment of land values, of property land values in and around our project areas. We have shared the results of that study with the community consultation committees in which we operate. Again the findings of that RP Data study are that there is no impact in project areas as compared to areas where coal seam gas as a reference is not present. So there is no trend or impact that is denoted from looking at a large volume of property transaction data.

The Hon. RICK COLLESS: Mr Ross do you liaise regularly with your hydrogeological colleagues in the industry both at a government and an industry level?

Mr ROSS: Yes, I am member of the International Association of Hydrogeologists. I have served on the committees in New South Wales and nationally. I do not get along to as many meetings as I would like but I am certainly active in the profession. I do liaise quite a bit with my colleagues in the New South Wales office, Office of Water, that is the primary body that manages groundwater resources and licences and impacts. We have quite a lot of dialogue.

The Hon. RICK COLLESS: Do you feel confident that a good flow of knowledge goes from industry and government professional hydrogeologists?

Mr ROSS: Yes, I think it is pretty good at the moment to be quite honest. Obviously we could share more information and we are starting to do that more and more. We are just going through large investigation programs at the present time with rolling out our monitoring networks. I have been in to see the Parramatta group a couple of times on those programs. I have a meeting next week to talk to the Newcastle people on our Gloucester and Hunter programs. It is a question of we want to roll out that information, let them know what we are doing in terms of the networks and the data assessment we are collecting. We want to get back intelligence as to whether they feel that this data is covering all the bases that they need to from a water resource and impact point of view. We need to keep on top of the regulatory aspects such as licensing and aquifer approvals.

The Hon. RICK COLLESS: Is it to say that the profession of hydrogeology would be fairly close knit? Do you know most of the people operating in that industry in Australia?

Mr ROSS: It is a growing one. When I started 30-odd years ago it was very closely knit, with probably less than 100 people in total. Today there is probably 1,000 people but it is still a very small group of specialists. We do have major national conferences every four years and every two years in New South Wales there is a Sydney Basin or State Groundwater conference. We had one in September this year which had record numbers, I think we had 150 people so it was very well attended but very close knit group and we network quite well.

The Hon. Dr PETER PHELPS: Do you think as part of the committee's recommendations it would be valuable if there were a regularly scheduled meeting between, for example, the hydrogeologists working in this field and those from the Office of Water?

Mr ROSS: Absolutely. We have made offers that they come down and inspect our Camden operation, especially when the drill rigs are in operation. We would be more than happy to have that sort of closer-knit arrangement in place. It can only benefit both of us.

The Hon. RICK COLLESS: My second question probably is to Mr Moraza. Your statements earlier about protocols for approaching landholders and so on sound good when you explain it in here, but can you explain why we have had so many reports of less than ethical practices by some of your front-line people? What sort of farmer extension methods training do you provide your front-line people before they go out and undertake that work?

Mr MORAZA: Can I just ask you to repeat that? Is it you have had reports of AGL's front-line people?

The Hon. RICK COLLESS: Yes, we have. I am sorry to say that we have had many reports and many people have approached me personally about the way AGL people have approached them and they are less than happy with it.

Mr MORAZA: I am sorry to hear that and I am disappointed to hear that. The people in AGL who—

The Hon. RICK COLLESS: It is not only AGL, I might add, it is across the board for all the coal seam gas companies.

Mr MORAZA: I can speak on behalf of the people who work in my team. We have approximately 14 people dedicated to the land and approvals efforts. When we started in this industry possibly five or so years ago we might have had one or two people, so I think the resources that we are putting in in this area have increased quite substantially. The people that we put into the field are certainly trained in representing the company; they know enough about the operations that will be taking place. I think you asked a question have they had front-line training?

The Hon. RICK COLLESS: Yes, farmer extension methods type training. Have they been taught how to deal with farmers, how to treat them and how to approach them and so on?

Mr MORAZA: Can I just turn to Sarah? Sarah heads up the community affairs effort, and I will be honest and say I have not heard about that program you are talking about. I will see if Sarah has heard about that.

Ms McNAMARA: No, I have not heard of that program.

The Hon. JEREMY BUCKINGHAM: A question to Mr Moraza: I was interested in your comments about your ongoing discussions with those people who control the gas from the Cooper Basin attempting to secure those long-term contracts. Obviously that is going to be a driver of price. Is it the case that this shortage of supply and a driver of cost and price is because these people in control of these unconventional gas resources are seeking to sign contracts for export LNG that are looking to maximise the export price and that the export price is going to drive a shortage and therefore that will drive up price, but also any coal seam gas that is tapped into that export LNG will also immediately go up to that price? Is it that export LNG and a driver for that is going to drive up prices in New South Wales and Queensland, but particularly in New South Wales?

Mr MORAZA: Again, you have asked a couple of questions there. To your last point: I think it is fair to say that the goal of selling into export LNG markets certainly has associated with it a business goal of getting a higher net-back price for the natural gas. I think that is factually correct. But when it comes to the discussions that AGL is having with our potential future suppliers, I will not go into too much detail other than to say those producers have a lot of considerations as they are allocating reserves into their markets. For example, it may well be more opportunistic for a Victorian supplier to earmark gas for supply into the Victorian market, which is more proximate to where they are located and therefore there is a chance that they will enjoy a higher price because there are less transportation components in that network.

I think it is fair to say that New South Wales has to face the fact that we are remote from and a long way away from conventional sources of natural gas in this country—be that in Gippsland, be that in the Cooper Basin, be that in the Surat Basin. Therefore, by definition, the transportation cost components of getting that gas to our State are higher than the transportation cost components paid by other States. That is why a company like AGL and some of the other people that may have been before you today are quite interested in developing indigenous gas supply in this State; it is going to be a good thing for this State to bring economic prosperity and to manage our future prices of energy by having a domestic source of natural gas, and we would like to see that happen at our Camden project, our Gloucester project and our Hunter project, which are the three key focal areas we have at the moment.

The Hon. JEREMY BUCKINGHAM: I understand that, but if those indigenous projects are tapped into a supply pipeline that can deliver gas to Gladstone, will not people purchasing from you have to compete with an export price and will that not immediately drive up prices here because you could sell it to China or Korea at a much higher price because the international price is a lot higher than the domestic price here?

Mr MORAZA: Yes. Over the long term there will be a competition for that supply and the competition in eastern Australia will increase in years to come—and I am talking beyond the LNG export era,

which is 2015 and beyond. There will be increasing competition for that gas supply, with the competition coming from global export markets. So yes it is fair to say that domestic consumers of that, be it industrial, commercial and, to some extent, residential customers, are going to have to compete with that. There will be market segments which AGL services—for example, our residential markets where we have earmarked very long-term supply sources; indeed, our equity gas projects are wholly earmarked for domestic supply in this State for many years to come. So we have a target market for those existing supply sources.

CHAIR: I would like to thank you for coming and giving us your evidence today. Thank you for the mix of people you have had at the table. Hydrology is the flavour of today so I am glad you were able to come along. The Committee may have some written questions for you. If you are prepared to take them as questions on notice once you receive those questions if you could return them to us within 21 days.

(The witnesses withdrew)

(The Committee adjourned at 4.52 p.m.)