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TRANSCRIPT OF PROCEEDINGS

O/N H-942252

MR B. WALKER SC, Royal Commissioner

IN THE MATTER OF THE MURRAY-DARLING BASIN ROYAL COMMISSION

ADELAIDE

10.08 AM, TUESDAY, 25 SEPTEMBER 2018

Continued from 21.9.18

DAY 29

MR R. BEASLEY SC, Senior Counsel Assisting, appears with MR S. O'FLAHERTY, Junior Counsel Assisting

MR BEASLEY: I think we are okay to go now, Commissioner, if you are ready.

THE COMMISSIONER: Yes, thanks.

MR BEASLEY: Before we begin we acknowledge that the land we meet on today is the traditional lands of the Kaurna People and that we respect their spiritual relationship with their country. We also acknowledge the Kaurna people as the custodians of the Adelaide region and the cultural and heritage briefs are still as important to the living Kaurna people today. I should say before we begin, Commissioner, that Ms Masters is extremely unwell. She wasn't in yesterday, so if she collapses we will obviously take a break.

THE COMMISSIONER: Oh, really?

MR BEASLEY: Yes. I have taken her name out of the freezer. I put it in because I'm acting for her son who has become one of my clients due to harsh punishment. She did say she started to read a book called Cyanide Games so, given her commitment to great Australian literature, I will keep her out of the freezer for a while.

THE COMMISSIONER: I can recommend it. In her own time.

MR BEASLEY: I should also say last week, I have forgotten what day, I made some criticism of someone – I didn't name them, but the Victorian Government Solicitor's Office ignoring what I said about a phone conversation between someone there and Ms Masters. I may have given the indication, and probably did, that – clumsily – that the Victorian Government Solicitor's Office was being rude by not responding to your letter and series of questions of 7 September. To the extent I gave that impression I withdraw it and apologise. The rudeness comes from the solicitor's client, which is the Victorian Government. That I don't apologise for.

It's unacceptable that the Victorian Government has not responded to a series of questions issued by you 18 days ago. Those questions are, to use other people's terms, not rocket science. They should have readily available answers. More to the point, if they don't intend to answer them, they can tell you promptly. If they do intend to answer them, they should have done it already. If they don't intend to turn – have someone turn up here to answer questions, they should tell you promptly. If they do intend to have someone come here to answer questions, again, they should tell us promptly. The Basin Plan has been in existence for six years, and the questions that you asked should have been capable of an answer in 2012, let alone now.

But to the extent that I implied the Victorian Government Solicitors were rude in not responding, they are obviously acting for a client and their client clearly hasn't given

them instructions, so I apologise if I implied that, because of that I implied the solicitors were rude, as different from their client.

THE COMMISSIONER: Thank you. I should make this clear: so far as I'm concerned what you have explained may well flow from a client not giving instructions, but I don't believe that between professionals, that is between lawyers, it is appropriate to remain silent rather than to simply send a letter saying that there are no instructions to reply.

MR BEASLEY: I think we may have got that letter. When did we get a letter like that or an email?

MS MASTERS: We had a couple to that effect ..... on Friday.

MR BEASLEY: Yes. The most – there was an email, which said what?

MS MASTERS:

We don't have any information to give you. We hope to have some.

MR BEASLEY: Right. So there has been communication from the Victorian Government Solicitors' office.

THE COMMISSIONER: The second thing is this: in relation to the Government, that is of Victoria, my Terms of Reference at several points require me to consider the manifestation or operation of federalism in relation to the Water Act and the Basin Plan. A matter of obvious concern nationally, but for South Australia in particular. That is, in particular, as the polity whose Royal Commission this is. And the attitude of the Victorian Government may well elicit comment suggesting that it's a long tradition, extending back to the colonial times, that reflects no credit whatever upon a succession of governments, including the Victorian Government. So there should be no doubt that the conduct is conduct that is being noted by me and may well be the subject of adverse comment by me. Thank you.

MR BEASLEY: All right. Today, Commissioner, we have Jason Alexandra, that's A-l-e-x-a-n-d-r-a, who's a former Executive at the Murray-Darling Basin Authority, to give evidence. Following that we have Professor Mike Young from the Adelaide University, and Wednesday we have Ben Bruce primarily giving evidence and Chris Morony, and Dr Teresa Heneker, who are all from the South Australian Department of Water and Environment. And those three witnesses tomorrow will give evidence simultaneously and will be answering questions about the submission made to you from the State Government of South Australia and the responses to your questions to the State Government of South Australia seeking clarification about the State Government submission.

THE COMMISSIONER: Thank you.

MR BEASLEY: So Mr Alexandra can be sworn, please.

<JASON ALEXANDRA, SWORN [10.15 am]

<EXAMINATION-IN-CHIEF BY MR BEASLEY

MR BEASLEY: The best affirmation I have ever heard.

THE COMMISSIONER: Please sit down.

MR BEASLEY: I think you have just – just undertaken to give sworn evidence. Mr Alexandra have you provided, first of all, the Commission with a – you have provided a Notice of Intention to present which I would also describe as a short form submission.

MR ALEXANDRA: Yes.

MR BEASLEY: And if you look behind tab 2 of the folder you have in front of you, that's that document?

MR ALEXANDRA: Yes.

MR BEASLEY: I notice you have got plural for Commissioners; there is only one.

MR ALEXANDRA: Apologies.

MR BEASLEY: That's all right. That's Mr Walker and I am Senior Counsel Assisting, not Adjudicator Beasley, as I have been called once. You have also provided a signed statement to the Commission dated 24 September 2018.

MR ALEXANDRA: Yes.

MR BEASLEY: And that statement is true and correct?

MR ALEXANDRA: It is.

MR BEASLEY: All right. Do you have a copy of that with you?

MR ALEXANDRA: I have got the one that's in this printout, I believe.

MR BEASLEY: I have pulled it out. It should be behind tab 1, I think.

MR ALEXANDRA: Yes.

MR BEASLEY: I think. And this morning you sent through an updated form of submission called 'Risk and Uncertainty in Water Planning' that largely deals with issues about climate change and risk.

MR ALEXANDRA: Correct. I attempted to make a plain English summary of some of the peer reviewed articles just focusing on the dimensions of how to deal with risk and uncertainty and the nature of the climate science advice that was being received while I was in the role.

MR BEASLEY: All right. Well, we will get to that in a moment. Behind tab B, at the back of, Commissioner at the back of the – okay, I'm sorry, you don't have what I'm referring to. But, for the Commissioner's benefit, behind tab B is Mr Alexandra's curriculum vitae, which I won't take him through in detail. Just on this at the moment, at the moment you are an Adjunct Fellow at Charles Darwin University?

MR ALEXANDRA: I think that ceased.

MR BEASLEY: That ceased?

MR ALEXANDRA: That might be slightly out of date. Look, currently I'm a Consultant. I do work for various clients, including most recently the World Bank on the nature of intergovernmental cooperation in Australia. So I am very interested in this process as an example of how we cooperate, or Australian federalism, but - - -

MR BEASLEY: Are you still doing a PhD at the moment?

MR ALEXANDRA: I'm still doing a PhD at RMIT. So I'm currently enrolled in a social science PhD with the topic firmly about the nature of climate change and how it's influencing governance, using the Murray-Darling Basin process as my case study. So drawing on my five years in the Senior Executive role.

MR BEASLEY: All right. And from January 2008 to December 2008 you were employed by the Murray-Darling Basin Commission, as it then was, as Director of Water Policy?

MR ALEXANDRA: That's correct.

MR BEASLEY: And from January 2009 when the Basin Commission became the Basin Authority you are employed as the Senior Executive of Ecosystem Management and Natural Resource Manager.

MR ALEXANDRA: Yes. Look, the branch actually was given several names over that four year period, as is the want of government to reorganise things, but essentially I managed natural resource management programs that were upon a Basin scale and they involved either the large research cooperation that we had with other

agencies or the multi-government cooperation we had on matters like salinity, water quality, and ecosystem assessment.

MR BEASLEY: Right. Okay. And I think you said you know some of the ex-employees of the MDBA that have given evidence here, for example Mr Bell. Was he in a different group?

MR ALEXANDRA: He was in the Basin Planning group, but Maryanne Slattery worked in my group for several years. At one stage I think I had 72 people employees, so I had quite a large - - -

MR BEASLEY: In your group?

MR ALEXANDRA: In my branch.

MR BEASLEY: Right.

MR ALEXANDRA: And they were largely, if you like, technical and professional specialists in science and natural resource policy.

MR BEASLEY: All right. Can I take you to your statement first?

MR ALEXANDRA: Sure.

MR BEASLEY: I would take you firstly to paragraph 9 and beyond. You tell us in paragraph 9 that while you were at the Basin Authority you advocated unsuccessfully for a formula based approach to set the sustainable diversion limit, and you talk about five different stages of wet – sorry, very wet, wet, average dry and very dry as distinct from a sustainable diversion limit being set by a long term average. Correct?

MR ALEXANDRA: That's correct.

MR BEASLEY: And the Commissioner has heard evidence from other scientists criticising setting a sustainable diversion limit by means of a long term average, principally because of the huge – (1) the huge variability in rainfall and climatic conditions in the Basin, but two, because the modelling has been statistical modelling based on the previous from 1895 to 2009 which may be leaving out something very important, that is, projections for the future. Are they the reasons you were advocating for what you talked about in paragraph 9, or is it more detailed than that? Please tell us.

MR ALEXANDRA: They are – there's a number of different bases for this approach or proposal. Firstly, the reference you gave to the episodic dry and wet phases of the climate of the Basin – we have very good science now to show that decadal or longer periods of dry or wet are the characteristics of this place. So it's not an abnormality. It's the normal, if you like. The normal is huge variation. And that, therefore, we need - - -

MR BEASLEY: So talking about a mean is - - -

MR ALEXANDRA: Yes.

MR BEASLEY: Slightly silly. Sorry you go on.

MR ALEXANDRA: If you want to play with the statistics, if you took out the really big floods out of these figures, it changes them dramatically. Yet floodplains - - -

MR BEASLEY: If you take '56 and '74 out.

MR ALEXANDRA: Yes. Flood flows can't be managed. That's the nature of the floods. That's the wild unharvestable water that sits above the unmanaged water. And so the – I will go back to the Water Act. There is a clause 23, which says that the Authority has the right to develop the limit based on long term average, a formula or any other means that it sees as appropriate. So the question of what is appropriate – and I would like to backtrack here – the question of what kind of conceptual architecture is at the foundations of the Plan seem to me of central importance and deserving of very serious consideration before trying to get precisely accurate numbers. So the approach I was proposing – the approach I proposed unsuccessfully was to start articulating how something like a formula that was – that could be adjusted depending on the current conditions could be brought to bear on thinking about or formulating a sustainable diversion limit.

THE COMMISSIONER: Can I just ask this: the expression long term average, is, I gather, a term of art. Is that right?

MR ALEXANDRA: Art.

THE COMMISSIONER: Art. It's a technical term. Is it?

MR ALEXANDRA: It's – I think it has become accepted in the discipline of hydrology.

THE COMMISSIONER: That's what I mean. It's a term of the hydrological art.

MR ALEXANDRA: Yes.

THE COMMISSIONER: And the long term, I take it, refers depending on context to the available records.

MR ALEXANDRA: That's correct. And in the Basin, it's a hundred and – at the time, it was 114, 110 years, but there are some interesting stories about Chinese hydrology that might have records going back several thousand years.

THE COMMISSIONER: And "average", does average mean mean?

MR ALEXANDRA: Look, the specific – the statistical manipulation of these figures can be done in so many different ways. And in fact - - -

THE COMMISSIONER: That's why I'm asking.

MR ALEXANDRA: Yes.

THE COMMISSIONER: So does average, which is an English word, may have different range of meanings depending upon context, are you aware whether in the context of the Basin Plan average is understood to mean only what statisticians call a mean?

MR ALEXANDRA: No, I'm not.

THE COMMISSIONER: Does it also include median or what?

MR ALEXANDRA: I'm not aware of those – I don't want to go into an area that is not my area of expertise.

THE COMMISSIONER: Thanks. And you have referred in particular to the effect, paraphrased by you of subsection 23(2), which says that the long term average sustainable diversion limit may be specified as a particular quantity of water per year, which seems to be what, in fact, has happened, or as a formula or other method that may be used to calculate a quantity of water per year. For the life of me, I can't imagine what method could be used to calculate a quantity of water per year which would not also be a formula but anyhow. And then finally in any other way that the author – the Authority determines to be appropriate. So of the three possibilities, two are set by Parliament, and one may be determined by the Authority. You were inviting consideration within the Authority to the possibility of determining the kind of method - - -

MR ALEXANDRA: Correct.

THE COMMISSIONER: - - - you are in the course of explaining.

MR ALEXANDRA: Correct.

THE COMMISSIONER: So how would the way you were suggesting should be considered from differed from paragraph (b) which is a formula or other method that may be used to calculate a quantity of water per year?

MR ALEXANDRA: Because the – first of all, the imposition of the – even the period a year, is not – does not relate to these highly variable natural events of floods and droughts.

THE COMMISSIONER: Pretty much relates, doesn't it, to sowing and harvesting seasons?

MR ALEXANDRA: For annual crops.

THE COMMISSIONER: And indeed pretty much relates to flowering pollination and harvesting seasons for permanent crops, too.

MR ALEXANDRA: Sure. Sure. And the question of how water is allocated into a – what's known as a water year, you know, the water that's available in a dam and a certain amount is allocated to irrigators is done on an annual cycle, but the flows – the climatic events that come are not annualised as they are in other parts of the world.

THE COMMISSIONER: I take your point and I find no difficulty with the idea that a year, 365 days, 13 lunar months, is not very appropriate if you are looking at it from the point of view of what I'm going to call inflows.

MR ALEXANDRA: Yes.

THE COMMISSIONER: However, if you are talking about, if you like, industrialised consumption, and you are then talking about seasons, whether you count four or nine or whatever – I don't care, at the moment – the seasons as they are reflected in plant life, then there surely is something in at least incorporating an annual understanding.

MR ALEXANDRA: Yes, there is. No doubt it is one of the many useful ways, and all I was attempting to bring to bear on the consideration is the idea that if we segmented – call them those years or seasons into these different five – the quintiles of very wet to very dry, then the appropriate planning response could be triggered based on the contingency. So if it was very dry, but heading – becoming wetter, you would runs a different set of scenarios if it was wet but becoming dryer because there is a the southern Basin in particular – you have these – I will call them a reference point being how full or empty the dams are. So you have a number of different factors that determine these inflows and the available water. And if we are thinking about a planning framework that enables, if you like, security of supply to downstream users, to irrigators, to the environment, the conditions that the Basin is in, in the proceeding seasons years and decades has a big bearing on how much water becomes available.

THE COMMISSIONER: How much does this depend upon forecasting the weather, say, a year ahead?

MR ALEXANDRA: The seasonal forecasting, the SEACI research program which I think you will refer to later – we did work on seasonal forecasting trying to predict flows out to three months at a time which was quite successful, and the work that's been done on annual forecasting based on ocean conditions, has become quite – quite good, but still imperfect. But it is one factor that could be taken into account in terms rather than just relying on how much water is in the bucket or in the dams is what the conditions and many irrigators use those – in terms of a tactical response,

use those kind of forecasts. But the question here is planning out – I mean, my sense was that in the period leading up to the Basin Plan, we were being asked to develop a plan that had a horizon out to about 2030 or beyond. Because the Water Resource Plans – the statutory Water Resource Plans, most of them were not to be renewed until 2019, and the Basin Plan was to have effect really for a decade or more. So even though it will be revised or it can be revised - - -

THE COMMISSIONER: It may not be revised.

MR ALEXANDRA: It may not be revised. Yes. And that's another matter of concern to me, is that the first Basin Plan with the significant investment of Commonwealth money sets a precedent for how subsequent plans will be done. So I suspect it will be harder to incorporate reference to climate science and climate predictions in future plans because there was very limited reference to it, or it had little effect in the first Basin Plan.

MR BEASLEY: In other words you are concerned that by not incorporating into its modelling or its sustainable diversion limit determination, any aspect of future climate change projections a precedent has been set that you don't do that. Is that the - - -

MR ALEXANDRA: That's what I'm suggesting but also, again, your question related to the 114 a year climate record. A lot of climatologists were telling us that they picked up a distinct shift in the climate in the mid '90s. So they were talking about the period we were dealing with in the mid '90s. Now, some people say that was just - - -

MR BEASLEY: Now, the shift for the southern Basin is warmer. And therefore less run off.

MR ALEXANDRA: Warmer, and there is also a significant change in the seasonality of the rain. So even when we have had a return to wetter years, we are typically still getting dryer – call it cool season, but basically from mid-autumn to mid-spring, we get - - -

MR BEASLEY: Which is when you generally want it to rain, or the environment does.

MR ALEXANDRA: I think I have reference to something called the dam filling season just to describe it as the period in which southern Australia generates most of the run-off. And run-off events over most of southern Australia are quite rare – temporally rare. And so the run-off relies on the wetting up of the catchments through the autumn and early winter, and then saturated catchments and then the run-off to fill the dams. So the climate science is, from a water resource management point of view, is concerning. Is deeply concerning and needs to be taken, even if it's imperfect, it alerts us from a policy perspective to the significant risks. And

therefore to assume that the future will be – will be a repeat of the past is – I think is dangerous.

MR BEASLEY: Well, I want to come to that. Can I just – before I do, though, can I just ask you this question but set it up with this context: you have expressed in, I think, paragraphs 9 through to 16 of your statement the twin concerns of modelling for SDLs using only the past historical data, statistical data and also not incorporating future projections for climate change - - -

MR ALEXANDRA: Yes.

MR BEASLEY: And you've said you advocated for a different approach which you described in paragraph 10 as contingent planning. One of the reasons I take for taking that approach is that – amongst many reasons you might take that approach is that it also helps deal with the situation where the climate actually changes more rapidly than is predicted. For example, to give an example, we have heard evidence about fairly rapid change in rainfall reduction in Perth from the mid 1970s.

MR ALEXANDRA: Yes. So the south west WA step change is brought out as the exemplar of this kind of change. And the significant – it's well documented because it is Perth's water supply, and it is an exemplar of the small reduction in average rainfall equalling a large reduction in run off. And it is – we refer to it as a fourfold amplification. Now, whether you get the same effect in the alpine conditions of south eastern Australia, is still open to some interpretation. We may in fact have a bigger effect because we have denser forests up there and I elude to that later in the submission. So these are not just simple linear equations where a reduction in rainfall equals the same reduction in run-off, because it is mediated through complex catchment – the eco-hydrology of the catchment. It depends on what grows there, how it responds.

And so for example I referred to the need for a SEACI phase three. One of the issues I was very keen to get sorted was if we are getting average higher temperatures during the daytime through the growing season, will that mean the eucalypt forests that are the sources of these rivers transpire a higher rate of water through spring and autumn, and if they do they might shrink stream flow, even if there is the same amount of rain. So there is these complex interrelationships. I don't want to make it sound like it is too complex, but the truth is I felt we were getting to the boundaries of the known science about how the climate interacts with these catchments.

MR BEASLEY: The other concern, if you just look at statistics in relation to climate change, is that whilst a – and I'm thinking of the sustainable yields project first, before I come to work you did on SEACI, but the Sustainable Yields Project by CSIRO in 2008 where it had projections for increases in average temperatures to 2030 and 2070, that the real – the – at least as important, perhaps more important, is the increases to extremes that's caused by climate change. So it's one thing to say the average temperature might increase one to two degrees by 2030 or slightly more

by 2050 or 2070, but there is a big difference for crops for having five days in a row of over 40 degrees to having 10 days in a row over 45 degrees.

MR ALEXANDRA: Yes. And there's a big impact in terms of the potential for bushfires and the changing the hydrology of the subalpine and alpine forests, and so forth. So it's these interactions between the hydrology, the way the catchment functions, and the way the climate is shifting that need to be taken into account.

MR BEASLEY: All right. Having set that context, can I ask you where you say in paragraph 9 that you advocated internally unsuccessfully for a different approach? Who were you advocating to and what was the nature of the discussion and what was the reason for you being unsuccessful?

MR ALEXANDRA: Right. I will start with the first part of the question. I was advocating to my fellow executives and to, if you like, the managers that worked for us. What was the nature of the discussion? Well, it was normally with a big whiteboard, sketching out this conceptual view so I was going to come back to the question. The long term average is a bit like looking at all the stats and envisaging water in the Basin as a kind of bucket and say in this average there is this much water and now we are going to work out how we are going to share it out. This share, this share, this share.

Whereas I was suggesting the bucket is not a useful starting point, and it's better to have these – whatever you want to call them – these quintiles, which we then adjust. So if we're in – as I was saying before, if we were in the median condition, as it starts to look like it is getting drier, there may be a different set of rules for how water is allocated as if it is getting wetter. If it is extremely wet and all the dams are very full, there may be a set of rules or ways of running those rivers to relieve some of that water, and make more room in the dams for the expected inflow. So it's becoming – it's a much more adaptive approach to it. So - - -

THE COMMISSIONER: You choose a five year period.

MR ALEXANDRA: Quintiles in terms of statistically five phases, if you like, and then allow – basically as the information comes in, to determine - - -

THE COMMISSIONER: But it's a quintile – that is, a fraction of what? The historical experience?

MR ALEXANDRA: Yes. The averages, if you like, from very wet to very dry. Anyway, back to your next question, why do I think I was unsuccessful? I think I was unsuccessful in proposing lots of different – or the consideration of different approaches partly because of the nature of the process, not – I don't want to personalise it, but in your documents you have reference to the PR campaigns and so on. Over the various phases of the Basin Planning from the earliest "read the Water Act; what are we required to do?" through to responding to various drafts if you

like, there was a sense of it being a fairly chaotic process. That was responding to - - -

MR BEASLEY: Preparing the Plan was a chaotic process?

MR ALEXANDRA: Preparing the Plan was a chaotic process. It was responding to external pressures as well as legislative requirements.

MR BEASLEY: External pressures being what, people burning the Guide?

MR ALEXANDRA: Yes. I think once it got to the people burning the books it became clear it was a very highly politicised – and there was a well-orchestrated anti-Plan campaign. So there was a sense of each step being scrutinised very heavily externally.

MR BEASLEY: Can I ask you this: the Guide provided some adjustment to the proposed - - -

MR ALEXANDRA: Correct.

MR BEASLEY: - - - sustainable diversion limit for climate change of, I think, 3 per cent.

MR ALEXANDRA: Yes.

MR BEASLEY: And I think that three per cent figure was chosen because they felt that that was – I think they said that's a reasonable figure to use for the short term.

MR ALEXANDRA: It's also - - -

MR BEASLEY: Until we get to readjust again ..... Sorry. You wanted to say something?

MR ALEXANDRA: Well, it is also the figure if we go to clauses 48 to 50 of the NWI. There's provision for a 3 per cent adjustment without compensation and without, if you like, proof of any further burden of proof.

MR BEASLEY: That might be – we will come to those clauses.

MR ALEXANDRA: So - - -

MR BEASLEY: That might be another reason.

MR ALEXANDRA: So 3 per cent sounds like a pretty - - -

MR BEASLEY: Yes. All right.

MR ALEXANDRA: If you like, a relatively simple figure to put in as the first adjustment, and as you said, and then to enable future adjustments should the evidence become firmer.

MR BEASLEY: Now, the Guide also – and I know there was a change in the modelling, a not very well explained change to the modelling between the Guide and the ESLT report, which you would be familiar with. Correct? You have to say yes rather than nod yes.

MR ALEXANDRA: Yes. Sorry.

MR BEASLEY: That's all right.

MR ALEXANDRA: Can I just make one other reference here?

MR BEASLEY: Go ahead. Please don't hesitate. If there is something important to say, chip in. I won't be – I only get upset if the Commissioner interrupts me. I won't get upset if you do.

MR ALEXANDRA: Right. In 2008, when the CSIRO Sustainable Yields report came out the Commonwealth Government had paid – and I think from memory several million dollars to CSIRO to have that work done, and up until then there wasn't – there wasn't that kind of comprehensive modelling, standardised modelling for the basin. And I was asked by the then Chief Executive, Wendy Craik, if I would help get negotiation between the Commonwealth Department of Environment - - -

MR BEASLEY: Sorry. Ms Craik was the Chief Executive of the Basin Commission at the time?

MR ALEXANDRA: The Commission.

MR BEASLEY: Right.

MR ALEXANDRA: Commission.

MR BEASLEY: Yes.

MR ALEXANDRA: If I would help – start the process of negotiating the transfer of the sustainable yields modelling platform to the Authority to be jointly owned and used by the Authority. And that proved to be very difficult, as often intergovernmental discussions are. And I got that process started but we did not end up using it, although Bill Young, who was one of the chief modellers, was brought over on secondment for a while to help with modelling inside the Basin. The other thing that - - -

MR BEASLEY: One of the modellers for the Sustainable Yields Project? Right.

MR ALEXANDRA: Yes. For the CSIRO Sustainable Yields Project.

MR BEASLEY: Yes. Yes.

MR ALEXANDRA: And so the – the question – modelling is not my area of professional expertise - - -

MR BEASLEY: Yes. No.

MR ALEXANDRA: But the question of how to use the best available models and how to, if you like, set them up with the right questions, is critically important. And I have made this clear in my report to you, and my evidence, that the modelling that was relied on did not incorporate any of the climate projections.

MR BEASLEY: Sure, yes.

MR ALEXANDRA: Right. So it seems to me that this is a flawed – just from a standard risk management approach, if the climate is – if the science is so - - -

MR BEASLEY: It might actually be ignoring perhaps the most important thing that should be taken into account, in terms of a plan that is planning for the future. Correct?

MR ALEXANDRA: I wouldn't want to overemphasise it and say it is the most important thing. I'm just saying that - - -

MR BEASLEY: A very important thing.

MR ALEXANDRA: Good practice in terms of risk management and the Water Act is very clear about the requirement for a risk based approach, the science is fairly, I would say, emphatic that there is a high probability of drying. And so to project forward - - -

MR BEASLEY: Well, it's getting warmer, isn't it? We don't know how much it will get warmer by, but we know it's going to get warmer and therefore unless there is an increase in rainfall there will be less run off, correct? That's almost certain.

MR ALEXANDRA: Can I get into the three - - -

MR BEASLEY: Do you agree with that, though?

MR ALEXANDRA: I do agree with that. To the three dimensions of climate science I think that it's important. There are the observations, and they are undeniable. It is getting warmer. There does appear to be a significant shift from cool season rain to wetter season rain over much of southern Australia. These are observations. We don't need to argue that. Then there is the modelling, which are

driven by big, you know, mathematical laws of physics, create these global – the climate model – has been a huge global effort, and then project forward.

So we rely on a lot of those climate models to anticipate the likely effects of the change in this part of the world, and those climate models have a clear consensus or clear majority that says this is likely to get drier, and it is particularly this – as in the southern Basin, or the Basin – and it is particularly – there is a very, very strong consensus as in about 80 or 90 per cent of the models that say it will get drier in the cooler months. Right? So they are – that's a very strong thing. And then there is a third dimension of the climate science, and that's – let's call it the theoretical understanding. So what causes what? And in the work that SEACI did, we believe that when you put those three, the observations, the models, and the theory together, you have a very strong alignment or multiple lines of evidence that this drying trend is pronounced, and is likely to continue.

MR BEASLEY: Now, if – sorry, not if – the Water Act commands the Basin Authority to act on – act on – the best available scientific knowledge.

MR ALEXANDRA: Yes, this is - - -

MR BEASLEY: What you are just describing in terms of the research on climate change is the best available scientific knowledge, correct?

MR ALEXANDRA: Correct. But - - -

MR BEASLEY: And – and – sorry? You wanted – you have got a "but"?

MR ALEXANDRA: Well, but even with the best available science there are degrees of uncertainty.

MR BEASLEY: Of course.

MR ALEXANDRA: So everything to do with the future has uncertainty.

MR BEASLEY: Yes.

MR ALEXANDRA: So the key skill in terms of being requested to prepare a plan for something as big and complex as the Murray-Darling Basin into the future is to come to terms with the nature of that risk and the nature of the uncertainty and still develop something that is meaningful under the range of probabilities.

THE COMMISSIONER: Well, unless you do so, you would not be taking into account the principles of ecologically sustainable development as they are explained in the statute, because the statute, using some rather odd language, says that if there are threats of serious or irreversible environmental damage, lack of scientific certainty shouldn't be used as a reason for postponing measures to prevent environmental degradation.

MR ALEXANDRA: That's correct.

THE COMMISSIONER: So if you put all of those matters together, including in the way you have described, as Counsel Assisting has suggested to you, it seems quite unjustifiable to leave an appreciation of climate change however that strikes the decision maker, out of the exercise of setting an SDL. Isn't that right?

MR ALEXANDRA: That's correct. It's the – I think the Act – I mean, I see you have a very well-thumbed copy of Act. I likewise had several of them.

MR BEASLEY: We both sleep with it.

MR ALEXANDRA: Yes. Marked up and all the rest of it. But it is very clear the Act says – I wrote this to you this morning – under the Water Act, the Basin Plan is required to assess risks and prepare for climate change. The Act ushered in a new regime of planning for the Basin, requiring a plan based on the best available scientific and socio-economic assessment.

THE COMMISSIONER: We are familiar with those propositions, believe me. Can I ask you just – I'm trying to get an understanding of your recollections of your work. This ultimately unsuccessful internal advocacy for what you call a formula based approach, was proceeding before the Basin Plan fixed 2,750 gigalitres as the - - -

MR ALEXANDRA: Yes.

THE COMMISSIONER: - - - determined recovery from the baseline diversion in order to produce a sustainable diversion limit. Is that correct?

MR ALEXANDRA: That's correct.

THE COMMISSIONER: Now, did – were you involved in any way in the process by which the figure of 2,750 was reached?

MR ALEXANDRA: Not directly. Only to the extent that my staff specialists were sometimes involved, for example, in assessing the salinity benefits or consequences of different model runs. So the Basin Planning division and the modellers who were working on the Basin Plan were in a separate division. So they weren't under my direct supervision.

THE COMMISSIONER: So you can't respond – you can't provide anything in answer to my question how was the figure 2,750 reached?

MR ALEXANDRA: No.

THE COMMISSIONER: Thank you.

MR ALEXANDRA: No. Just to be clear about that, there's the – my experience was that there was a lot of Basin planning, I will call them policy decisions being taken by the board, and with the support of the executive group and the Basin planning division and my division was, if you like, to one side of that process.

THE COMMISSIONER: Yes.

MR ALEXANDRA: And so we were involved in, for example, in reviewing early drafts of the Basin Plan, or I – as early as 2008 I was involved with – in discussions how we would set up the process of enabling the Basin Plan to be prepared under the Water Act once it became the authority. But once we got into that end of the process I wasn't involved in those discussions.

THE COMMISSIONER: Thanks.

MR ALEXANDRA: Can I just add though, that I think it's – apart from the proposal for contingency planning, it would have been quite – not that difficult to incorporate model runs that included scaled down climate change. And that indeed is what CSIRO had been doing from 2008 with the Sustainable Yields Project. So there is modelling capability and there is experience in bringing a range of probabilities, a range of different climate scenarios to the hydrological modelling in the Basin.

MR BEASLEY: All right. Forget the Water Act – we won't forget the Water Act but let's forget it for a moment and the fact that the law requires the Authority to act on the best available science. Just put that aside and let's move back just to common sense or good planning.

MR ALEXANDRA: Yes.

MR BEASLEY: You said you know Professor Andy Pitman who gave evidence last week. I put to him – again leaving aside lawful requirements – that not incorporating climate change projections into the setting of a sustainable diversion limit or whatever was madness. That was my word. He wasn't quite so rash in his response, but he talked of the principle of stationarity. Is that – is that something you are familiar with?

MR ALEXANDRA: Yes.

MR BEASLEY: And then he said this:

> *So the science around temperature changes, the consequence of that on evaporation, the consequence of emerging new environments around heatwaves for example, the change in seasonality of the climate, warmer, clearer, dryer winter for instance, these things are really robust in the science and to not take those into account doesn't make any sense to me.*

Now, is that a proposition in terms of both its – the facts he's talking about and the fact that not taking those things into account doesn't make any sense. Is that a view you share?

MR ALEXANDRA: I share all of those concerns and I also share, being a fairly moderate kind of person, I don't think it's madness, I just think it's a serious oversight but it perhaps could be regarded as negligence from a public policy point of view. Because the – as I was saying before, the observations, so let's not get involved in speculation. For example take Andy's last comment - - -

MR BEASLEY: When you say negligence I want you to tell the Commissioner why you consider it negligent.

MR ALEXANDRA: Well, you ask me – we're not talking in a legal sense, in a common sense sense. So here we have got to deal with a – I will call it a large public asset called the rivers of the Murray-Darling Basin and we're trying to plan for them into the future and we've been asked to prepare for risk. What are the risks for this system and to, if you like, the sustainable enjoyment or productivity of it for the nation and the very good scientists are telling us there is this big thing called climate risk. Now, even with a range of uncertainties, to ignore that climate risk is in my view negligent from a public policy point of view. The fact that the science is fairly emphatic makes it even more concerning that it was kind of written out of the process.

And in the paper called 'Climate Confusion in the Murray-Darling Basin Reforms', I speculate on the motivations as to why it was written out of the process or not given due regard. So – but I do want to come back to this, the – I want to support the statement that you just read out from Andy, just take this question of what's the observations of increased aridity. The winters are getting dryer and colder. You can go on the BOM website and look at the change over the decades and it is not – it is not a speculative thing, it's based on observation after observation. And so the question from a planning point of view is what – how do we take – there is a range of probable futures, how do we take these into account and how do we build a plan which is robust under these different risk scenarios. Now, I bet you that you, if you own a house, you have insurance against it burning down. I bet if you were asked if you thought it would burn down you would say probably not. Right, so when – we are all in the business of dealing with risk about the future.

MR BEASLEY: I love candles in the house so there is probably a high risk. Go on.

THE COMMISSIONER: Can I ask in the 'Risks Uncertainty and Climate Confusion' paper, you quote, as indeed you do in your statement for this Commission, from the MDBA Proposed Basin Plan Consultation Report

MR BEASLEY: It is tab 6.

THE COMMISSIONER: Yes. MDBA 59/12, and this is at tab 6 of the folder before you at page 5, you see at the foot of that page you quote from the 2012, if you like, determination on this question. The – it may not be quite fair to say that the MDBA has ignored climate change, it may be that they have, however, done something either as bad or worse, namely the way they took account of it was to decide that it would have no effect on their determination. So it's not as if they have not given any thought to it. They have given thought to it and said "But it doesn't change the approach we would take". They seem to do that on the basis that what they call forecasts, perhaps projections, posit magnitude of change that lies within the 110 year plus range that has been produced by the extreme variability of the climate.

MR ALEXANDRA: Yes.

THE COMMISSIONER: They can't possibly be saying, can they, that that means no change is occurring. Rather they are saying, I assume, that means and medians will increase as to temperature, increase as to evaporation, reduce as to inflows. But all within the very wide historically observable range.

MR ALEXANDRA: Yes.

THE COMMISSIONER: So if it's the latter then that – that accepts that there is climate change and of a kind that is, if I may say so, to humans, if not to other biota, devastating. Increase of – the increase of mean and median temperature and evaporation accompanied by a decrease in mean and median inflows is correctly summed up as drying but it is a very serious state of affairs. I think that's what you have been writing about. Is that correct?

MR ALEXANDRA: That's correct.

THE COMMISSIONER: So am I right, that in a sense is the central thesis of 'Risks, Uncertainty and Climate Confusion' as a paper?

MR ALEXANDRA: It is. But I would like to pick up on something – I tend to agree with you that climate change was not ignored and in fact in the Basin Plan and the reference documents it is actually deferred to dozens maybe hundreds of times. The central thing that I'm stating is that taking account of climate change, as you mentioned, taking it into account in terms of the total projected water available into the future was deemed to be too uncertain. So it wasn't ignored there, was a decision taken to, if you like, discount that risk probability. And I just wanted to - - -

MR BEASLEY: Just pause there. I want you to continue with the answer to the Commissioner's question but I want to understand how this change occurred. In the same paper at the bottom of page 3, you have quoted Senator Wong at 2008 by which time you were at the Commission saying the Plan:

... enables the national interest to be put first by providing SDL deals on water use taking account of future climate change and addressing a legacy of past over-allocation in the Basin. For the first time ever we will have enforceable scientifically informed limits on the amount of water that can be taken out of our rivers. It is extremely important (a) that the science is for the first time actually going to drive the SDLs and (b) that the Authority's approach will reflect the recognition by this government that we have to confront the future of climate change.

Now, that seems to be the then, I think, Water Minister saying the Water Act is going to be followed.

THE COMMISSIONER: You've nodded. You have quoted that because you regard it as, what, an interesting historical cameo of what might have been?

MR ALEXANDRA: No. I'm quoting it because it's the second reading speech for the amendments and the Minister is making it clear what the policy intent of the Water Act is.

THE COMMISSIONER: I'm sorry, as a lawyer I understand that. But you've selected that. Of all the material you could have selected from the second reading speech or any other speech because you regard that as, what, a neat statement of what was intended but has not happened?

MR ALEXANDRA: This statement makes it clear that the intention of the Basin Plan, particularly the SDL, would be to prepare for climate change and deal with the legacy of over-allocation. But in the subsequent years - - -

THE COMMISSIONER: But what you're telling me is it hasn't happened.

MR ALEXANDRA: In the subsequent years the focus became almost entirely on the numeric determination of the SDL, and of dealing with that historic over-allocation. So it became a debate about how much water the environment deserved versus how much water should be retained by extractive licence-holders. And the concern I have, and I want to come to your – back to your question – if we – pity there isn't a whiteboard but I will do it with my hands – if we take this 114 year record as doing that very, you know, episodic like that diagram shows, we then statistically derive an average and project that forward. With – with that variation, the magnitude of that variation tells you how wet or dry it gets.

The average, as a projection, tells you what is likely to occur without climate change and then a range of probabilities from the present are either increased water availability due to climate change, continuation of the present or decrease. And the – the concern – the basis of my concern as being in a role as a senior executive in a government implementing policy is that the scientific advice about that projection was not divided, there was a very strong scientific consensus and in fact indeed explicit advice from the scientists when they were asked to say it would be prudent to

plan from this range of scenarios including the worst case scenario which was the continuation of the Millennium Drought. So even greater than the projected climate change.

THE COMMISSIONER: You draw to attention again on page 5 of your 'Risks Uncertainty and Climate Confusion' paper, to the 2012 MDBA post-Guide conclusion that:

> *There was considerable uncertainty regarding the potential effects of climate change, more knowledge was needed to make what they called robust water planning and policy decisions that includes some quantified allowance for climate change. Until there was greater certainty the Authority considered that the historical climate record remains the most climate benchmark for planning purposes.*

MR ALEXANDRA: Yes.

THE COMMISSIONER: Now, you've drawn that to attention because that is an approach that you argue was fundamentally misconceived in this paper. Is that right?

MR ALEXANDRA: I'm not saying it is fundamentally misconceived.

THE COMMISSIONER: Is it misconceived?

MR ALEXANDRA: No. I'm saying this provides evidence of the way in which when there are policy decisions to be taken, certain science and certain disciplines are relied on more heavily than others. To argue that the climate projections, climate predictions are deeply uncertain, whereas the historical hydrological record provides certainty, that's saying that the hydrological science is more reliable than the climate science. So that then comes down to a value judgment, if you like. A proposition of what is it that is inherently in the nature of good planning practice or poor planning practice. How do we deal with questions of risk and uncertainty? That's what I was trying to allude to.

So I'm prepared to accept that that statement and indeed that report, which is a report on the modelling is explained in the methods were used and the decisions that were taken. Regardless of that, I personally have deep concerns that it is inadequate – an inadequate approach for dealing with what appears to be a substantial, if you like, a real risk that we confront in managing this Basin.

THE COMMISSIONER: That's what you call negligent.

MR ALEXANDRA: That's what I call negligent. To leave aside - - -

THE COMMISSIONER: It is the end of stationarity, according to Professor Pitman. The idea that you can, as one might in some areas of life, treat past experience as the best indication of the future has been exploded in relation to climate because of the,

as you say very strongly established consensus it is changing and it will continue to change. Have I captured that correctly?

MR ALEXANDRA: It's the term that is used in literature is the death of stationarity. So for a long time hydrology as a discipline from working out how big the drains should be alongside this building to whatever has - - -

THE COMMISSIONER: It is proceeded by what's happened in the past, what do I need to accommodate?

MR ALEXANDRA: Yes. And you will have heard reference to the probability of a 100 year flood, etcetera, etcetera. That's all coming out of that – out of a stationary model of the climate, and yes, to say it has been exploded, whatever term you want to give it, we really – it's a bit like the caveats on financial investment, you know, the past is no guide to the future – future performance. Except for in something as big and complex as the climate systems and the rivers in the Murray-Darling Basin, the 114 year past first of all may be atypical even in the Paleo record and we have evidence of much longer droughts. I have a colleague who has worked – he thinks that there was a 50 year drought that makes the Millennium Drought look like a baby. So that's the past. So we have got the deeper past to look at reconstructing as well.

THE COMMISSIONER: Well, I realise that the statute in section 4 uses a very unfortunate expression "lack of full scientific certainty", and I emphasise the word "full", but it does seem to me that it's questionable that it was proper to refer to a need for greater certainty as a reason for the Authority to decide that the historical climate record was the most useful climate benchmark for planning, that is, into the future. That is, by the time that was being decided in 2012, one thing was clear was it was not going to be the same as the history showed. If there is one thing you knew, amidst all the uncertainty, was it was not going to be the same.

MR BEASLEY: There wouldn't be one large institution, particularly financial institution that isn't planning for climate change.

THE COMMISSIONER: The MDBA, I'm sure, would consider that it has taken it into account but it has taken it into account by saying - - -

MR BEASLEY: It's a risk.

THE COMMISSIONER: - - - we are going to proceed as if history is the most useful climate benchmark for the future.

MR ALEXANDRA: Yes.

THE COMMISSIONER: And that is not the death of stationarity that is the triumph of stationarity.

MR ALEXANDRA: Yes.

THE COMMISSIONER: That's why I put to you earlier – and please don't adopt words because I put them to you, I want to know your reaction to them. That's why I put to you earlier that it was misconceived and fundamentally so. Because they are obliged under their Act to proceed to deal with threats that may materialise in the future notwithstanding there is a lack of what's called full scientific certainty.

MR ALEXANDRA: Yes. That's what I was responding to the question about a common sense approach. I mean, my view is that it's – it's front and centre, if you like, on the radar with the scientific community saying this is a real risk. This is not – you know, you can't – you can't really - - -

MR BEASLEY: I said financial. I can bet you London to a brick that underwriters in insurance companies that are writing policies for storm damage etcetera, are not ignoring climate change.

MR ALEXANDRA: I think I quoted some of them in 2012 in a paper I wrote on climate change. So – because, yes, like Swiss Re, the very big insurance, they are tracking the number of large storm events and things that are determining their payout and of course they are concerned about it. So – and I even referred to the Victorian Government Department of Sustainability and Environment, I think it is 2008 or 2009, Northern Sustainable Water Strategy, that used a range of climate scenarios and tried to plan irrigation water rights, water planning for northern Victoria under a range of climate scenarios. So it was, if you like, becoming accepted practice in Australia at the time. So one jurisdiction in the Basin was already using this approach.

MR BEASLEY: So what happened? You got Senator Wong's quote from 2008. We have got the Guide that incorporates climate change projections to some degree, and then you have got at least in terms of – in volumetric terms ignored by the time you get to the ESLT report. What – I know you have said how it was explained.

MR ALEXANDRA: Yes.

MR BEASLEY: But who made the decision and why?

MR ALEXANDRA: Right. I want to make it clear I was not privy to any internal consideration.

MR BEASLEY: All right. If you don't know, you don't know.

THE COMMISSIONER: We will find such explanation as there is officially in the publications, including the 2012 publication that you have quoted from.

MR ALEXANDRA: Yes. But that's how I find it. But I have also in that paper – later in the paper, I have speculated on several pertinent or possible motivations for ignoring it. So - - -

THE COMMISSIONER: What about this: that it's a discrete topic in relation to which there could be a reduction in the amount to be recovered for the environment on the grounds of so-called uncertainty as part of an overall exercise to reduce it as much as possible to placate the political opponents of the Plan?

MR ALEXANDRA: That's not unlike what I wrote in that paper. That indeed if you look at it, the – and those – I sent earlier the ones on the – the fact there was a substantive anti-plan PR campaign, burning of books, a lot of television and so on - - -

MR BEASLEY: This is you saying, on page 13:

> *The government may have decided it did not want water reforms embroiled in the political hostile debate occurring.*

MR ALEXANDRA: Yes. There was already – there was two hostile debates going, if you like. There is one on the Basin Plan - - -

MR BEASLEY: One on climate change.

MR ALEXANDRA: - - - and one on climate change. And if you put the two together, it will be an unholy mess.

THE COMMISSIONER: Leave it – I'm going to it leave it aside. It's not worthy of much time in this hearing – or any hearing – people who say there is no evidence for so-called climate change.

MR ALEXANDRA: Yes.

THE COMMISSIONER: I'm more interested in people who opposed the Basin Plan because – I'm trying not to ascribe motivation, but it may be inferred – because it would involve reduction in consumptive use, particularly for irrigation. Now, as you recall it – and you obviously have been through processes of recalling and reviewing it in your publications – was the – that opposition, did it take the form of maintaining that there should be greater consumptive use for irrigation, that it should remain the same as had been already reached or there should be some reduction but just not so much as the guide proposed?

MR ALEXANDRA: I think it was mostly the latter. So I think it was - - -

THE COMMISSIONER: Mostly the last. Some reduction - - -

MR ALEXANDRA: Some reduction - - -

THE COMMISSIONER: - - - but not too much.

MR ALEXANDRA: - - - but not too much. So minimise the impact and I do believe there is a deeply ingrained, if you like, ideological commitment to irrigation as the source of wealth as it is in South Australia and all along the Murray and the Murrumbidgee I should put on the record, I run a farm and I irrigate perennial crops and it's one of the most valuable things and I am not opposed to irrigation.

But I also, early in the piece, asked earlier in the piece to help coordinate the economic assessment and brought together a bunch of the prominent economists and we proposed that – this is in 2008 – that the starting position for the economics assessment should be that almost the – that you could take about 20 or 30 per cent of the water and have minimal economic impact because there was so much potential for improvement in efficiency but also improve – as in water use efficiency – but also shift to higher value crops. So about 20 per cent of the water volume that's used in the Basin produces about 80 per cent of the economic wealth.

So there is a whole range of reasons why you would have that kind of ideological opposition, but my sense of it was that it became a well-orchestrated campaign and those documents – I think they are at 10 and 11 – give some indication – or they might be at 9 and 10 – some indication of the nature of the campaign and that became quite ferocious, if you like, and it is not a problem to me. I think that's the nature of policy.

MR BEASLEY: This is SOCOM you are talking about.

MR ALEXANDRA: SOCOM. So you had big PR firms engaged by the local governments of the Basin to try to stir it up, if you like. And good public policy progresses through contest of ideas, so let's not pretend there is a contest of ideas. But in that process you had the Water Act requiring something based on, if you like, a technical scientific assessment, and at the same time, very heated policy debate going on as to what number was going to – and this – what became a big focus, almost the exclusion of other concerns, was this number, as if it was going to be the magic determinant of who or what would get done in the future.

THE COMMISSIONER: Yes. I haven't seen much trace of a true clash of ideas or policy difference in relation to the concept that the sustainable diversion limits should reflect an environmentally sustainable level of take defined as one above which what I call environmental values are compromised. I haven't heard anybody or, indeed, read anybody saying, in effect, "Yes, let's compromise the environment values of the Murray-Darling."

MR ALEXANDRA: Nobody. I mean, I - - -

THE COMMISSIONER: That may be a motherhood point. It's like asking people to vote against motherhood. But isn't that important, that if that is a motherhood idea, as Senator Wong said, well, then the scientists come in and tell us from time to

time, no doubt after their own very important and, I hope, continuing debates and differences, they tell us what that amount should be. Is there something wrong with that as an approach, in your experience of this?

MR ALEXANDRA: I don't think there is something wrong with it, but I think it underestimates the nature of the way in which these decisions are not in the technical realm but in the social – they are socially and politically driven.

THE COMMISSIONER: I have just got a glimmer of that, yes.

MR BEASLEY: So radio shock jocks as you say - - -

THE COMMISSIONER: I do understand that.

MR BEASLEY: - - - on page 13 are responsible for climate change, not being incorporated into the Basin Plan. I'm not even saying that flippantly. It's probably true.

MR ALEXANDRA: Well, you know, I think the idea of there being – somewhere out there, using natural sciences – there's an ideal amount of water to put into these rivers. It could be everything from 100 per cent of the water through to a very significant percentage of it. But that tends to underestimate the fact that it's a socially negotiated answer as to what state we want these rivers to be in. And I think you can start with the view that after 100 years of irrigation development, too much water was being taken out of the greater Murray-Darling system. You know, so I think there is a consensus there - - -

THE COMMISSIONER: Well, the social negotiation produced the Water Act - - -

MR ALEXANDRA: It did. Yes.

THE COMMISSIONER: Which produced the legislated fact that you have just referred to.

MR ALEXANDRA: Which then produced the Plan.

THE COMMISSIONER: That's right. So the compromise produces the statute and the compromise, in effect, says, "There will be irrigation but not too much." And how – what is too much? The level at which you compromise the environmental value – whatever "compromise" means which, itself, is arguable, of course.

MR ALEXANDRA: Yes. But, you know, then again there is varying degrees of, if you like, degradation – apparent degradation of the river systems, whether it's in the nature of the salt that's – the salt load that's in the South Australian section; whether it is in the state of the wetlands; whether they're meeting the RAMSAR provisions, etcetera, etcetera. So I think we can get - - -

MR BEASLEY: Well, enforcing our – sorry, complying with our international obligations is an important part of all of this too, yes.

THE COMMISSIONER: It's difficult to see how that could be done on anything other than the best available science. Otherwise, you are not really setting about the subject matter with tools appropriate to the subject matter.

MR ALEXANDRA: Well, would you get a jumbo jet designed by public consultation or would you go to the aeronautic engineers?

THE COMMISSIONER: I wouldn't want to hesitate too long in answering that.

MR ALEXANDRA: Yes. I think – well, I guess I'm agreeing with you. The – something like the rivers of the Murray-Darling Basin – leaving aside anything like climate change – just, "What is the nature of these rivers? How do we understand them?" First of all, in my experience, there are no other rivers like them in the world. So unless Australia drops its own understanding and its own way of caring for them and managing them, we're not going to get it from anywhere else.

So there's already a unique challenge. They are large; they are complex; the scientific understanding is incomplete, as in we are still progressing down the route and we know that they are full of unique biodiversity, etcetera. So I think we start with that point – that the – coming to terms with how we understand them as a riverine – set of riverine ecosystems is incredibly important and it underpins good public policy in this country.

THE COMMISSIONER: Now, can I - - -

MR BEASLEY: So it is rocket science.

THE COMMISSIONER: Yes.

MR ALEXANDRA: It's harder than rocket science.

THE COMMISSIONER: Can I ask if - - -

MR BEASLEY: That's what the Commissioner made – point the other day with Professor Pitman.

THE COMMISSIONER: Could Mr Alexandra just be shown the Basin Plan, please – unless it's already there.

MR ALEXANDRA: Thank you.

THE COMMISSIONER: If you've got the same print as I have, 3 July this year, if you turn to page 21.

MR ALEXANDRA: Chapter four?

THE COMMISSIONER: Yes, the beginning of chapter four. So that page - - -

MR ALEXANDRA: Yes.

THE COMMISSIONER: - - - it sets out what's laughably called a simplified outline of the chapter.

MR ALEXANDRA: Yes.

THE COMMISSIONER: And the next page and a half or page and two-thirds is the chapter.

MR ALEXANDRA: Yes.

THE COMMISSIONER: And this responds to items 3 and 6 of the table in section 22 of the Act which compels certain content in the plan. 4.02 thus identifies the risks arising from matters including climate change, and the – I have to say the fatuity of it is really breathtaking:

> *Insufficient water available for the environment, and poor health of water dependant ecosystems.*

That must have come as a dazzling insight:

> *The consequences of the risk materialising would be that insufficient water is available –*

etcetera. Again, I have to say one wonders why printer's ink is being wasted on it, but then we go to what lots of people might think, "Well, don't worry about that. Look at what they're going to do to manage or address the risks." That's 4.03. So this is, now, what the water plan promulgates to address matters including – not confined to, but including climate change, and when you see that – 4.03(2) compels the Authority to have regard to these strategies when undertaking its functions. Its functions, of course, by now are looking beyond the fixing of 2,750 gigalitres recovery for the environment, but does involve proposing adjustments.

And so the strategies start by what is – it seems to be bordering on the rise-able, namely to implement the Basin Plan – well, it's required to implement the Basin Plan; that's the law. And then to develop Water Resource Plans – well, it has to do that as well. Based on best available knowledge, it has to do that under the Act and in consultation with relevant stakeholders, it has to do that under the Act. So, so far, the strategies are obey the law.

MR ALEXANDRA: Yes.

THE COMMISSIONER: Then we come to one which picks up something you've been telling me about: promoting a risk based approach to water resource planning and management.

MR ALEXANDRA: Yes.

THE COMMISSIONER: Risk is about contingencies or chances in the future, aren't they? Once something has happened, there is no longer a risk.

MR ALEXANDRA: Or the risk is known. Yes.

THE COMMISSIONER: It has materialised.

MR ALEXANDRA: The – the hazard, if you like.

THE COMMISSIONER: There is no longer a chance or a probability, it has either occurred or not.

MR ALEXANDRA: Yes.

THE COMMISSIONER: So it's all about future, a risk of those - - -

MR ALEXANDRA: Yes.

THE COMMISSIONER: And it's clear that the statute has required – as part of this social negotiation, it has required climate change to be one of the matters to be taken into account.

MR ALEXANDRA: Yes.

THE COMMISSIONER: And so the strategy is to promote a risk-based approach. That seems to be just a paraphrase for what the Act already said, you have got to take that into account, anyhow. So the next one is (d):

> *To manage flows to optimise outcomes across the range of water uses in the Murray-Darling Basin.*

The Act already requires that in two or three different places.

MR ALEXANDRA: Yes.

THE COMMISSIONER: So that's another insulting piece of drafting. Then we have to ensure effective monitoring and evaluation of the implementation of the Basin Plan. Whether or not the Act required that, it's appalling to think that a public body would not - - -

MR ALEXANDRA: I think the Act does require it, yes.

THE COMMISSIONER: - - - effectively – of course it does – effectively monitor and valuate. The Auditor-General would be wanting to know why not, if not.

MR ALEXANDRA: Yes.

THE COMMISSIONER: So, so far, we've gone 1, 2, 3, 4, 5; they're all things the law already requires and are the bleeding obvious. We then come to (f):

> *To promote an enforced compliance with the Basin Plan and Water Resource Plans.*

Well, subject to the limits that the law imposes on the Authority of the – Authority to enforce anything, and I certainly would not want to see it as a prosecutor, that doesn't seem to me to add anything. (g), is the one – and (h) and (i) are the ones I'm really interested in because, by elimination, we've got rid of most of these so called strategies and, now, we have something which actually uses ordinary English to describe a task. It doesn't actually say the task has to be carried out. Simply that this is a task to which the Authority must have regard to when undertaking its functions.

MR ALEXANDRA: Yes.

THE COMMISSIONER: If I may say so, appalling drafting because one doesn't know who has to do what. In any event, this is a strategy which in each of the three cases (g), (h) and (i) is to improve knowledge.

MR ALEXANDRA: Yes.

THE COMMISSIONER: That means doing or funding science, doesn't it?

MR ALEXANDRA: Well, I guess there's multiple forms of knowledge, but, yes, there's, natural science, social science, etcetera. We – I agree, it's too - - -

THE COMMISSIONER: And there's a lot of natural science involved in each of (g), (h) and (i), isn't there?

MR ALEXANDRA: Yes, but (g)(ii) relating to the social and spiritual and cultural uses.

THE COMMISSIONER: No, quite. Absolutely, it's not limited to it.

MR BEASLEY: No, but climate change, you're not going to - - -

MR ALEXANDRA: Yes.

THE COMMISSIONER: There's not – I'm not, for a moment, suggesting only the natural sciences, but, certainly, there's a lot of natural science in (g), (h) and (i).

MR ALEXANDRA: Yes, there's a lot of natural science, yes.

THE COMMISSIONER: How much natural science is the Authority funding or doing in relation to climate change in the Basin?

MR ALEXANDRA: As far as I'm aware very little.

THE COMMISSIONER: What, nil?

MR ALEXANDRA: Well, I'm no longer across their budgets, but last time I looked, you could say nil.

THE COMMISSIONER: Isn't this a problem, then, in 2012, of the Authority deciding thus, "Until there is a greater certainty, we will proceed as if the past is the best guide to the future", notwithstanding it's not, and then doing nothing to address that state of affairs. Notwithstanding the strategy is to improve knowledge about these things.

MR ALEXANDRA: Yes. Look - - -

THE COMMISSIONER: It's just a breach of law, isn't it?

MR ALEXANDRA: Not - - -

THE COMMISSIONER: Maybe it isn't because of the drafting. All they have to do is to have regard to this.

MR ALEXANDRA: Just what I would like to say with respect to this risk and strategy is to assess risk. I did have responsibilities for what was known as the risk assessment program or the risk program.

THE COMMISSIONER: Yes.

MR ALEXANDRA: And in – I think it was 2009. It may have been 2010, commissioned about $1 million worth of risk reviews which dealt with all of these – the issues that are outlined there except for, perhaps, those regarding environmental watering. So they were essentially framed as what do we know about the risks to the quality and quantity of water in the Basin? What does the science tell us? We commissioned many of Australia's best scientists to do this work and, as far as I'm aware, all of those risk reports were published and made available on the Authority's website at some stage.

We also had many of them published in a special edition of Water Resources Research, which is an international journal and the guest editor was Michael Roderick from the ANU. So in terms of the then status of, if you like, the accepted understanding, there is a bundle of fairly formal documents that lay out that risk and start to give a basis for what to do – what to do about it. And, again, I mean I've had

the – if you like, the benefit of having read all those reports as drafts, and I think we had four different climate science groups do the work on slight variations on what we understand to be the climate driven risks in the Basin, and as I've said earlier, they're all fairly emphatic that the climate risks are significant risk risks.

MR BEASLEY: Sure. Sure, but I think where the Commissioner is going in terms of the MDBA fulfilling what it is meant to do under either 4.03 or, indeed, under the Water Act - - -

MR ALEXANDRA: Yes.

MR BEASLEY: - - - 2,750 was set in 2012, totally ignoring climate change projections. So totally ignoring all the sustainable yields work by the CSIRO and ignoring the SEACI research that you were involved in; correct?

MR ALEXANDRA: Yes.

MR BEASLEY: Six years later, they're still - - -

THE COMMISSIONER: What's changed?

MR BEASLEY: Nothing has changed except this: they're quite content to adjust down the 2,750 by 605 gigalitres on the basis of supply measures that are far less certain than climate science.

MR ALEXANDRA: Yes. I find the adjustment downwards quite disconcerting, I have to say, because – I would take it, that if a number has been arrived at and if you can improve the efficiency, then simply water a bigger area of the floodplain; don't reduce the amount, because it's clear, that there is large areas of the floodplains that need water. So - - -

THE COMMISSIONER: Do you know of any guidelines that have been published under 4.04 in relation to the Authority and the improvement of knowledge as a strategy?

MR ALEXANDRA: I don't know of any; no. Not in terms of – if you refer to them as guidelines to guide subsequent actions and - - -

THE COMMISSIONER: Well, what they say is – guidelines setting out specific actions that may be taken in relation to the implementations of the strategies listed in the subsection that I've been so rude about.

MR ALEXANDRA: Yes. Yes. Yes. So I think part of – well, I share some of the concerns. So the Water Act, essentially, is a requirement to prepare a plan, and that plan requires subsequent plans and sub-strategies and so forth. Many of those sub-plans – if you like – or Water Resource Plans are yet to be prepared. And I'm not

aware of there being guidance as to how to incorporate these risks into those Water Resource Plans or any subsequent Basin Plan.

THE COMMISSIONER: But from the point of view of South Australia as a jurisdiction whose area depends as greatly as it does on the downstream culmination of the Basin - - -

MR ALEXANDRA: Yes. Yes.

THE COMMISSIONER: Doesn't it look to you as if chapter 4 is a derisory piece of lip service? Doesn't actually do anything to propose any strategies. They all boil down to this: in answer to the admonition "You must think about climate change" these three pages pompously say "We will think about climate change, or someone will think about it. And we will publish guidelines how we might do that".

MR ALEXANDRA: In – well, as I said, I'm not aware of any, and the obvious place – the obvious directive – the direction for those guidelines would be in terms of guidance for how to prepare Water Resource Plans that comply with and attend to these known risks.

THE COMMISSIONER: So you've got to tell the people who are preparing the WRPs how to go about it in light of climate change. Isn't that right?

MR ALEXANDRA: I would think that's an important thing - - -

THE COMMISSIONER: Has been done – to your knowledge?

MR ALEXANDRA: I'm not aware of it.

THE COMMISSIONER: Within the Authority, when you were there, surely, the inadequacy of something like chapter 4 must have been apparent to a number of you. If – this is the culmination of the Authority's attending the Basin Plan, for how the Authority was to attend to climate change.

MR ALEXANDRA: My concern is that the – I just mentioned the risk reports that – we've referred earlier to the climate research program that – well, they were either studiously ignored or discounted as being significant. That's my concern. And so – I'm not a lawyer, and I'm not that concerned about the – and I mean – good legislation is important; a good legal instrument is important for guiding what gets done, but if we go back to the framing in terms of common sense – it seems to me, to be an avoidance of the – of good – if you like – common sense or good public policy.

MR BEASLEY: I know. Sure. But you don't need to be a lawyer to be – if you got a statutory instrument that tells you you've to act on the best available science – you don't need a law degree to work out what that means; do you?

MR ALEXANDRA: No, no.

THE COMMISSIONER: Indeed. It might be better, if lawyers kept away from determination of what the best available science is. I would like to think scientists will be the best guardians of that.

MR ALEXANDRA: Well, it wasn't me, but the Basin planning division did actually commission a fairly prominent water scientist to prepare advice on what they should take as regard best available science. I think - - -

MR BEASLEY: Did he say "Ignore climate change"?

MR ALEXANDRA: No.

MR BEASLEY: No?

MR ALEXANDRA: Basically – he had a whole range of different ways of them – if you like – determining what was – represented good or best available science.

THE COMMISSIONER: You see – one of the risks that had to be dealt with in the plan - - -

MR ALEXANDRA: Yes. Yes.

THE COMMISSIONER: The last of the item 3 specific requirements in section 22 reads as follows:

> *the limitations on the state of knowledge on the basis of which estimates about matters relating to Basin-water resources are made.*

And at – what chapter 4 does in 4.O3(3)(g), (h) and (i)– say that the strategy to address the risk of the limitations of knowledge will be to improve knowledge.

MR ALEXANDRA: Yes. And I do - - -

THE COMMISSIONER: Leave aside the fact that I don't – I hope not too many people were clustered around too many white boards to come up with that startling insight; what I am interested to know is – within the Authority when you were there, did that not appear to be bordering on the impertinent, for a Plan to have been promulgated to address limitations of knowledge by solemnly saying we should improve it and that's it?

MR ALEXANDRA: Yes.

THE COMMISSIONER: And then to promulgate 2,750 on the basis that there were limits of knowledge.

MR ALEXANDRA: Yes. Look; my concerns about the quality of - - -

THE COMMISSIONER: I'm – what I'm inquiring is that - - -

MR ALEXANDRA: Yes.

THE COMMISSIONER: It sounds to me, as if the Authority was not doing its work properly, and those within the Authority must have known or suspected that at the time.

MR ALEXANDRA: I had deep concerns then, and I have deep concerns now about the adequacy of the Basin Plan as a legal instrument. Right. I don't think I can put that on record.

THE COMMISSIONER: Yes; you can. You just have put it on the record.

MR ALEXANDRA: Yes. But let me say my concerns go deeper than that, and I've tried to put that into the papers I've provided.

MR BEASLEY: Yes.

MR ALEXANDRA: And that is in – and I think it was late 2011 or 2012. I travelled to most of the capital cities of the basin with Dr Graeme Pearman, former head of CSIRO, to advocate for the continuation of SEACI. So – SEACI phase 3; we had it planned. We had it budgeted, and we had the decision rejected, the proposal rejected by the Basin governments, including the Commonwealth government, on the basis that there was an insufficient budget to fund this work.

THE COMMISSIONER: Resources.

MR ALEXANDRA: So my concern - - -

THE COMMISSIONER: This country is not rich enough to afford to do science about the Basin.

MR ALEXANDRA: My concern is that – you were referring to this as fatuous or other terms more eloquently than I can in terms of a critique of it.

THE COMMISSIONER: Yes.

MR ALEXANDRA: My critique is that there – it was limited attempts to give effect to this intention. So – as in – we already had assembled a cohort of competent scientists in CSIRO - - -

THE COMMISSIONER: You had the carta in place.

MR ALEXANDRA: Yes. We had - - -

THE COMMISSIONER: And they threw it away.

MR ALEXANDRA: They came from BOM, CSIRO and several of the universities, and we had agreement that the next stage would involve PhD students, more universities, and we would continue to build this specialist community around understanding climate change and its impacts in the Murray-Darling Basin. So – and we're talking – well, SEACI phase 2 was $9.6 million over the three years and – with substantial contributions from agencies themselves. So given the amount of money that's being spent on water reform on the Basin, it's a relatively small investment. So my concern is not - - -

MR BEASLEY: Some people get more for drip irrigation than that .....

MR ALEXANDRA: My concern is not in the words that are written but in how – whether these strategies or intent are given effect.

THE COMMISSIONER: Yes.

MR ALEXANDRA: Yes.

MR BEASLEY: All right. I was going to take the - - -

THE COMMISSIONER: It's my concern as well.

MR BEASLEY: I was going to take the witness to the SEACI research in a moment.

THE COMMISSIONER: Can we - - -

MR BEASLEY: Should we have a break, though?

THE COMMISSIONER: Yes, please. We will resume at five to.

ADJOURNED **[11.38 am]**

RESUMED **[11.53 am]**

MR BEASLEY: Are you ready, Commissioner?

THE COMMISSIONER: Yes.

MR BEASLEY: Mr Alexandra, can you – the SEACI research, can you – was that building on – that program, was that building on the Sustainable Yields Project or something totally independent of that?

MR ALEXANDRA: It was independent, but because there was similar researchers or the same research groups working on both, they were related and they – I guess they benefitted from one another as often these kind of research programs do.

MR BEASLEY: So behind tab 3 is the South-Eastern Australian Climate Initiative, or SEACI, S-E-A-C-I, report, 'Climate Variability and Change in South-eastern Australia'.

MR ALEXANDRA: Yes.

MR BEASLEY: Subheading, 'A Synthesis of Findings from Phase 1 of the South-Eastern Australian Climate Initiative'. Who funded the – the SEACI was funded by the commonwealth, or was it a combination of the commonwealth and various states?

MR ALEXANDRA: SEACI was funded initially by the Murray-Darling Basin Commission - - -

MR BEASLEY: Right.

MR ALEXANDRA: - - - which included joint Commonwealth and state funds, but also had contributions from state governments such as the Victorian Government, it had the Department of Climate Change and what are referred to as in-kind contributions from CSIRO and BOM. So it was a partnership agreement where cash was provided, if you like, by the policy and management agencies and research capabilities was provided by the research agencies.

MR BEASLEY: All right. Over the page, that phase 1 report at the back of page 1, it gives the address and contact details as CSIRO Water for a Healthy Country Flagship. That was a division CSIRO, was it?

MR ALEXANDRA: Yes. Well, they have matrix management in CSIRO, so they have both flagships and divisions, but in plain English it's a program or a division within CSIRO.

MR BEASLEY: All right. And there is a very large number of contributors to this report.

MR ALEXANDRA: Yes.

MR BEASLEY: But for project leaders, Bryson Bates, Paul Hulper and Ian Smith. Which organisation were they are a part of? If you recall.

MR ALEXANDRA: They are all CSIRO.

MR BEASLEY: Okay. You were part of the science panel.

MR ALEXANDRA: Yes, correct.

MR BEASLEY: Is that – are people's names alphabetical in that? It looks like they are. Is that the reason you come first?

MR ALEXANDRA: Probably, yes.

MR BEASLEY: Okay. Was there an equal contribution between each team, like CSIRO, Bureau of Meteorology, the science panel, the steering committee, or did people take different responsibilities for different things?

MR ALEXANDRA: Look, the – there was a series of projects, so in terms of funding actual activities that were, if you like, coordinated and implemented mostly by BOM and CSIRO. The science panel was a collegiate panel that focused on the quality of the science and the scientific outputs like this report. And the steering committee which comes next in that list, long list of parties involved were the senior executives that were involved in signing off budget – budget and progress reports. So the science panel was the – we would meet quite frequently and review the science, talk to the project leaders, and prepare these kind of – or help prepare these kind of documents.

MR BEASLEY: And with this many people listed here as having made a contribution, I take it they all didn't make a contribution to drafting the report. Otherwise they would get about three words each. But did someone – who drafted – actually drafted the report?

MR ALEXANDRA: The - - -

MR BEASLEY: If you recall?

MR ALEXANDRA: This phase 1 report I actually think Mike Manton, who was an independent ex-Bureau of Meteorology scientist, was contracted, because it was a requirement of the intergovernmental contract that there be a synthesis report to summarise the science. And there are many technical and scientific papers that were produced out of the projects.

MR BEASLEY: And the purpose of the report, I take it, was to give advice to government about what's happening.

MR ALEXANDRA: The purpose of the report was to make it clearly available and easily interpreted for policy makers. So it was meant to be a synthesis of an entire program and saying what had been found in that program that had policy implications, but not – we actually had some quite active debates as the degree to which we would interpret the findings of the science and say this is what you are required to do in terms of responding to it.

MR BEASLEY: Yes. And document itself is dated May 2010, so it was actually produced before the Guide to the Basin Plan was published.

MR ALEXANDRA: It was quite long in production. So the – technically the program finished, I think, in June 2009. But it was one of those remaining contractual obligations.

MR BEASLEY: Given 100 people, it took that long to you to get around to approve the document.

MR ALEXANDRA: To be fair we also – I think we extended SEACI 1 for six months while we prepared a detailed plan for SEACI 2.

MR BEASLEY: Right.

MR ALEXANDRA: So the same project teams were kept in place.

MR BEASLEY: I see. And can I just – in terms of the work and the findings that are involved in this paper, was a large part of the CSIRO Sustainable Yields Project used for this, or was this taking that science and then doing further research beyond that?

MR ALEXANDRA: The – my understanding is that the SEACI phase one was started in 2006 as a separate and independent research program.

MR BEASLEY: Right.

MR ALEXANDRA: And then the Commonwealth contract – the Commonwealth Department of Environment contracted CSIRO to do the sustainable yields work, which was really much more detailed hydrological modelling, taking the climate scenarios and running them through a mega-modelling process. So as I said before, they were related and it is – and some of the same project teams were on both.

MR BEASLEY: Now, I noticed on page 1 of this report - - -

MR ALEXANDRA: Yes.

MR BEASLEY: - - - under the heading, the important heading 'Anticipating the Future' - - -

MR ALEXANDRA: Yes.

MR BEASLEY: - - - the fourth bullet point makes what seems to be a fairly obvious point, that it is prudent to plan for conditions that are likely to be drier than the long term historical average conditions because the current drought appears to be linked at least partly linked to climate change.

MR ALEXANDRA: Yes.

MR BEASLEY: And climate model projections of a drier future across the south-east. Had the drought – the drought hadn't – the Millennium Drought hadn't yet broken, had it?

MR ALEXANDRA: No. The Millennium Drought broke in I think December 2010 and that was, you know, one of the wettest or biggest rainfall events on record and then we went into a very wet summer.

MR BEASLEY: Yes. Now, I wanted to ask you this in the next bullet point: the report says there are questions remaining about how to apply climate change projections. Given that the recent observed changes in rainfall and stream flow are larger than the projected changes to mean climate for 2030 - - -

MR ALEXANDRA: Yes.

MR BEASLEY: Those projected changes to mean climate for 2030: is that the SEACI research, or is that the CSIRO Sustainable Yields, or is it very similar?

MR ALEXANDRA: I think that's – it's very similar, but I think that's the reference to the generalisation of those models from Sustainable Yields came up with a mean average projection of 13 per cent reduction in stream flows whereas by 2010 I think we had – and this is from memory – been experiencing something like a 40 per cent reduction in stream flows. So I have a graph somewhere on my computer with a nice sort of even curve of decline, graceful decline, contrasted with actual conditions in the Millennium Drought, which was at the – way out, you know.

MR BEASLEY: Can I ask you this about that bullet point and the recent observed changes being larger than the projected changes and see whether you agree with this. When Professor Pitman gave his evidence to the Commissioner last week, one of the things he said was this:

> *I think this climate science community can be criticised for having been too conservative in how rapidly climate extremes can change. Things like we were going to get 2030 climates – in fact, we probably almost have already.*

MR ALEXANDRA: Yes.

MR BEASLEY: And then he on to say – he went on to say that:

> *Science isn't about speculation; it's about what you can publish in the international literature with absolute rigour, and the standard is 95 per cent certainty. Occasionally 90 per cent certainty. But everything we try to publish has to be correct, 90 to 95 per cent sure.*

MR ALEXANDRA: Yes.

MR BEASLEY: Then he went on – and I will paraphrase now. He went on to say but if I'm talking to a government decision maker I'm actually going to be – I'm not going to – I'm going to be franker than that and less conservative and perhaps more accurate in saying things are changing more quickly and the projections are at the more extreme stage – sorry, level. Sorry, the reality is at the more extreme level than the projections have been. Is that – do you agree with that, and is that your understanding about how things are progressing?

MR ALEXANDRA: Well, there is many things to agree with in your statement.

MR BEASLEY: All right.

MR ALEXANDRA: So, firstly, I recognise and I work with many of the climate scientists who have to maintain their work at that kind of threshold of certainty. So, for example, the comment that says that there appears to be appears climate change signal in the current conditions, is really a very toned down – the scientists who are working on that were convinced they were finding that evidence and were awaiting to get it published, were trying to get it published. So on that front – and as I was saying, I think there is this quite complex interplay between the nature of high quality and if you like leading edge science – that is, the science that is contemporary, with how that then gets brought into a public policy process that mandates its use.

And so in my role I was very much in that – I felt like sort of in that relationship between going from something like these SEACI meetings or the annual conference and then trying to bring that information back into the Authority and something like this report is a very carefully crafted, very carefully crafted and well written document that tries to explain what that science – you know, it doesn't in any way denigrate that science. It is based on that science as closely as we can but to put it into a plain English summary. Because I could find you a publications coming out of SEACI that would just bamboozle everybody here because they are full of mathematics and statistics and physics that most of you wouldn't understand. So this was - - -

MR BEASLEY: Come on. Try us.

MR ALEXANDRA: Well, I couldn't understand them half the time.

MR BEASLEY: Right. Go on. Don't try us actually.

THE COMMISSIONER: Your assumption is correct, so for me – so you can keep going, please.

MR ALEXANDRA: So again, in this report there was some very powerful graphics about the nature of the drying, the conditions, and the models and understanding the causality of these climate patterns. And what I've said in my statement of evidence

is that I think SEACI 2 went a lot further in providing very convincing findings that – of the causal processes that can be used to explain these drying trends.

MR BEASLEY: Yes. Now SEACI 2, which is behind tab 4, there – which – and that report is entitled 'Climate and Water Availability in South-Eastern Australia, Synthesis Findings from phase 2 of SEACI'.

MR ALEXANDRA: Yes.

MR BEASLEY: That report is dated September 2012. So I assume there was further work done between the publication of the phase 1 report?

MR ALEXANDRA: Absolutely.

MR BEASLEY: It was an ongoing program.

MR ALEXANDRA: The SEACI 2, the partners spent many days planning a research plan in 2008 or 2009. This report summarises, as I said, $9.6 or $9.8 million of research and has – in this case the first couple of pages are the key message for policy-makers and the second couple of pages is a summary of the scientific findings.

MR BEASLEY: Yes. Now, there is discussion about various phenomena such as El Niño and the Indian Ocean Dipole and the Southern Annular Mode and we did have some evidence from Professor Pitman about that, but in term of the projections for future water availability for south-eastern Australia that commences at page 30 of this document. So projected change in future mean annual rainfall and run off across south-eastern Australia for a one degree global warming is shown in figure 19. Best estimate of annual average warming for Australia is one degree by 2030 relative to 1990 and between .8 to 1.8 and 1.5 to 2.8 by 2050. Are those projections still current? I have certainly seen the range of 1 to 2 degrees by 2030, for example.

MR ALEXANDRA: Again, I'm – I'm not across that – the degree of accuracy of those projections. But let's say they were accurate at 2012, when it was published.

MR BEASLEY: Sure, all right.

MR ALEXANDRA: Yes.

MR BEASLEY: Page 31, middle of the page. Sorry, middle of the first column. Averaged over the southern half of the region.

MR ALEXANDRA: Yes.

MR BEASLEY: So that's the southern Basin, is it?

MR ALEXANDRA: Yes.

MR BEASLEY: Yes:

Mean annual rainfall is projected to reduce by 0 to 9 per cent median of 4 per cent, and mean annual run off is projected to reduce by 2 to 22 per cent for a one degree global warming.

So that – that shows where the – using averages can give a misleading figure because a one degree global warming could actually mean as much as a 22 per cent reduction in run off.

MR ALEXANDRA: It could, but it could – it could also mean, given the uncertainty that we were talking about earlier, it could mean more than 22 per cent.

MR BEASLEY: Of course.

MR ALEXANDRA: So again coming back to this 95 per cent certainty, my experience of working with these highly qualified – they're mostly maths and physics nerds – is that they are really very, very careful, and so while they are starting to get a sense of what are the causal processes for this phenomenon, they are also unlikely to go out to something that they have a lot of uncertainty for.

MR BEASLEY: Well – and I think in that column I was referring to there is the discussion on page 31 about the range of uncertainty.

MR ALEXANDRA: Yes.

MR BEASLEY: And:

The projected decline as well as the range of uncertainty is larger for higher levels of warming and although not scaling exactly linearly is roughly twice as large for a two degree global warming.

MR ALEXANDRA: Yes.

MR BEASLEY: And this is only to 2030. Of course that doesn't – I have certainly seen the commission has evidence about a range of potentially three to six degrees by 2070.

MR ALEXANDRA: Yes.

MR BEASLEY: But - - -

MR ALEXANDRA: I would like to draw your attention really to the graphics.

MR BEASLEY: Please.

MR ALEXANDRA: So it's these figures are quite significant. But when you look at the graphics.

MR BEASLEY: All right. What page do you want us to have a look at?

MR ALEXANDRA: We start at page 30 with the models and the strong alignment in nearly all of these models of a drying trend in the southern basin, and then the impact on run-off. So while there is – while the models, for example if you take the bottom middle one, it's showing a significant increase in rainfall in the north-west of the Basin. That's up in the Paroo and Warrego. It is getting wetter off a very dry base, whereas most of them are showing you a pronounced drying trend in the key sources – head waters of the rivers, so in the arc of the mountain ranges that deliver most of the water.

MR BEASLEY: Yes.

MR ALEXANDRA: And so, you know, the models are interesting and it's interesting to note the potential for an increase in the north-west and it might be good for some cotton growers, but by far the bulk of the water is sourced from a relatively small area in the south-east corner of the Basin.

MR BEASLEY: And this was, as I attempted to point out before, this was the combined work of what – please, tell me if I'm wrong – the combined work of Australia's – a large number of Australia's best scientists in these fields working at places like the CSIRO and the Bureau of Meteorology and the MDBA, etcetera.

MR ALEXANDRA: Well, the scientists are really mostly working in CSIRO, Bureau of Meteorology's Research Centre, and in universities like where Andy Pitman comes from, but also from the ANU, and the referencing I think is probably illustrative – if you go over to the references, you know, a lot of them are the technical reports of CSIRO, but there's still many published papers. You know, there is - - -

MR BEASLEY: But my point is there seems to be – unless there is a equivalent paper saying, "This paper is a load of rubbish," with a range of people from similar organisations with similar qualifications, it seems to be that Australia's best scientists, scientific consensus, is what's included in these phase 1 and page 2 reports.

MR ALEXANDRA: Yes. This – not only does it represent a summary of what you could call the scientific consensus we – as I mentioned, I was responsible for commissioning independent reviews of the science, so – in part so we didn't have to rely entirely on that coming out of CSIRO, and those independent reviews confirmed this understanding, this direction if you like. The other thing that we did, in a good scientific tradition, is expose these findings at the end of SEACI 2 to a conference of the Australian Academy of Sciences where the – if you like, the entire climate science community was invited to scrutinise the findings. So the whole thing was

done as openly, transparently as possible and there was some on some key projects vigorous debate as there should be about the – both the nature of the data being used, the methods, etcetera. That's how it – that's how it progressed.

THE COMMISSIONER: Has there been any forum or gathering or collaboration that resembles SEACI since its stage 2 was completed, phase 2 was completed.

MR BEASLEY: Please answer in the context of also telling the Commissioner what happened to phase 3.

MR ALEXANDRA: Yes. So the – not only SEACI, but most of the climate research programs that were being funded out of Department of Department of Climate Change, I think, have been terminated. And the quantity – the quantum of funds being used for climate research in Australia are in serious decline, or have been in serious decline. So as I said in 2000 – I think it was late 2011, early 2012, Graeme Pearman and I went round advocating SEACI 3 and it was – well, it was not funded because of this budget problems. And - - -

THE COMMISSIONER: Well, sorry. Somebody told you about budget problems, did they?

MR ALEXANDRA: No. They didn't tell us about budget problems. I mean, as a - - -

THE COMMISSIONER: Well, $9 million is not a budget problem. I mean, it's a rounding error.

MR ALEXANDRA: No. No. But what happened in 2012, June 2012, New South Wales reduced its contributions to the Authority budget for its joint programs by about $20 million. And part of my responsibilities was to work through present where – present to the Basin officials group where opportunities were to cut the budget. And one of the decisions they took was not to continue funding SEACI – or SEACI-type research. And so, just to be clear, in terms of my own role in it, I – we arrived at how the $20 million would be cut out of the Authority's budget. It included not continuing with SEACI, not continuing with the Sustainable Rivers Audit, which was the biggest assessment of river ..... health, and not continuing with the native fish program. And they were three of the three programs in my branch.

So I then had a fairly frank discussion with my Chief Executive saying, "I don't think you can really justify having a Senior Executive oversighting half the number of programs I had formerly. I think it's time we have a serious discussion." And, as a result of that, I ended up quitting and leaving the Authority in early 2013. So if there is a forum on something like SEACI going on, I haven't heard about it. But that doesn't mean it's not happening. But my understanding is there is no large scale partnership focused on the climate and hydrology of the Basin.

MR BEASLEY: What was phase 3 going to involve?

MR ALEXANDRA: It was going to involve further research that would have shed light on particularly these catchment or biological responses to climate change. So we had identified that there was significant area of risk or uncertainty resulting from how the forested catchments would use water under rising temperatures and changing seasonality. It would have continued some of the work on trying to understand the causality. So this identification of the southward movement of the tropical influence and the southward retraction of the Antarctic storm cycles is, together, resulting in these lower rainfalls across the Basin.

So once the – if the phenomenon that can be observed can be understood in terms of causality, then you have a much better certainty that it's not just a – you're observing one trend and then it could turn into another trend but, in fact, there is an established pattern here that is corresponding, if you like, with the laws of physics, the way the climate system is driven through the oceans and the atmosphere.

THE COMMISSIONER: Could you turn to page 37, please, of the document behind tab 4 - - -

MR ALEXANDRA: Yes.

THE COMMISSIONER: - - - which is SEACI phase 2. In the right-hand column on that page, under the heading 'Science Delivery', second paragraph, you see it starts:

While SEACI will not continue in its current format - - -

MR ALEXANDRA: Yes.

THE COMMISSIONER: So that was written after you and Mr Pearman had failed. Is that right?

MR ALEXANDRA: Yes. Well, that decision, I think, as we said earlier, this is dated September. The decision not to fund SEACI 3 would have been taken in July or August.

THE COMMISSIONER: And you attribute it mainly, do you, to New South Wales?

MR ALEXANDRA: Well, the situation was that each year the states make their contribution to the Authority. In is no – or before that the Commission. There is no long term partnership agreement specifying their budget contributions. And I think, if I have got this right, with the election and the Baird Government in three days before the end of the financial year we got notice to say that the New South Wales contribution, which had the previous year been about 30 something million, was reducing to 12 million. And so that meant that a lot of the joint government programs were being renegotiated as to how they would be funded.

THE COMMISSIONER: So in that paragraph one of the key learnings is described as the value of having an active science panel.

MR ALEXANDRA: Yes.

THE COMMISSIONER: Now, I see that you at both these phases sat on a science panel. Is that right?

MR ALEXANDRA: Yes, that's correct.

THE COMMISSIONER: But that reference to science panel, is that, as it were, a plea to continue part of the SEACI exercise?

MR ALEXANDRA: No. I think that's just a genuine observation that structuring a large complex or complex program with multiple partners benefits from having just not the oversight in terms of an approval of budgets, but an active panel that's bringing researchers together discussing their work, guiding it and communicating it.

THE COMMISSIONER: Is that what is now lacking, so far as you understand?

MR ALEXANDRA: Well, there is – as I mentioned, as far as I know, there is no partnership taking this kind of research forward. So it's more the research effort is likely to be scattered and under – probably under-resourced. But so the art of a good applied research program is to make sure the researchers have a good understanding of what policy agencies want and need, and the policy agencies having a good opportunity to interact with the researchers to see what the research is – what research is bringing forth.

THE COMMISSIONER: And for us, the public, to pay for it.

MR ALEXANDRA: Public good research in Australia, we have a long tradition of paying for it. Yes.

THE COMMISSIONER: That seems fair.

MR ALEXANDRA: Yes.

MR BEASLEY: I forgot to ask you a question before, but I've been reminded by these documents we're looking at. For the phase 1 SEACI document, one of the theme leaders, who is identified as Francis Chiew - - -

MR ALEXANDRA: Yes.

MR BEASLEY: - - - C-h-i-e-w, from the CSIRO, is Mr Chiew – or could be Dr Chiew. Is it?

MR ALEXANDRA: Probably. Almost certainly. Yes.

MR BEASLEY: Let's call him doctor. Dr Chiew is a – is he a hydrologist or a climate change specialist or - - -

MR ALEXANDRA: No, I believe he's a hydrologist.

MR BEASLEY: Yes.

MR ALEXANDRA: Yes.

MR BEASLEY: And it's explained that in – sorry – we're told in the phase 2 document that the theme he is actually responsible for is called Theme 2.

MR ALEXANDRA: Yes.

MR BEASLEY: Which is – and I'm now looking at page 5 of the phase 1 report – 'High Resolution Climate Projections and Impacts'. And so the key questions identified for the phase 1 report are:

> *How was the climate, average, inter-annual variability and extreme events for rainfall temperature and evaporation likely to change over the next 25 to 65 years?*

MR ALEXANDRA: Yes.

MR BEASLEY:

> *What are the probabilities attached to these changes? How can methods for regional projections be improved so as to provide greater confidence for stakeholders?*

In the phase 2 report, all of that is summarised in at page 6 where the theme 2, long term hydro-climate projections for South-Eastern Australia climate change projection - - -

MR ALEXANDRA: Yes.

MR BEASLEY: - - - right-hand column, averaged over the southern part of the SEACI region, south of 33 degrees south, means – I take it that's the southern Basin. Mean annual rainfall is projected to reduce by 0 to 9 per cent, median of four and mean annual run off by two to 22 per cent. We already discussed that - - -

MR ALEXANDRA: Yes.

MR BEASLEY: - - - for a one per cent warming:

> *Projections indicate a rainfall decline in the cool season, April to October, consistent with expected changes in the large scale atmospheric and oceanic*

influences on a rainfall in a warmer world as described in the outputs of Theme 1.

MR ALEXANDRA: Yes.

MR BEASLEY: Now, Mr – sorry – Dr Chiew when he was at the CSIRO was also, I think, the lead author of a CSIRO report called 'Advice on Defining Climate Scenarios for Use in the Murray-Darling Basin Authority Basin Plan Modelling'.

MR ALEXANDRA: Yes, correct.

MR BEASLEY: In July 2001. By saying "correct', you're familiar with that report?

MR ALEXANDRA: Yes. I'm familiar with it. Yes.

MR BEASLEY: Commissioner, it's exhibit RCE 392. How many are there? I've got to stop tendering things. Climate Change Core Materials folder behind tab 2. What I forgot and it says on the inside cover that the report may cited as Chiew FSH and two other authors.

MR ALEXANDRA: Yes.

MR BEASLEY: But what I wanted to take you to is page 14 of this document. So page – sorry – 13 section 5 is entitled 'Options and Recommended Approaches for Defining Climate Scenarios'. Then on page 14 we have 'Climate Sequences Over Period of Implementation of First Basin Plan'. And you will see that in the second paragraph the CSIRO is making a clear recommendation to the Authority that:

> *…the climate sequence for modelling over the period of implementation of the first Basin Plan should be based on scenarios ranging from the recent climate over the past 10 to 20 years (a very dry scenario, although drier conditions are possible) and future climate scenarios obtained using the daily scaling method that has been described above.*

So that's the CSIRO telling the Basin Authority, "This is how you need to do this."

MR ALEXANDRA: Yes, correct.

MR BEASLEY: So what happened?

MR ALEXANDRA: Correct. I don't know what happened.

MR BEASLEY: Right.

MR ALEXANDRA: It didn't happen. Let's put it that way. And - - -

THE COMMISSIONER: One way to try to cut through that is to posit the possibility that at the MDBA it was well understood that if you took that approach you would be reducing the sustainable diversion limit pretty quickly and fairly materially.

MR ALEXANDRA: Well, I think what you would be doing is would be reducing the total water available, which is more fundamental than the sustainable diversion limit.

THE COMMISSIONER: I accept the correction. The approach you would take to an understanding of the hydrology would entail, as a consequence, materially and quickly reducing the sustainable diversion limit.

MR ALEXANDRA: Yes. I agree. And I - - -

THE COMMISSIONER: And I earnestly hope this is not being cynical, but material, including material you have drawn to this Commission's attention, rather suggests that there is a sensitivity to the social and political reception that proposals to reduce consumptive use have had in the past and may have again

MR ALEXANDRA: And I agree and I alert you to what I had published in the paper on climate risks and uncertainty which is really just alluding to the implications of the risk assignment clauses of the National Water Initiative, clause 48, 49 and 50, which are also in – effectively repeated in the Water Act, which while, apparently, fairly clear, are also, if you like, could be the source of a great deal of confusion. So they are clauses that say that a reduction in water availability that is caused by short-term fluctuations or climate change will be borne by entitlement holders.

But a change that's borne by government policy, governments will compensate. So in a highly charged political environment over the introduction of these reforms, if the Authority had come in and said, "Well, CSIRO is telling us to work on 10 or 11 per cent reduction, so our proposal is to take 10 or 11 per cent off all entitlement holders", this would potentially be seen as – if you are the entitlement holder the government is using the science to prosecute and agenda to reduce the value of what people regard as a private asset.

THE COMMISSIONER: So there should be compensation.

MR ALEXANDRA: Well, under clause 48, there is no need for compensation if the reliability or volume is reduced by climate change. So I alert you to those clauses and to consider the – if you like – the real politics of, you know, "It's going to be a lot easier if we – if the government agrees to compensate for all changes in extractive water rights" – which they have done – "via purchases or efficiency measures." Which you have also heard about.

So I don't have – as I have said previously – I don't have any inside information as to how these decisions are taken, but when we look at it from outside, there seems to be quite substantial pressure, if you like, to not play the climate change card in terms of reducing the water available. The other thing that some parties may argue is that it doesn't matter if we work on the average, because, in the end, it will be the annual allocation that will be affected by climate change. However, I think that is incorrect because, as you know, the water is in both extractive rights and, if you like, non-extractive rights. The residual. And one of the - - -

THE COMMISSIONER: Sorry, the term just slipped my mind. The other kind of environmental water which is not held environmental water is what?

MR ALEXANDRA: It's sometimes referred to as rules-based environmental water.

THE COMMISSIONER: No, there's another expression.

MR ALEXANDRA: But in one sense, I think it is rather cynical to even call it environmental water. It is essentially the residual water that is not attached to an extractive right.

THE COMMISSIONER: Sorry, the expression - - -

MR ALEXANDRA: Planned.

THE COMMISSIONER: Planned. That's right. I can never – no wonder it slips my mind. I can't understand why it is called planned. Why is it called planned?

MR ALEXANDRA: I presume because it is deemed to be like a planned release from a dam or something that is not attached to a – held to entitlement. So you can still plan its management.

THE COMMISSIONER: It's a word that signifies the thoroughly regulated nature of the Murray.

MR ALEXANDRA: I suspect so – yes.

THE COMMISSIONER: Thanks.

MR ALEXANDRA: But the point I'm making is a large – particularly in the wetter sequences, but a large amount of water is just residual. It's not attached to an extractive right. And I think it's rather cynical to call that "environmental water" because it's not really dedicated to the environment. It's just part of what flows down the rivers. Anyway. So my point is that by not – by not reducing the total water available has a bearing on how all subsequent types of water rights will be water rights and planning will be undertaken.

MR BEASLEY: Can I just get your view on this, which flows from what the commissioner was just asking you. On – in November 2011 the CSIRO produced a report entitled 'Science Review of the Estimation of an Environmentally Sustainable Level of Take for the Murray-Darling Basin'. The authors were Bill Young, Professor Justin Brookes.

MR ALEXANDRA: Yes.

MR BEASLEY: Is it Professor Gawne?

MR ALEXANDRA: Gawne, yes. Ben Gawne.

MR BEASLEY: Okay. Dr Gawne and I'm going to say Dr Jones and Dr Bond, just in case. It's exhibit RC9. But this was a report prepared reviewing a 2,800 gigalitre restoration of water for the environment. I want your views on this. The report says this:

> *The panel understands that other reduction scenarios have been modelled but the panel has not seen modelling results –*

sorry I'm reading from the – sorry:

> *MDBA has made a policy choice –*

this is page 20 of the report –

> *MDBA has made a policy choice not to directly address the projected impacts of future climate change on water availability in the determination of SDLs for the proposed Basin Plan. MDBA determined SDLs using historical climate and inflow sequences and has not modelled the consequences of future climate on the ability to meet the hydrologic targets under the proposed SDL. No view has been given on whether the ecological targets would be changed should the climate change as projected. If climate change impacts do unfold as projected lower SDLs will be required to maintain the level of environmental protection offered by the current proposed SDLs.*

That's right, isn't it?

MR ALEXANDRA: I would suspect they actually mean higher but I would like to see that in black and white.

MR BEASLEY: Well, you would need a lower sustainable diversion limit, wouldn't you, if - - -

MR ALEXANDRA: A lower limit on extractions, yes.

MR BEASLEY: Yes. Lower limit.

MR ALEXANDRA: Yes. A higher level of environmental water. Yes, that's correct.

MR BEASLEY: Yes. Right. And then they go on to say this:

> *This represents a significant risk in the longer term and a smaller risk in the short term.*

MR ALEXANDRA: Yes. I agree with that. That's a very neat summary of it. Can I answer one of your earlier questions about the SEACI 3?

MR BEASLEY: Of course. Yes.

MR ALEXANDRA: I think that that SEACI 2 report where it referred to future directions in – close to the last page, I think it was. I will see if I've got it here – scientific challenges.

MR BEASLEY: What page are you on?

MR ALEXANDRA: Page 37. There's a long list of dot points:

> *Future research directions should further progress our understanding.*

And then it lists this long list of dot points. I think that is likely to be indicative of what was being planned. That's a fairly comprehensive list there of what was being planned in – in SEACI 3.

MR BEASLEY: Yes. Just bear with me.

THE COMMISSIONER: Did you ever have discussions with any authority or, for that matter, within the SEACI gatherings where someone espoused the view that the risk of climate change was not such as required any account to be taken of it in setting an ESLT?

MR ALEXANDRA: It – just to be clear, that's not the kind of discussion we would have had in SEACI because the focus was on trying to better understand the climate and so on.

THE COMMISSIONER: What about more generally?

MR ALEXANDRA: Inside - - -

THE COMMISSIONER: So departing from the statutory concept of ESLT and more generally speaking about managing the natural resource, which is the Basin and its water.

MR ALEXANDRA: Yes. Yes. Yes. I can recall some discussions, particularly in the – it would have been in 2010; so the drought was still quite strong – with the view being expressed that – "Look. It's likely, it will rain again; droughts break. This whole story – there's a– "panic" might be too hard a word, but – "There's a sense of hysteria around climate change that's being overstated". So there – that view was expressed but very, very rarely. And I was indeed surprised by people expressing that, because - - -

MR BEASLEY: Just pause there.

MR ALEXANDRA: Yes.

MR BEASLEY: Who were the people expressing that view? What was their - - -

MR ALEXANDRA: Well, Rob Freeman, the then CEO, expressed that view to me on one occasion.

MR BEASLEY: Right. Okay.

THE COMMISSIONER: So – but not as a scientist.

MR ALEXANDRA: Not as a scientist, but the important part of it – and you know – to his credit, he was right; it was going to rain again. Droughts do break. And there will be floods in the - - -

THE COMMISSIONER: But there isn't anybody, seriously – is there? Who thinks the fact it's going to rain again refutes climate change?

MR ALEXANDRA: No. I don't think there is. The - - -

MR BEASLEY: There are people that do say that, but they are not necessarily scientists, I think.

THE COMMISSIONER: I confess – if anybody has ever said or written anything so silly, then – we can all agree not to waste time on his or her views.

MR ALEXANDRA: Yes. No.

MR BEASLEY: You must listen to too much ABC radio and not enough of the commercial stations.

MR ALEXANDRA: There is – you know – I mean – there's a whole lot of people whose response to the drought was that – we should build a lot more dams. So you know – I think there are some fairly – or we should drain the coastal-flowing rivers and send them inland. So there are a lot of strange ideas about water and water management, and when you point out that nearly all the rivers already have dams on

them but they don't fill up during droughts ..... "Well, just build more dams, and then we will have more water".

THE COMMISSIONER: Is that right. A dam doesn't fill during a drought.

MR ALEXANDRA: Plenty of them haven't.

THE COMMISSIONER: Don't worry.

MR ALEXANDRA: Actually - - -

MR BEASLEY: Was that part of the SEACI research? Was it?

MR ALEXANDRA: As an aside – it is very interesting, that many of the more recently built dams, large dams in Australia were built high in the catchments and they tend not to fill even more dramatically, whereas many of the – Lake Hume and so forth have a huge catchment and they tend to fill much more reliably. So depending on the climatic sequence that has preceded them – dams have a tendency to be located in different places, but that's an aside.

THE COMMISSIONER: Who would have thought that the storage speed of – or capacity – speed of reaching capacity in a dam would depend upon the efficiency of the catchment.

MR ALEXANDRA: Yes.

THE COMMISSIONER: Remarkable. Yes. Thank you.

MR ALEXANDRA: And then it does actually depend on the climate that delivers the water into that catchment. Yes.

MR BEASLEY: You've sent through to us this morning a document you've prepared entitled "Risk and uncertainty in water planning", which unhelpfully you haven't had paginated.

MR ALEXANDRA: Yes. No; look - - -

THE COMMISSIONER: It's all right. I've read it. I've read it.

MR BEASLEY: Can I - - -

THE COMMISSIONER: We don't need to – we don't - - -

MR BEASLEY: Having expressed that level of chastisement – this document is in the nature of a submission. Correct, Mr Alexandra?

MR ALEXANDRA: Yes. Well, I thought that it would be useful, that - - -

MR BEASLEY: Yes.

MR ALEXANDRA: And I'm happy to reformat it as required, but the - - -

MR BEASLEY: No, no, no.

THE COMMISSIONER: No, no, no, no, no. Pay no attention to the exasperation of Counsel Assisting.

MR BEASLEY: You're not used to me yet.

MR ALEXANDRA: Yes. But I wanted - - -

THE COMMISSIONER: This is very useful. You don't need to elaborate it for me now.

MR ALEXANDRA: Right.

THE COMMISSIONER: It's highly likely to be quoted – as to part of it – I can tell you, if only so that I can get to use the word "stationarity".

MR BEASLEY: I have read through it. Is there anything, though, that you in particular wanted to draw the Commissioner's attention to in this – in the document you've provided this morning? It does seem to pick up almost all of what we've been discussing. But is there anything else that - - -

THE COMMISSIONER: I must say I was much taken by something you've already now referred to today, which is the – going back to the National Water Initiative – the risk assignment clauses.

MR ALEXANDRA: Yes.

THE COMMISSIONER: That is something that had escaped me, and I was grateful for you drawing that to attention. But there's no need to elaborate that.

MR ALEXANDRA: Well, I think there is an interesting part of the story which is one that – while the Basin Plan has unique legislative basis, it really attempts to give effect to commitments made by governments as early as 1994.

THE COMMISSIONER: Quite. A very important pre-history. Yes. Yes.

MR ALEXANDRA: And in one sense – if you like – the reluctance particularly of the state governments to give effect to those commitments to environmental flows as fully as one would assume, when a – and I think the COAG agreement of '94 says something like – you know – "This is the Premier's signing off; we commit to providing environmental flows based on the best available science". And then you

fast-forward to 2008, and there has been very limited effect given to that commitment.

THE COMMISSIONER: Who would have thought it?

MR ALEXANDRA: And then the Basin Plan is in effect the Commonwealth legislating to bring that about as well as the 13 point something billion dollars to make it happen. And then – so one of the matters that – I think – is worth reflecting on is that under our water law – so – which I trace back to Deakin in 1886, all water belongs to the state.

THE COMMISSIONER: Yes. Yes.

MR ALEXANDRA: And the state can determine what it wants to do with it. And I think we've had a failure of public policy in that the – not giving effect to those earlier commitments, leaving it to the point that it turns into a kind of national crisis – but also there has been this – bringing into effect this view that the water is now private-property rights and that entitlements have the same or very similar legal basis to land titles and the state has no right to interfere without compensation. So the point I'm trying to make here is that, if we stand back from the Water Act and the Basin Plan and the way that reform process was implemented – there's a really salient lesson for public policy in Australia with respect to water rights and with respect to water planning that needs to be re-affirmed, that the state still ultimately has full responsibility and can by decree re-assign that water from a – an extractive right to an environmental right without compensation. Now, it may be unwilling to do that, but as a point of law, I think, it's really important. The other thing I haven't concentrated on and that I would like to draw attention to - - -

THE COMMISSIONER: Sure.

MR ALEXANDRA: I know you – one of your - - -

MR BEASLEY: Can we just finish that point though.

MR ALEXANDRA: Yes.

MR BEASLEY: Can I just – so we get it clarified – you've referred to this – the risk path and the National Water Initiative.

MR ALEXANDRA: Yes. Yes.

MR BEASLEY: And you have also raised that commencing at paragraphs 44 and onwards of your statement.

MR ALEXANDRA: Yes.

MR BEASLEY: But you've also raised that argument in the paper you authored, 'Risk, uncertainty and climate confusions in the Murray-Darling Basin' – behind tab 6.

MR ALEXANDRA: Yes.

MR BEASLEY: If I just take you to page 13 just so we can do the correction – where you've referred to clause 46 in that article - - -

MR ALEXANDRA: Yes.

MR BEASLEY: That should be corrected to clause 48. Correct?

MR ALEXANDRA: Yes.

MR BEASLEY: Yes.

MR ALEXANDRA: I suspect that's a typo.

MR BEASLEY: Yes.

MR ALEXANDRA: But – yes. 48, 49 and 50 are my understanding of the key risk assignment clauses that deal with changes in extractive rights due to climate change or public policy.

MR BEASLEY: Yes. Sure. All right. Now, I interrupted you when you said there was another point you wanted to - - -

MR ALEXANDRA: I wanted – it's an area – seeing as I was starting to talk about property rights and the fundamental nature of water property rights and how Australian water law has evolved – I think one of the issues that the Basin planning process failed to really address is Indigenous – an Indigenous share of water.

MR BEASLEY: An allocation of a cultural flow.

MR ALEXANDRA: Well, the question - - -

MR BEASLEY: You don't have to use that term.

MR ALEXANDRA: No.

MR BEASLEY: That's a term that is used.

MR ALEXANDRA: And I was going to say the question, whether we call it a cultural flow or not – I guess my concern is that we – through the Water Act we have the Commonwealth involving itself in a fundamental re-organisation of water in the

basin, and I think there's one or two lines in it that says it should take into account Indigenous interests.

MR BEASLEY: Yes. No. We've come across that. Yes.

MR ALEXANDRA: And yet my view is, if we are talking about a fundamental re-alignment – if you like – or re-assignment of property rights – it was an – a substantive opportunity to deal with those Indigenous concerns about them not being granted any of the rights or whatever. Call it cultural flows; call it economic rights, whatever. But it seems to me - - -

MR BEASLEY: If you think getting climate change in was controversial - - -

MR ALEXANDRA: Yes.

MR BEASLEY: You're really heading into controversial territory.

THE COMMISSIONER: But we haven't lost that chance; have we? Because – the WRPs ought to take that into account?

MR ALEXANDRA: WR – but like they ought to take into account climate change. And now, seeing as you mentioned it – another one of my concerns is the – the Water Act and the Basin Plan say "Go forth, and do more planning at this other scale". My concern is – where are the technical and social competencies going to come from – to do all these water plans that now have a higher expectation; they're going to deal with climate change. They're going to deal with biodiversity. They're going to deal with Indigenous rights, etcetera.

THE COMMISSIONER: And all done and dusted by the middle of the next year.

MR ALEXANDRA: When, in fact, you and I know that nearly all the state governments have been cutting their staff in their water agencies. So, you know, I'm concerned that we have the illusion of a robust planning or public policy process around water planning that keeps on shifting responsibility to other scales, when indeed, it might not get done at that scale. So that is also a very immediate risk to the efficacy of this reform process.

THE COMMISSIONER: That's one of the reasons – that's very useful, I must say. That's one of the reasons I was asking you about chapter 4 of the Basin Plan of which you may have gathered, I had a very, very dim view.

MR ALEXANDRA: Yes.

THE COMMISSIONER: That in response to a pretty terse and direct requirement in the statute to address risks including by identifying strategies to address it, to deal with it, they use a whole lot more words simply to say the same thing.

MR ALEXANDRA: Yes.

THE COMMISSIONER: We – commanded to think it, they say, "We will think about it".

MR ALEXANDRA: Yes. Well, and perhaps, as I said I share those concerns but we also have to respect that that made its way through Parliament without being – you know, it got whatever it was - - -

THE COMMISSIONER: Not disallowed.

MR ALEXANDRA: But it got a great majority vote to not disallow it, so by then there was a view that I guess it needed to proceed in whatever form it was.

MR BEASLEY: I don't have any further questions. Do you - - -

THE COMMISSIONER: I have one - - -

MR BEASLEY: I'm sorry. Yes.

THE COMMISSIONER: I have one question. It's a small point. I just wanted to check your – what you meant. In paragraph 15 of your statement, at tab 1, you say that you also:

> *Are concerned that reliance on long-term flow averages puts at risk the ability to plan to the changing climatic conditions.*

Is that something other than what I will call the inappropriate precedent?

MR ALEXANDRA: I think it goes further than that.

THE COMMISSIONER: Right.

MR ALEXANDRA: I think there is – and I think I may have alluded it to it in the paper I sent through this morning, and I think it does several things. I think one is it provides a false sense of security for those industries, communities and others who are reliant on that water. If - - -

MR BEASLEY: It's potentially unfair, isn't it, I mean to not - - -

MR ALEXANDRA: I think it has equity - - -

MR BEASLEY: - - - give them the best information?

MR ALEXANDRA: Yes. I think it has equity considerations. I think if we – in a liberal democracy, if we think what the role of government is in something like a

rapidly changing world, certainly bringing forth the best available information to let other people make good decisions on is important.

MR BEASLEY: I've just thought of a question.

MR ALEXANDRA: So not from a regulatory point of view but from an informative point of view.

THE COMMISSIONER: So the plan there is not just governmental planning, it is also the planning by individuals who may with wish to invest money.

MR ALEXANDRA: Yes. And that I also think it has a bearing on the likes of infrastructure decisions, so government expenditure or irrigation authorities. I also think it has a bearing, for example, if you are an investor and you want to – you are going to buy water rights and move them around. So – so I guess if there is a substantive caution about the – about the reliability – the projected reliability of water, it – that should be sort of, if you like, up there in lights. So that's one of the concerns I had. And that – I guess it's a concern that – well, I mentioned it earlier, we are unlikely to get a – at least in our lifetime, another $13.5 billion reform process for the Murray-Darling Basin. So I see it as a significant opportunity to get things right. And I have this deep sense that on this particular dimension they haven't been got right. So – and so I see it as an opportunity at least to reveal some of these deficiencies. Well, and perhaps it will be in the hands of other people to attend to rectifying them.

THE COMMISSIONER: Thank you very much.

MR BEASLEY: Do you feel as though – is there anything further you would like to add that you feel we haven't covered?

MR ALEXANDRA: I think we have covered it pretty well.

MR BEASLEY: Good.

MR ALEXANDRA: And I'm more than likely to go away and probably think about another dozen things that I wished I had said on this occasion.

MR BEASLEY: Then don't hesitate to ring.

THE COMMISSIONER: Be in touch with the staff if there's something you want to add.

MR ALEXANDRA: Yes. But, so – and I'm grateful for the opportunity to – as I said, to put it in writing and the support you have given me and so forth. And I wish - - -

THE COMMISSIONER: No, well I – it's – the gratitude is in the opposite direction. I'm much obliged for your assistance and the real care and energy you have put into the material. It really helps me. Thank you very much.

MR ALEXANDRA: Thank you.

MR BEASLEY: All right. So it can be done now, I will tender Mr Alexandra's witness statement of 24 September 2018. I will tender the document supplied today, whatever date it is today. 25 September, I suppose, is it?

THE COMMISSIONER: It is the 25th, yes.

MR BEASLEY: Still 2018, is it? 'Risk and Uncertainty in Water Planning' and I tender all the documents and journal articles and reports that are between pages – sorry, between tabs 2 to 11 of the folder Jason Alexandra Brief. But I also tender Mr Alexandra's curriculum vitae which is behind tab B of my brief.

THE COMMISSIONER: It's headed Background in my version.

MR BEASLEY: There is a background but then attached to that there is an actual curriculum vitae which I will tender as well.

THE COMMISSIONER: Thank you. And I – and there's also the 'Risk and Uncertainty in Water Planning' document.

MR ALEXANDRA: That's the one from today. Yes.

THE COMMISSIONER: Which is – has that been tendered? Thank you.

MR BEASLEY: All right. Yes. Okay.

MR ALEXANDRA: And I will – my last comment is that I'm sure my academic supervisors will be very pleased to see that my papers have been found their way into this forum and are being considered in - - -

MR BEASLEY: All right.

THE COMMISSIONER: Good.

MR ALEXANDRA: In this way.

THE COMMISSIONER: Good.

MR BEASLEY: All right. Thank you.

MR ALEXANDRA: Thank you.

<THE WITNESS WITHDREW [12.51 pm]

THE COMMISSIONER: Very well. We will adjourn until 2 o'clock.

ADJOURNED [12.51 pm]

RESUMED [2.00 pm]

MR BEASLEY: So Professor Young is here. He will have to be sworn.

<MICHAEL DENIS YOUNG, AFFIRMED [2.00 pm]

<EXAMINATION-IN-CHIEF BY MR BEASLEY

THE COMMISSIONER: Thanks, Professor.

MR BEASLEY: Now, Professor Young, you have provided the Commission with a – first of all, a statement dated 24 September 2018.

PROF YOUNG: Yes, that's correct.

MR BEASLEY: Do you have a copy of that with you?

PROF YOUNG: Yes, I do.

MR BEASLEY: All right. And that statement is true and correct?

PROF YOUNG: Yes.

MR BEASLEY: And you also made a submission to the Commission of 11 pages. I'm not sure it's dated. Submitted on 23 July. Your 11 page submission.

PROF YOUNG: Yes.

MR BEASLEY: All right. You are currently at the University of Adelaide and you are the Professor in the Centre for Global Food and Resources. Correct?

PROF YOUNG: Yes, that's correct, yes.

MR BEASLEY: Hold the Research Chair in Environmental Water Policy.

PROF YOUNG: Yes.

MR BEASLEY: And you are a founding Executive Director of its Environment Institute.

PROF YOUNG: That's correct, yes.

MR BEASLEY: And your formal qualifications are those set out in paragraph 2 of your statement.

PROF YOUNG: Yes.

MR BEASLEY: In 2013-2014 academic year you were the Gough Whitlam and Malcolm Fraser Chair in Australian Studies at Harvard University.

PROF YOUNG: That's correct.

MR BEASLEY: What did you do there?

PROF YOUNG: I taught a course on transformational change. I was invited to teach a course on, actually, water policy, and I wrote a book on water policy.

MR BEASLEY: Transformational change in relation to your experience in water policy or - - -

PROF YOUNG: Water, fisheries, forestry, and water pollution, the full experience of my career over 30 years.

MR BEASLEY: Right. And you also spent 30 years at the CSIRO, correct?

PROF YOUNG: That's correct, yes.

MR BEASLEY: What were the positions you held at the CSIRO?

PROF YOUNG: I started off as an Experimental ..... and rose through up to be a Chief Research Scientist.

MR BEASLEY: And when did you finish with the CSIRO, approximately?

PROF YOUNG: I think about 2006, around about then. I might not have the date quite correct.

MR BEASLEY: All right. And in 2003 you were awarded the Centenary Medal for Outstanding Service through Environmental Economics.

PROF YOUNG: That's correct.

MR BEASLEY: Right. If I could turn to your statement, please. Under the heading on page 2, just before paragraph 10, 'Context, A Future of Water Scarcity and Variability'. In paragraph 10 you say "it's important to understand that we may be facing a future of greater water scarcity invariability". In relation to the Murray-Darling Basin, or in particular the southern Basin, there is not much doubt about that, is there?

PROF YOUNG: No.

MR BEASLEY: It's going to be warmer. We don't know how much, but it's going to be warmer.

PROF YOUNG: They are certainly what is predicted at the moment by scientists.

MR BEASLEY: Yes. And because it's going to be warmer the predictions or the projections are less run off into the river systems.

PROF YOUNG: Should it also be drier as well. There is a difference between actually warmer and drier. And one needs to be careful. But I always stress that climate change is probably the least of the issues to worry about. The influences on flow from changes in land use, changes in irrigation practice, changes in demand population, crop types, are much more severe than climate change. You take for example the recent expansion of cotton and the reduction of rice: that has massive implications for hydrological considerations.

MR BEASLEY: Do you want to expand on that?

THE COMMISSIONER: They are both annual crops aren't they?

PROF YOUNG: They are both annual crops, but they grow under different circumstances and require different layouts of land. Will result in the reconfiguration of the land. And as you do that – I can remember when I lived in Deniliquin, farmers with great pride were showing me how they were re – actually aligning their roads so the water flowing over the – their land would flow not any more down to the river but instead flow into retention areas where they could then capture the water and use it for agriculture. So there were a lot of changes going on. It's irrigating at different times.

THE COMMISSIONER: So with cotton and rice is the biggest difference when the bulk of the water is applied?

PROF YOUNG: And when it is applied and how it is applied. Rice is a crop which is actually sitting under water for a period of time.

THE COMMISSIONER: Flood irrigated.

PROF YOUNG: It is flood irrigation in the traditional sense of a solid area under rice. Cotton doesn't require that. It has furrows, so they are very different implications for actually recharged groundwater. I'm not an expert on this, but I know it's different. The thing I have learnt looking at water throughout the world is that hydrology matters and change in land use matter.

MR BEASLEY: Equally, though, I'm right, aren't I, that two of the points you are making at least in paragraphs 10 through to at least 13 of your statement are first of all – and these are both points made in relation to designing a water sharing system, and can we call the Basin Plan a form of water sharing system?

PROF YOUNG: That's exactly how I describe it anywhere in the world. Essentially it's a sharing system.

MR BEASLEY: All right. So two of the things – two of the points you are seeking to make there is that first of all in relation to a water sharing system, it's got to have some consideration – we will get to the detail later – but some consideration as to the projections and likelihood of changes in climate. Changes in water availability because of that. And secondly, I think the point you're making in paragraph 12 is that the system has to be able to respond when there's more sudden changes in climate than were even predicted. And the example of Perth - - -

PROF YOUNG: Yes, I think the example of actually Perth is used around the world now to point that a very small, seemingly small reduction in mean rainfall can cause the need to reduce use by as much as 70 or 80 per cent.

MR BEASLEY: And I think in the paper you have written called – this is behind tab 3 of that folder Sharing Water: The Role of Robust Water Sharing Arrangements in the Management of Water Scarcity, you have given examples of Capetown and Barcelona as well on page 11.

PROF YOUNG: That's correct, yes.

MR BEASLEY: As well as discussing the sudden shift in Perth from 1974 onwards. Equally, in the paper you have prepared – sorry, in the – yes, no, it is. There is an – behind tab 10 there is a paper, 'Environmental Effectiveness and Economic Efficiency of Water Use in Agriculture: the Experience and Lessons from the Australian Water Reform Program'. That was a paper – you were funded to do by the OECD, was it?

PROF YOUNG: That's correct, yes.

MR BEASLEY: And on page 20 of that, pages 20 and 21 of that paper you highlight the sudden change in Perth, and there is quite a graphic graph on the change in stream inflows for Perth – for Perth dams on page 21.

PROF YOUNG: That's correct, yes.

MR BEASLEY: Yes. Okay. The Basin Plan of course as it's currently formed does not – at least in terms of the volume metric amounts for the long term average Basin-wide Sustainable Diversion Limit, has not incorporated into any of its modelling climate change projections. I assume you feel as though that that's a flaw in the Plan.

PROF YOUNG: Not quite. I wouldn't say they should incorporate projections of climate change; it should be designed in a way that expects that the climate will change. There is a difference between putting a lot of effort into predicting what will happen and designing a system that automatically adapts as conditions change. And particularly as is the case in the Basin Plan, where not all forms of water use are included in the Plan, yet there is an obligation to maintain performance of the river and of the groundwater systems throughout. So you need a mechanism that automatically actually adjusts for the things that are not included and for the hydrology that you have got wrong and the hydrology you change.

MR BEASLEY: And I take it that a plan that can make adaptations to those things in real time - - -

PROF YOUNG: Yes.

MR BEASLEY: Rather than will do that in 10 years' time.

PROF YOUNG: Yes. And the state of the art in the world is to build in approximaters to try to deal with that. So when there is a review you actually review how well all those things are automatically adjusting rather than doing, as the Basin Plan does now, is it denies their existence and promise to have a review at a time in the future. And if you look at experience with that policy approach around the world, you find governments try to put off the review, it then becomes savage and politically difficult to handle, and so resource degradation and depletion is accepted until everybody becomes so desperate that you bring in a reform. I would recommend a system that automatically adjusts so everybody lives off a world best system continuously.

THE COMMISSIONER: So it is, as it were, a continuously incremental approach rather than dramatic step change.

PROF YOUNG: Yes, a dramatic step change. And experience particularly in global fishery and forestry and lots of other systems is that unless you have a continuous adaptive framework overseen by somebody who is skilled at doing this, you get into strife. And the best example in, when we were setting up the Murray-Darling Basin Authority, I and others argued that we needed an authority with powers like Australia's Reserve Bank, and the experts should be chosen to make the difficult judgments continuously. As we do with the management of our economy.

THE COMMISSIONER: So that if one expressed sharing crudely as a – a set of rules or arrangements that could be expressed as a numerator and a denominator, the

numerators might differ according to the section of society enjoying that allocation, the denominator should always be the same. That is, the allocable water.

PROF YOUNG: Yes, but the amount that could be allocated could vary.

THE COMMISSIONER: Sure. But so could the assessment of the allocable water as well.

PROF YOUNG: Yes.

THE COMMISSIONER: You are proposing that in order to avoid the sometimes fatal but always painful step changes, it should be expressed by something of the nature of an algorithm that will adjust according to far more frequent acquisitions of data.

PROF YOUNG: Yes. And the state of the art that I'm aware of in the work I've done around the world suggests it is probably a moving average and one which I suggest in my submission is - - -

THE COMMISSIONER: What sort of period is carried along it from a moving average ordinarily?

PROF YOUNG: Depending on the variable, but probably somewhere between 5, 10 or even 15 years.

THE COMMISSIONER: In this country with its huge variability in the Basin climate, what do you intuit would be a decent approach for a moving average?

PROF YOUNG: Well, there are different moving averages. If you look at the system there's water for essential human needs, which – we have the highest of high security water, and something like a 10 year moving average would be sufficient to deal with that. If the amount of water that's available for high security goes down, then cities like Adelaide should be informed of that, and then their water managers need to find an alternative water source or else suggest to people that they actually live elsewhere or use water more conservatively. There is a difference between high security water and general security, it's called in the Basin, and low security.

One of the things that is important for a system which is going to sustain for centuries is you keep all three types of water in place. I often talk to the – actually grape growers and citrus growers in the Basin and ask them to thank the rice industry and the cotton industry and the dairy industry, because when it's dry those businesses shut down so that water is still available. And you need to have a system which enables efficient management of risk through time and to run out of actually general security and low security water because you are guaranteed high security water is designing in a system that takes away one of the critical elements, which is a capacity to adjust through time in perpetuity.

THE COMMISSIONER: One of those mechanisms for adjustment presumably is the policy decision that's been taken to place as few obstacles as possible in the way of trading. Is that right?

PROF YOUNG: Yes. And there are two types of trade. There is permanent trade, as it's called in the Basin, and temporary trade, but essentially trade in shares and trade in allocations.

THE COMMISSIONER: So that the temporary trade is a means by which according to, supposedly, market self-interested decisions by individual entitlement holders, annual or permanent plantings are either not made in the former case, or watered with more expensive water in the latter case.

PROF YOUNG: What happens when you have temporary trade of the allocations or trade of the allocations, is that there is continuous adjustment and questioning about where to make best use of the water through time. In a very dry period then people who were, for example, going to put the water on to grass to feed into cows to produce milk, decide not to do that and they can then move the water through to a citrus grower or somebody else and that's done through a market mechanism very, very efficiently.

If you look back in 2006, when there was a massive drought throughout the Basin, the market essentially worked out what needed to happen in a space of about three weeks with massive volumes of water trading between New South Wales, Victoria, and South Australia. No government could have done that. In fact, while this was happening, government officials were flying overhead trying to attend meetings to work out what to do. You need a decision-making framework which can adjust as fast as water supplies change.

THE COMMISSIONER: Now, the notion of trading water upstream and downstream is one which I gather is really quite important to the operation of this market. Is that right?

PROF YOUNG: Yes. And the Murray-Darling Basin is unique or the southern connected River Murray Basin is unique in that it's probably best described as a link system of bathtubs with weirs holding the water back. So there is a very high degree of control; much more than in most river systems around the world. But it does enable us to have close to one-for-one trading up and down the river, provided you can get it through some of the constraints.

THE COMMISSIONER: That's what I was going to ask you. Notoriously, there is what I call a physical constraint on the volume that can pass into South Australia in any one day. Isn't that right?

PROF YOUNG: The real physical constraint is through the Barmah Choke, which is above the South Australian border.

THE COMMISSIONER: I appreciate that but as a result of that and other configurations, at the border, which – humour me. It's a political thing, not a hydrological thing. At the border we know that there is a limit to how much water can be delivered to South Australia per day.

PROF YOUNG: Yes. That is correct. But that limit is rarely reached. It is much more than the amount that the states guarantee to supply to South Australia.

THE COMMISSIONER: Leave aside the guarantee, at the moment, under the agreement. You may already have answered this in your last answer. Does the market need rules to deal with the limit on how much can be delivered to plantings in South Australia or, so far, has market experience not produced - - -

PROF YOUNG: So far there has never been a problem. What you do need is an exchange rate if there are losses along the way. I would advise against ever making rules to favour certain crops.

THE COMMISSIONER: I understand that.

PROF YOUNG: I can go to the detail of that - - -

THE COMMISSIONER: That would rather defeat the purpose of a market.

PROF YOUNG: The market is to put the water to the highest and best use, whether that be to the environment, to a city or anything else.

THE COMMISSIONER: I understand why you say that. But it shouldn't – it's something I gather you are telling me I don't really need to worry about: the fact that there is a physical limit to how much water can be delivered, say, to permanent plantings in South Australia if they offer the best price in dry times?

PROF YOUNG: That would be my advice at the moment. There is subtleties around trade which I would urge you to worry about. When districts try and stop water trading out of their district because they want to keep the economic development locally that can create problems. Victoria, in particular, has been keen over the years to stop water trading out of its irrigation districts. Farmers on the other hand have been very, very keen to transfer it from areas like Shepparton further downstream where they can pump water themselves out of the river to grow almonds, for example, without having to rely on a complex irrigation system which is very expensive to main

MR BEASLEY: That's around Mildura, you're talking about? That's sort of area. Sunraysia. Yes.

PROF YOUNG: And, actually, Robinvale and now through into South Australia. There is a strong interest and awareness that often the most profitable way to establish a permanent plantation is to pump the water straight from the river yourself

and not rely on a company to supply water to you. But that's detail. I would add, you can design a system without water trading. But then you can only use half as much water, because the thing that water trading does is enables you to use much more of the water actually in a system without striking problems in supply and management.

We could have a fixed irrigation system in South Australia, Victoria, and New South Wales and just take half as much water and have half as much of the production. Half is illustrative, but the reason why you trade is because you can make a lot more money and have a lot more economic growth and development at a regional level whilst not causing harm to the environment.

THE COMMISSIONER: Yes.

MR BEASLEY: I think some of what you have just been touching on you have mentioned in paragraph 15 of your statement. When you're saying that you specialise in designing "robust water-sharing systems" and you say by "robust", they are designed to work well in extreme circumstances. You are talking there about extreme circumstances – things like ongoing drought, for example, or, as is predicted with climate change, periods where despite whatever the change in average temperatures are, there might be, for example, 10 days of over 45 degrees as distinct from five, causing real problems for crops, for example. And you're suggesting a Plan that has got more flexibility than the current Plan that has been based on historical data from 1895 to 2009 in terms of setting its SDL.

PROF YOUNG: Once again I would advise against setting an SDL on historic averages. Experience, as I showed in Perth, is – and Perth – up until 1974 had worked out what is average inflows into its dam system was. Since then, to this very day, they have never once had an average inflow. They have never once had an average inflow. And there was – a sudden shift in climate can occur and a wise and Australian Authority would expect the same thing to happen in the Basin. I hope it doesn't happen, for the sake of all the people involved, but a well-designed system would work off, as I was saying, a moving average of some sort that takes account of the past but doesn't lock us into a regime which assumes that it's always going to rain.

MR BEASLEY: I think we have heard the term even today, and certainly last week, "stationarity is dead". Do you think - - -

PROF YOUNG: Yes. I would agree with that statement and that's where - - -

THE COMMISSIONER: Now that we understand what it means.

MR BEASLEY: It took three goes but we are nearly there.

PROF YOUNG: Stationarity is things that are fixed and what you need is something that's – that actually adapts. Excuse the pun: flows with the state of the system.

THE COMMISSIONER: So the moving average has the feature of taking into account what has happened, if you like, recently but also has the feature that it tries to avoid the distorting influence of what happened remotely.

PROF YOUNG: That's right. So the academic word is "lock in". You lock in expectations that the past will be the same as the future or the future will be the same as the past.

THE COMMISSIONER: And everyone who has given any evidence about climate change in the Basin – or affecting the Basin – seems united, I think, in saying, "If there is one thing we do know – is it won't be the same".

PROF YOUNG: Yes. And you only have to look at the first half of last century which was significantly drier than the second half of last century. And it was in the second half of last century that we built our irrigation systems and when we did it we didn't have the data we now have from the first half, because the records haven't been kept. We have been able to use computer modelling techniques to go back and create a very thorough understanding of the first half of last century, which experienced very long droughts and, even in the last bit of the 1890s, there was some very long droughts throughout Australia.

THE COMMISSIONER: Yes.

MR BEASLEY: The issue we are discussing, you say, in paragraph 25 of your statement, is one where during the development of the Basin Plan you say you tried to convince the Authority to include a mechanism that would allow ongoing adjustment of these limits. And you have criticised the Plan for setting its SDL in a manner that's not dynamic. I take that is a reference to being the opposite of stationary. Who were you trying to convince and what was the nature of the discussions?

PROF YOUNG: The nature of the discussion was I was watching what was happening in the development of the Basin Plan, I can't remember the order and exactly what happened but I wrote a droplet on – actually building a continuous adjustment system into the Basin Plan. And I was - - -

THE COMMISSIONER: You wrote a droplet.

PROF YOUNG: I wrote a droplet, yes. I used to write a series of droplets which were - - -

THE COMMISSIONER: A droplet is - - -

PROF YOUNG: Is a two-page article that I would release about every three months on one suggestion for reform in water management in Australia. And one of them I wrote was an argument for bringing in an adjustment mechanism for the sustainable diversion limits. The Authority, to its credit, invited me then to go to Canberra and meet with them on several occasions to talk through the case for an adjustment mechanism because they too were aware of the merits of having such a mechanism in place.

By the time the amendments to the Basin Plan had got through, it was adapted back from being a proposal for an ongoing sustainable diversion adjustment mechanism to a mechanism that would allow adjustment through until, I think, it is 2024 but then after it would be fixed and you would rely on the other mechanisms of a periodic review of the entire Basin Plan. And I was arguing – and I still do argue – that a state of the art, well-informed manager of a Basin would continuously inform everybody of the changes that are occurring throughout the Basin, and have an adaptive framework. Just like a manager of a company always announces the dividend every year and makes sure that everybody understands it can go up and down.

THE COMMISSIONER: What was said to you by way of objection to or refutation of that approach?

PROF YOUNG: When I was meeting with the Authority staff at the time – or, actually, the Authority members, not the staff – there was concern about - - -

MR BEASLEY: It may have been the Commission at the time, wasn't it?

PROF YOUNG: Sorry?

MR BEASLEY: It may have been the Commission at the time, was it?

PROF YOUNG: No, it was the Authority.

THE COMMISSIONER: No, the Authority.

PROF YOUNG: It was the Authority.

THE COMMISSIONER: So you are talking about meeting the board.

PROF YOUNG: Meeting the board of the Authority as it was then constituted. We were talking through the need for a sustainable diversion.

THE COMMISSIONER: This is about, what, 2010?

PROF YOUNG: I would have to go back and look up very carefully what the dates would be. It would be 2008, '09, '10, somewhere in there.

MR BEASLEY: The Authority became the Authority from the Commission in January 2009.

PROF YOUNG: And so it was after that. It was early on and there was an adjustment mechanism brought into the legislation.

THE COMMISSIONER: It was before the SDL was set.

PROF YOUNG: No, the Basin Plan had been put together in its concept stage, and, actually, the legislation had been written and the Basin Plan was in the process of development and one of the issues – I raised a whole pile of issues about how this should happen and one of them I raised was the need to have an ongoing adjustment mechanism.

THE COMMISSIONER: The Plan was being drafted; it had not yet been fixed?

PROF YOUNG: The Plan had not yet been fixed. In fact, it was still at the very, very early stages and they hadn't even gone out to full consultation.

THE COMMISSIONER: So promulgating a SDL in terms that yield a 2,057 gigalitre recovery had not occurred but was in train. Is that right?

PROF YOUNG: It was in train, yes. So they hadn't signed off on the final form of the Plan.

THE COMMISSIONER: So do you recall anybody who enunciated to you a reason to reject your continuous adaptive approach?

PROF YOUNG: No. But in all of these things it's not the Authority's prerogative to change the legislation. They took recommendations through into the political system, which I was not part of. I briefed them on the issue, but they listened very, very carefully. We had various careful discussions around fine point detail as to what could be done. And then it was decided to go off and try and build in an adjustment mechanism, which led ultimately to all the discussions about up-water and all the rest of it that have come out of that process.

THE COMMISSIONER: As you understood it when you were having these discussions, was it then understood that there would be promulgated an SDL which, subject to a legislated change, would remain the SDL?

PROF YOUNG: Yes. That was the expectation.

THE COMMISSIONER: I suppose I'm wondering where that comes from in the statute.

PROF YOUNG: I would have to go looking, but I know in section 10(12) of the
- - -

THE COMMISSIONER: That's the Plan.

PROF YOUNG: Of the - - -

THE COMMISSIONER: No, that's the Plan.

PROF YOUNG: Of the Plan.

THE COMMISSIONER: Which is not the Act. The Act stipulates what the Plan must do.

PROF YOUNG: Right. I'm dealing with a lawyer here - - -

THE COMMISSIONER: Yes, you are.

PROF YOUNG: - - - and I'm not the lawyer and it's possible I have got some of this wrong.

THE COMMISSIONER: No. That's all right.

PROF YOUNG: I can remember having a discussion about the importance of changing this that led to a need to amend the Basin Plan – sorry – the Water Act - - -

THE COMMISSIONER: Yes.

PROF YOUNG: - - - so that they could bring in the adjustment mechanism.

THE COMMISSIONER: That's right.

PROF YOUNG: But I think your question is whether or not the SDL framework was locked into the Water Act.

THE COMMISSIONER: Yes. At the time of these discussions you recall, did you understand that people thought the Water Act meant there would be an SDL fixed just once?

PROF YOUNG: Yes. But it might be that came out of the work that the – that the Authority was doing and they had put that interpretation in it. And there's no SDL mentioned in the Water Act.

THE COMMISSIONER: There is, believe me. It's a fundamental – so 23A, which is for the two statutory adjustments - - -

PROF YOUNG: Yes.

THE COMMISSIONER: - - - that wasn't introduced until 2012.

PROF YOUNG: Right.

THE COMMISSIONER: And it provided for adjustments, as you have pointed out in your statement, basically, for efficiency reasons, taking place under the Basin Plan, so that the Basin Plan was where you would find the way in which adjustments could be done. And it turns out that it was going to be done from proposals said to commence in 2017.

PROF YOUNG: Yes.

THE COMMISSIONER: Proposals to be made in 2017. And then to be adjusted, reconciled as it's sometimes put, in 2024.

PROF YOUNG: That's correct. And then there is a future major review that comes up further down of the whole Plan once it's fully implemented.

THE COMMISSIONER: Yes. Well, the Plan has got a limited duration.

PROF YOUNG: Yes.

THE COMMISSIONER: So that it will be passed to another political generation, the question of what to do with SDL.

PROF YOUNG: Yes. My strong advice is that it's a continuously adjusting mechanism.

THE COMMISSIONER: ..... whereas, you say, "Well, don't kick it down the road. Put in place a mechanism that is more hydrologically realistic, socially variable and politically feasible."

PROF YOUNG: It might be very difficult to bear, as Perth discovered. But if we had a – the biggest mistake that was made in Perth was a discussion that went on for many years after 1974, saying it was a drought and it's going to rain again. And it took Perth a long time to conclude that it had to plan differently. But, in retrospect, water managers there will argue very strongly for an adaptive mechanism that forces timely and early investment in changes as they start to occur.

THE COMMISSIONER: A stitch in time.

PROF YOUNG: Yes.

THE COMMISSIONER: Well, now, you couldn't have a continuously adapted SDL unless you had continuously available and scrutinised hydrological and environmental observations, I take it.

PROF YOUNG: Which you have.

THE COMMISSIONER: Well, do we have that for the environment?

PROF YOUNG: We have it in terms of flows out the end of the river.

THE COMMISSIONER: But not in terms all the multifarious points in between concerning the health of communities and biota.

PROF YOUNG: Yes. Let me just take the discussion slightly to one side for a minute, because it's important.

THE COMMISSIONER: Please.

PROF YOUNG: The SDL is only one thing. If you think of the Basin as a tank - - -

THE COMMISSIONER: Yes.

PROF YOUNG: - - - there is the bottom bit of the tank which is always needed. But then there's a part of the tank which can be used and then there's floodwater.

THE COMMISSIONER: ..... the third one, which is not in the tank but above the tank.

PROF YOUNG: Yes, which is above the tank, which is the flood water.

THE COMMISSIONER: It's all right. The above the top third of the tank. Yes.

PROF YOUNG: It's very clear to understand at the moment we don't have a minimum flow specification that's properly articulated throughout the system.

THE COMMISSIONER: Am I remembering – yes.

PROF YOUNG: What the UK calls hands-off flow.

THE COMMISSIONER: Yes. Am I remembering correctly that there's a very crude rule of thumb about consumptive take and hands-off. Is it two thirds or have I got that wrong? That if you're taking more than a third you might be in trouble?

PROF YOUNG: Some people have argued that.

THE COMMISSIONER: I'm sure that's not true all around the world. I just heard about it as a rule of thumb.

PROF YOUNG: I would never say it. I have heard it said by people who are very learned hydrologists, but they're always talking about the circumstances where they live, rather than anywhere around the world.

THE COMMISSIONER: The Rhine, for example - - -

PROF YOUNG: Yes.

THE COMMISSIONER: - - - is not much of an example for us.

PROF YOUNG: No. Exactly. But the lessons are there. So there's a minimum amount. And then but what really matters in terms of data allocation are all the rules that determine how much water is made available week by week and month by month. And they are actually more critical that – than actually the SDL. And, in fact, in a state of the art system you wouldn't talk about environmental water. You would split the environmental water up into a lot different functions that occur. The sum of that can be held as an entitlement exactly the same as an irrigation entitlement. There is - - -

THE COMMISSIONER: What we call held environmental water.

PROF YOUNG: Environmental water, yes. And then there's water shares that are held by the environment. And then there are water shares held by cities and by irrigators and everybody else.

THE COMMISSIONER: I don't think it's possible - - -

PROF YOUNG: That can be a fluid system.

THE COMMISSIONER: So to speak.

PROF YOUNG: Yes. And that would be the water is taken for the environment and evaporated and transpired. And while it's difficult to meter that water, you can estimate how much is used. And I find it surprising that the same water accounting disciplines are not put on environmental water as are put on water for other consumptive uses.

THE COMMISSIONER: Well, if you build up the process for understanding how much is available to be allocated, particularly to consumptive use, by the statutory notion of limiting take to a point beyond which there would be a compromise of environmental values, doesn't it follow that you will need continuously available and appropriately scrutinised data on the environmental health, if you like, or the environmental state of the river?

PROF YOUNG: Yes.

THE COMMISSIONER: Of the Basin.

PROF YOUNG: Yes. But how much information you need is always debatable.

THE COMMISSIONER: Quite. Absolutely.

PROF YOUNG: And you can do a lot with crude proxies and getting things approximately right, granted expensively, correct or - - -

MR BEASLEY: Or comprehensively wrong.

PROF YOUNG: Yes, or comprehensively wrong.

THE COMMISSIONER: But if we took – I think the crudest of the proxies, I gather, is a volume out the Mouth.

MR BEASLEY: Yes

THE COMMISSIONER: And one of the reasons why it's regarded as a crude proxy is that volumes, times and locations for the whole of the system are critical for environmental outcomes in a way that merely measuring an annual discharge from the Mouth may not capture at all.

PROF YOUNG: I would agree with that, yes.

THE COMMISSIONER: But I do understand what you mean by a proxy and the notion of a crude proxy. Let me assume that a notion of indicator sites or indicator measures is put into practice, presumably, modified from time to time according to consensus science in order to provide some reporting capacity as well as planning capacity. The approach of adaptive – an adaptive process for allocating would necessarily involve then at some level, presumably, at the MDBA level, but perhaps collaboratively, at least as much attention to the environmental matters as to the hydrological matters.

PROF YOUNG: Yes. I think a lot of this is - - -

THE COMMISSIONER: That doesn't – it doesn't seem to come out from either the Act or the Plan or current practice.

PROF YOUNG: Yes. If I was able to start again, I would argue much more strongly than I did at the time for a continuously adapting sustainable diversion-level Basin diversion limit, simply, because it starts the dialogue.

THE COMMISSIONER: Yes.

PROF YOUNG: If every person in every region knows that every year their diversion limit is going to change, then they can talk with excitement when it goes up and talk with disappointment when it goes down, but the dialogue is part of what you're looking for. And then there's pressure on people to improve their understanding of what's going on, but understanding always that a wise manager would continuously adapt.

THE COMMISSIONER: If you want to make the risk of, say, drying placed upon what I will call consumptive users rather than the environment, then it seems of the essence, that you need to know what is the state of affairs, including at a relatively broad-brush hydrological level, below which in fact the environment is bearing the risk.

PROF YOUNG: Yes.

THE COMMISSIONER: Yes.

PROF YOUNG: And behind that you also then force an open discussion about other means of capturing water that are outside the SDL mechanism, and that includes return flows; it ..... overland-flow capture - - -

THE COMMISSIONER: In your paragraph 28 of your statement, you express a suspicion that the majority of the water used to grow almonds under drip irrigation will come from land that previously was used to flood-irrigate pasture. That's an observation you make because of the disparity of return water between those two techniques. Is that right?

PROF YOUNG: Yes.

THE COMMISSIONER: Much less return water under drip irrigation for almonds than flood irrigation for pasture.

PROF YOUNG: That's correct; yes.

THE COMMISSIONER: And by the way just – this is just a matter I couldn't understand. In paragraph 30, in the third line you say "the latter option". And in the fifth line you talk – you refer to the latter approach. In each case are you referring to the net-accounting system?

PROF YOUNG: I haven't read the paragraph. But, yes, I always talk about net-accounting systems and the importance - - -

THE COMMISSIONER: You better just read the paragraph for me just to make sure I've understood it correctly, that – you set out option 1 and then option 2, and then you say in the past the latter option has been expensive - - -

PROF YOUNG: Right. Yes. So what's - - -

THE COMMISSIONER: The latter option there – do you mean - - -

PROF YOUNG: The net-accounting systems.

THE COMMISSIONER: I see.

PROF YOUNG: Net-accounting systems are expensive to administer under conventional systems, because it requires you to identify the crops that are grown and the type of technologies that is used to apply water paddock by paddock and sum it all up. And that in the past required - - -

THE COMMISSIONER: That's in order to infer an amount of water returned. Is that right?

PROF YOUNG: That's right, yes.

MR BEASLEY: Through some sort of estimation process.

PROF YOUNG: Through some sort of estimation practice.

MR BEASLEY: Yes.

THE COMMISSIONER: Ultimately biologically and physically based.

PROF YOUNG: Yes. And that used to be very, very expensive, because it required you to send an inspector out to record what was going on paddock by paddock.

THE COMMISSIONER: Yes.

PROF YOUNG: And so it was rarely done. Changes in the United States now in satellite technology and GIS systems and the capacity to actually estimate evapotranspiration on a square-metre basis have – are changing that, and there are firms in the United States now claiming they can do it. And some businesses are using that information to manage their own irrigation on their farms. But as far as I'm aware – there is no irrigation community or – in the world which has moved to a satellite-based net-accounting system, but it is now under very, very serious consideration in California. And I would expect them to decide to try and adopt it. So this is the frontiers.

THE COMMISSIONER: Option 1 is in a sense a netting approach; is it not?

PROF YOUNG: That's right; yes. But you do it across the board.

THE COMMISSIONER: Yes.

PROF YOUNG: So rather than trying to assess it for the – farm by farm, you say "Okay; on average water-use efficiency in the Basin has gone up five per cent. So we take five per cent off everything's allocation".

THE COMMISSIONER: I understand. Yes.

PROF YOUNG: And that's a windfall gain for the people who move first.

THE COMMISSIONER: That's right.

PROF YOUNG: And it's a loss to those who move last. Very simple.

THE COMMISSIONER: May even be salutary.

PROF YOUNG: But once again it starts a debate and makes everybody aware of what's going on.

THE COMMISSIONER: Doesn't it. Thank you.

MR BEASLEY: You referred the Commissioner at one stage to 10.12 of the Basin Plan, which says that for annual determinations of water ..... permitted to be taken the Authority has got to account for – and this is 10.12 1c.

PROF YOUNG: Yes.

MR BEASLEY: Return flows.

THE COMMISSIONER: What does the next phrase mean?

> *in a way that is consistent with arrangements under the agreement immediately before the commencement of the Basin Plan.*

MR BEASLEY: No idea. The fact is they don't account – they haven't accounted for return flows at all in the - - -

THE COMMISSIONER: Yes.

PROF YOUNG: I can place two interpretations on that. One is the interpretation which has been placed, that actually you don't. The other is – that means you refer to the state of water use at the time. The convention throughout the Murray-Darling is that you look at the arrangements and the land-use practices and water-use practices that were in place at the time. And I would place that latter interpretation so that would require you to adjust for changes in return flow at the date which was – which occurred just before the Basin Plan came into effect.

THE COMMISSIONER: So - - -

MR BEASLEY: Yes. But in terms of the efficiency measures and the water that's said to be recovered through them – return flows has not been accounted for at all.

THE COMMISSIONER: So the first one you suggested to me, though, is that the phrase "in a way that is consistent with arrangements under the agreement immediately before the commencement of the Basin Plan" translates to "Don't bother".

PROF YOUNG: No. I don't place that interpretation. Your staff did. I think it's the other interpretation that you have to use as a benchmark the proportion of - - -

THE COMMISSIONER: Yes.

MR BEASLEY: Sorry. That was not my – I wasn't interpreting the clause - - -

THE COMMISSIONER: No one – I don't think anyone – I hope no one is interpreting it that way. But I'm actually asking – do you know what it means, to talk about a way that is consistent with arrangements under the agreement? What does that mean?

PROF YOUNG: As a lawyer I don't. My interpretation – this could be argued in law; there are a number of phrases throughout all of which which are close to gobbledygook. I think this means - - -

THE COMMISSIONER: They're much closer than close. They are gobbledygook. Yes.

PROF YOUNG: Right. They are gobbledygook. My interpretation of this bit of gobbledygook is – you look at the land-use arrangements and water-use arrangements at the time, at the date immediately before the Plan came in, whatever date that was.

THE COMMISSIONER: Yes.

PROF YOUNG: And at that point in time you use that as the reference. So if there has been a decline in return flows after that, then – my reading of this is the SDLs should be adjusted or – might leave the SDLs in place but have a margin that can never be accessed, because return flows have gone down.

THE COMMISSIONER: Yes. Thanks.

PROF YOUNG: Does that make sense?

THE COMMISSIONER: No, it doesn't, because – no; your answer is fine – with respect, but no, the thing – the reference in 10.12 1c doesn't make sense to me. But I will continue to nut it out. It's all right.

PROF YOUNG: And you also might like to look on – you haven't got it in front of you, but in the same section – section g says "changes over time".

THE COMMISSIONER: No. I do have it front of me. Yes.

PROF YOUNG: Okay. Section g is interesting – and particularly the note in section g, which talks about a gross and use strategy, which I would interpret once

again to mean – this means that, if the change is in the way water is used that needs to be accounted for - - -

THE COMMISSIONER: What does it mean, though, to say it must be accounted for?

PROF YOUNG: I think this means – in terms of adjusting the SDL mechanism.

THE COMMISSIONER: Yes. I mean – you might be right.

PROF YOUNG: I've been engaged in some discussions with people around this in recent time, and I went back looking to see whether or not the Plan dealt with this properly and - - -

THE COMMISSIONER: See – 10.10 is about the annual determinations within each SDL resource unit.

PROF YOUNG: Exactly. So once again it's the rules for allocating the water that's available, and this, as you point out, is critically important for determining the health of the river, much more important than the SDL.

THE COMMISSIONER: Absolutely. The WR – exactly. Exactly. The WRPs, that will really run the place, and so 10.10 says the Water Resource Plan must set out the method for determining the maximum quantity of water that the Plan permits to be taken for consumptive use during a watering-accounting period. And in 10.10 3a, it says that the method must account for the matters in 10.12, which is the one you've drawn to attention.

PROF YOUNG: Yes.

THE COMMISSIONER: And I'm trying to nut out what that means in relation to – for example – return flows. I think it means that return flows are – as it were – credited.

PROF YOUNG: Yes, or actually debited, if they go down. So - - -

THE COMMISSIONER: Depends on which side you're looking from. Yes.

PROF YOUNG: Yes. But they must be accounted for in the debit-credit frame-work that's put together.

THE COMMISSIONER: Yes. Yes. Thank you. Yes. Thanks. I think that's right.

PROF YOUNG: Yes. If I was actually on the Authority, I would be reminding the members this is what we need to do and say "Are we doing it, and how are we doing it, and where can I see the data that shows that we are doing it?"

THE COMMISSIONER: Because – in a sense, though there may be interim plans at the moment, there are no WRPs yet. So - - -

PROF YOUNG: Yes, and we're getting very close to having to have them all suddenly prepared.

THE COMMISSIONER: Yes; that's right.

PROF YOUNG: I think, if you – I haven't seen the guidelines for the – for, actually, the preparation of these plans. I don't know if you have seen them.

THE COMMISSIONER: I've seen some.

PROF YOUNG: But do they include - - -

THE COMMISSIONER: Not that I know, but I wouldn't be able to say off the top of my head.

PROF YOUNG: Yes.

THE COMMISSIONER: Mind you, you don't need a guideline to have to obey 10.12.

PROF YOUNG: Say that again.

THE COMMISSIONER: You don't need a guideline to have to obey 10.12.

PROF YOUNG: No, but it would useful, if each of the WRPs included a statement as to how this was going to be done and how people were going to be informed of changes in return flows and implications for it, how base flows were going to be maintained, in fact, what the base flows was or the hands-off water was.

THE COMMISSIONER: Indeed.

MR BEASLEY: Well, in a sense, when you're – when you talk about – paragraph 17 of your statement – you talk about – in terms of designing a robust water-allocation system – you say the first step is to decide what water needs to be left in the system to maintain an adequate flow to supply essential ecosystem services. You say it's – it could be known as base flow or conveyance flow; in the UK it's known as hands-off flow. I think under the Water Act it's, probably, the amount of water below which you start to compromise key environmental assets or key ecosystem functions. That's the way it's defined in the Water Act. You are talking about something different?

PROF YOUNG: No. I could work within that definition.

MR BEASLEY: Yes. Yes. So - - -

PROF YOUNG: Recognising also there are tier 2 and tier 3 conditions which kick in in emergencies.

MR BEASLEY: Yes. But we were talking about – before about what should bear the risk, the environment or consumptive use. In a sense the Water Act demands that the environment shouldn't have to bear the risk, because it sets this environmentally sustainable level of take that says there can be no more water taken beyond the point by which you would either compromise or perhaps – another way of saying it – put in danger key ecosystem – key environmental assets, key ecosystem functions et cetera.

PROF YOUNG: I would never explain it that way.

MR BEASLEY: Yes?

PROF YOUNG: Because to me there are core essential environmental functions, and then there's a set of environmental functions which we would like to have and which can be traded and managed through held environmental assets.

MR BEASLEY: Sure. And they may not be key assets.

PROF YOUNG: There's an absolute minimum, which we don't go below.

MR BEASLEY: Yes.

PROF YOUNG: And that's what has worked as absolute minimum, recognising there's held ..... water that can be moved around the Basin and used to maximise environmental outcomes and do things like promote tourism, facilitate recreation, and there's also flood water that comes in over the top. So I'm asking or suggesting a much more sophisticated discussion, and we don't just talk about environment as one thing. There is a core function that's needed and often the base flow is needed by everybody. Actually the city of Adelaide needs water to be flowing past Murray Bridge, so it can get the water out. So do irrigators down ..... Langhorne Creek. There is water that's needed for actually – it's things like actually navigation.

THE COMMISSIONER: That's one of the reasons why it's sometimes – it seems a very dull, utilitarian term, but why it's sometimes called a conveyance flow.

PROF YOUNG: It is. Yes. It conveys - - -

THE COMMISSIONER: ..... think about a river.

PROF YOUNG: - - - the water that everybody needs. Yes. It's conveyance.

THE COMMISSIONER: Yes. Odd way to think about a river, but perhaps a very grim functionalist approach.

PROF YOUNG: Well, this is a very grim, functional business, unfortunately, of getting something right.

THE COMMISSIONER: But a very anthropocentric approach, perhaps.

PROF YOUNG: Yes.

THE COMMISSIONER: If you can have degrees of anthropocentric. Which you can't, no doubt.

MR BEASLEY: Now, the last sentence of 17 where you say – I will read it out:

> *In general, access to the hands-off flow should be contemplated only in extreme conditions. The Water Act wouldn't allow –*

I take it by that you mean – well, tell me, do you mean by that that the hands-off flow can be used or could – water from the hands-off flow could be allocated for example to a farmer during a drought. Or are you talking about something different?

PROF YOUNG: I'm talking about something different.

MR BEASLEY: Right.

PROF YOUNG: In extreme circumstances, as happened back in 2006 in the heart of the drought, that the Lower Lakes were dry.

MR BEASLEY: Right.

PROF YOUNG: The government was going in bulldozing in access to wetlands and stopping water flowing in because we were truly in a desperate situation.

THE COMMISSIONER: You're talking about seawater?

PROF YOUNG: No. This was surface water flowing down. It almost stopped. Hume and Dartmouth dams were virtually empty.

THE COMMISSIONER: And what were the temporary earthworks doing?

PROF YOUNG: They were – right along the river, wherever there was a backwater that you could close off and let dry out, then you would do that to save the evaporative losses from those areas. So there were a lot of temporary works put in, there was serious discussions about building a weir at the bottom of the ..... river before the Lower Lakes.

MR BEASLEY: Sorry. Is this all to prioritise one environmental asset over a more important environmental asset?

PROF YOUNG: No. This was to prioritise water access for essential human services.

MR BEASLEY: Right. Yes, of course. Okay.

THE COMMISSIONER: To maintain sufficient depth for pumping.

PROF YOUNG: Yes. And as part of that to still make a very small volume of water available for essentially permanent crops, but done through a trading environment. But there are circumstances when you can imagine emergencies are needed. And they can also be done through quality reasons if there is a massive outbreak in algae blooms or something which requires, essentially, the entire Basin Plan to be suspended.

THE COMMISSIONER: In order, you mean, to increase flows?

PROF YOUNG: Or to manage out of whatever situation – it might just be to make water available. You probably can't increase flows. Probably to reduce flows or to stop flows in one direction. And I strongly support the inclusion of essentially tier 1 and tier 2 conditions and the mechanisms around that which enable each state separately to call the transition through if they consider it's an emergency.

MR BEASLEY: Sarah Avey, A-v-e-y, has just sent out a Tweet saying Basin Authority came into existence March 2008. So that's helpful. So I don't know if that helps what year you had those discussions. Can I just - - -

PROF YOUNG: I suspect it was later than I was first talking about and I need to go back – but I have been thinking about the dates.

MR BEASLEY: Just before we come back to your statements can I – you mentioned that you put out little publications called droplets. I think we have an example of that. If you go to tab 13, that's an example of one of your droplets in relation to the topics there. Principle 1, etcetera. Is that what you are referring to?

PROF YOUNG: Yes. That's exactly what I'm referring to.

THE COMMISSIONER: Sorry. Is this the one that you were referring to?

MR BEASLEY: I think it may be.

THE COMMISSIONER: Is this the one that they invited you to Canberra to talk about, do you think?

PROF YOUNG: It's an earlier one. I wrote another one that follows up from this as well, which talks about an adjustment mechanism where I proposed a formula.

THE COMMISSIONER: Would we be able to - - -

PROF YOUNG: I can get that to you, yes, no problem. It's up on the internet available and available publicly.

THE COMMISSIONER: Well, if it's on the internet we will find it. Thank you very much.

PROF YOUNG: This is the one I wrote because I was thinking, at the time it was written in 2008, I was thinking through what a cap would look like and how it would be sustainable.

THE COMMISSIONER: What did you understand the thinking, if I can use that word loosely, to be behind the bumper sticker? Zap the cap, which I presume means, "Let's have no limits."

PROF YOUNG: Yes.

THE COMMISSIONER: What was the thinking behind that?

PROF YOUNG: I was living at the time when the bumper sticker was put on cars. I was living in Deniliquin in New South Wales, and in the late 1980s water managers around Australia became aware of the fact that they could no longer go on developing irrigation. We had essentially got to roughly where the limit was. And there were massive concerns then about salinity as well, and river salinity, and as part of that process governments started a debate around the need to put a cap or a limit on water resources.

THE COMMISSIONER: Yes.

PROF YOUNG: Farmers at the time were totally opposed to the idea of having limits.

THE COMMISSIONER: What does that mean, totally opposed to having limits? They just take as much water as they like whenever they like?

PROF YOUNG: Yes. They wanted a different solution of something could be done and people were thinking having a limit would be wrong.

MR BEASLEY: It would have to rain more would be the only - - -

THE COMMISSIONER: What was the idea, that - - -

PROF YOUNG: You would have to ask them, not me.

THE COMMISSIONER: But you were there. I was just wondering - - -

PROF YOUNG: It was a concern. And this is a global concern. It's not just here. People hate setting limits and hate having to live within a budget.

THE COMMISSIONER: I disagree completely. People love setting limits. Employers don't want to pay employees more than a certain amount of money.

PROF YOUNG: When it comes to water everybody wants more water.

THE COMMISSIONER: People don't want to pay more tax than the law that they would like to see would impose. People love limits. It's not true people don't like limits; they love them.

PROF YOUNG: Okay. Well, at the time there was a debate and people were hoping a way would be found to allow development to continue. And the way – one of the ways this was being expressed was in language that was running around saying "zap the cap".

THE COMMISSIONER: Well, that may be as intelligent as people who burn the guide.

MR BEASLEY: .....

THE COMMISSIONER: An opinion that I am required to – historically to recognise was held but which I'm afraid I can find no reason to respect. It doesn't seem to me to be a valuable addition to pluralist thinking at all.

PROF YOUNG: Behind this is another strategic opportunity, which is often used in different parts of the world, and which I'm seeing happen in the United States at the movement, that when a discussion around actually bringing in a limit comes into place people then have an incentive to get through before the limit is put in place.

THE COMMISSIONER: Yes.

PROF YOUNG: And so behind this is what is called in fishing, fishing for quota. There are people who – and they are fearful the government will come in and say all development after a certain date will no longer be recognised.

THE COMMISSIONER: The well-known phenomenon of more military style firearms being sold when fears are held for a new limit.

PROF YOUNG: That's right. So probably a separate explanation of the idea zap the cap, which was happening in the early 1990s as a slogan, was around, "I just need a little bit more time to develop more of my farm before there are no more water licences issued."

THE COMMISSIONER: You mean, "Limit him and not me."

PROF YOUNG: Yes. Or, "Don't limit me until I have got my business in place."

THE COMMISSIONER: And then grandfather me.

PROF YOUNG: And then grandfather me in.

THE COMMISSIONER: This is a very jaundiced view of human nature, isn't it?

PROF YOUNG: Yes.

THE COMMISSIONER: It doesn't mean it's not right.

PROF YOUNG: I see it happening at the moment in the United States. Massive investments going in. People putting in millions of dollars investment actually into groundwater use in areas that are already over drafted, but they are going into to make sure they are part of whatever sharing regime is put in place. The Californian Government has passed legislation that says that changes in groundwater use after 2016 will not be recognised, but when push comes to shove you would expect the local communities to recognise what happens after 2016 as they roll out the new sharing regimes.

THE COMMISSIONER: Well, it's familiar in tax law reform to announce, before the legislation has been enacted, the date which will be, as it were, operative and retrospectively so people don't game the system between the announcement of the initiative and the enactment of the law. Why couldn't that happen with water as well?

PROF YOUNG: You will have to ask the politicians at the time and the Ministers at the time who were nervously putting this together. It might be – and I'm speculating here – it might be because of the existence of the Murray-Darling Basin Commission, in that stage not an Authority, and everything was done by consensus. And a meeting of the full Commission with all the Ministers typically involved over 30 people in the room trying to come to consensus, and it was a very difficult process. So for Australia to get to a cap actually is an international milestone. There are very, very few river systems in the world that have an absolute binding cap.

THE COMMISSIONER: Well, obviously with international rivers there are much greater problems than there are with rivers that – within one nation, albeit a federal one. I mean, you can explain a lot of the history – that sadly disappointing history of the Basin as being the result of inter-colonial rivalry and then federation. But at least we don't have the problem that many countries have of international rivers.

PROF YOUNG: Yes. As I have said in my submission to your Commission, I think the Basin Plan is probably the best water resource management legislative framework that exists in the world.

THE COMMISSIONER: And I can understand why you say that too.

PROF YOUNG: It's very, very close to being world best practice. The changes that I'm talking about in my submission are fine tuning. The basic structure is wrong. I

argue, strongly I hope, for more independence of the Authority. It is too much under political control.

THE COMMISSIONER: The basic structure is right, do you think?

PROF YOUNG: The basic structure is right. The size of the Authority is right. It's a small Authority, it's six members, not a big unwieldy beast. It is empowered to deal with all the things we have been talking about. It could define sustainable diversion limits in an adjustable way. It could build in, as you say, guidelines for Water Resources Plans that require conveyance water, base flow, whatever you want it to be defined. Properly, it could act as a truly the world's very, very best water management authority. It's close.

THE COMMISSIONER: No, I understand why you say that.

MR BEASLEY: Just can you help me with this, Professor. Jessica Bajger and Michael Opacic have just sent me a Instagram of droplet number 19: Sustainable Diversion Limits, a Plan for the Murray-Darling Basin, 25 July 2011, where you have set out section 23(2) of the Water Act involving three choices for the Authority. (a) – this is for the SDL – set a number, (b) use a formula, (c) specify sustainable diversion limits in any other way that the Authority determines to be appropriate. You prefer option (c) because it allows the Murray-Darling Basin Authority to be as innovative as it wants to be and then you say this:

> *Options – paraphrasing Dorothea Mackellar – a good Basin Plan needs to plan for droughts and flooding rains and, given the likelihood of changes in technology and climate, a fixed number based on averages does not seem like a good idea. Conceptually, a formula sounds better than a number as it could allow for change, but all the variables in the formula and all the coefficients in the formula would need to be right from day 1. Difficult. Given these limitations we believe that option (c) is worthy of serious consideration. The Authority could specify SDLs so that continuous improvement in the management of the Basin's resources becomes possible. If option (c) is chosen SDLs could be published in the Basin Plan of 2012 but specified as the starting point in a continuous search for better ways to manage and use the Basin's water resources. In other words an adaptive SDL register.*

PROF YOUNG: Yes.

MR BEASLEY: So that's the one that you discussed with - - -

PROF YOUNG: That's correct. And you can help me by telling me what date is on the top of that?

MR BEASLEY: It's 25 July 2011. And you actually – in the acknowledgment you say:

The opportunity to explore some of the ideas expressed in this droplet with the Board of the Murray-Darling Basin Authority is acknowledged with appreciation.

PROF YOUNG: Well, you now have the date when I was meeting with them.

THE COMMISSIONER: I'm much obliged. Thanks.

MR BEASLEY: All right.

PROF YOUNG: And as would be my practice, it always was then, whenever I wrote one of these droplets, because they were classically written up in The Australian and discussed on radio and TV, I would always give the people I was talking about the opportunity to see a near final draft and to meet with them and, in that case, I sat down with the Authority's Board and discussed it at length.

MR BEASLEY: So that would have been – Mr Knowles would have been the Chair at the time.

PROF YOUNG: Yes.

MR BEASLEY: Yes. What's the date – 25 July '11. So that's before the – that's after the Guide has come out, but before the ESLT report.

PROF YOUNG: Yes.

THE COMMISSIONER: As we face things now, come 2024, the Authority has to ask itself, were we to do now what we did back then, which really means about now, might we get a different outcome? Therefore, we will do it again and we will adjust the SDL in light of experience by that time in 2024, including, of course, whether or not supply measures had achieved equivalent environmental outcomes or efficiency measures had the effect they're intended to have, and that will be one of the these step changes, won't it?

PROF YOUNG: If they ask that question, and if they are given the opportunity to explore that by the Ministerial Council on all of the convoluted things.

THE COMMISSIONER: How will the Ministerial Council prevent them from doing that? How could they prevent them from doing that?

PROF YOUNG: Through political interference, through actually applying political pressures, putting things – they can send instructions.

THE COMMISSIONER: On some subjects, yes.

PROF YOUNG: On some subjects – some subjects. I don't know if they could stop them totally, but the - - -

THE COMMISSIONER: Because that would be a radical departure from decisions being made on the best available science.

PROF YOUNG: Yes, and - - -

THE COMMISSIONER: Seven - - -

PROF YOUNG: But, also, there is a tone in a lot of what's being put together that the major – that this is supposed to be a minor readjustment of what's put together, not a major review. The major review happens in another, I think, five or six years' time. Forgive me. I'm a little bit rusty on the dates around all of this.

THE COMMISSIONER: That's all right. 7.11, I'm referring to. It starts off:

If it appears to the Authority - - -

MR BEASLEY: It's 2026.

THE COMMISSIONER: I'm sorry?

MR BEASLEY: The major review of the Basin Plan is 2026, section 51.

THE COMMISSIONER: Yes, I know.

MR BEASLEY: Yes.

PROF YOUNG: Yes.

THE COMMISSIONER: But it's – mid 2024 is the one I'm talking about.

MR BEASLEY: Yes, reconciliation.

THE COMMISSIONER: So "if it appears to the Authority", so that involves the Authority looking at this question.

PROF YOUNG: Yes.

THE COMMISSIONER: As a lawyer, I ask myself the question, does it mean they have to look at the question. I think the answer to that is yes. I haven't heard to the contrary of that. In any event, so:

If it appears to the Authority that a new determination as at June 24 of the appropriate adjustment resulting from the notified issues –

etcetera, that's – those are measures back 2017 –

would produce a result different from the determination made back then, the Authority must determine the amounts of proposed adjustments –

etcetera, etcetera, etcetera –

including an adjustment of the SDL.

Now, I may be wrong, but I don't think that adjustment is subject to a limit. Is that – does anybody disagree with that? Or is it subject also to a statutory ceiling of 10 per cent? I don't know off the top of my head.

PROF YOUNG: And there's also – it's – there's also a question in there in terms of how this is brought about and particularly whether the SDL – if water would then have to be purchased and pulled out of the system or if, in fact, this is just a change in the sharing allocation system.

MR BEASLEY: But this is only looking at a reconciliation of the supply measure adjustment as distinct from - - -

THE COMMISSIONER: Of the – of this exactly.

MR BEASLEY: Yes.

THE COMMISSIONER: Exactly. So this is just looking at things which effected the SDL on the basis of projected – I call them savings. Although, as you've pointed out, the word "savings" needs to be carefully considered. And that could be a step change, could it not?

PROF YOUNG: It could be a step change.

THE COMMISSIONER: All 605 might need to be reversed.

PROF YOUNG: Yes. So when I - - -

THE COMMISSIONER: That's a bit of a shock to people who have to adjust their farming business models, I would have - - -

PROF YOUNG: And then all of the water resource management plans would have to be written again unless there is handshaking between the Basin Plan and the Water Resource Plan so it's automatic. A state of the art system would – would not put the number or whatever is used in the Water Resource Plan, but would have a central register which could be amended by the Authority, preferably on an annual basis that says what the number is.

THE COMMISSIONER: Yes.

PROF YOUNG: And then the whole Plan would then stay current. To me, I think what we're talking about here, if I may, is a question of how we – how Australia starts the discussion about what happens around this period. There's a lot of effort going in at the moment and a lot of wake-up calls are occurring as we get further into implementing the Basin Plan, and then there is a very serious discussion that needs to be crafted about how all stakeholders are informed of the issues and what changes need to be put in place as we move forward and talk about, and formulating a narrative around that is critically important, and your report will play an important role in shaping that narrative.

THE COMMISSIONER: Well, now, the independence that you have suggested to me ought to be accorded to the Authority means, in particular, I suppose, being freed from an obligation to accept Ministerial Direction.

PROF YOUNG: Yes

THE COMMISSIONER: And less formally, but perhaps more meaningfully, day by day, being freed from reporting lines within the bureaucracy.

PROF YOUNG: Yes. I think – if I can make a general observation, the Authority is often blamed for a lot of the things that the Federal Government department is doing as it buys back water for the environment and negotiates so-called efficiency projects.

THE COMMISSIONER: Yes.

PROF YOUNG: In my view, the role of the Authority is to make sure the accounting is right and how the Federal Government chooses to invest in an efficiency measures or whatever else it chooses to do as its business.

THE COMMISSIONER: Does it follow from that evidence and some other things you've written that I've read that you doubt the policy wisdom of the imposition of a limit on buybacks?

PROF YOUNG: I have always thought that it would be a lot smarter to just buy back water in the open market. In fact, Jim McColl and I, early on when the government first put 8.9 billion on the table, we wrote a document about future proofing the Basin where we suggested it – the smartest thing the government could do would be to bring out a Plan to bring everything back to sustainable yield as we – I think we called at the time, and send everybody a cheque as compulsory – as compensation for a compulsory, across the board, claw back of about 25 per cent of the water, and it would be done, then, under compulsory acquisition rules. Farmers would be given - - -

THE COMMISSIONER: Just terms.

PROF YOUNG: Would be given just terms. They would have been very adequately compensated well above what they have received now as a result.

MR BEASLEY: Is this the paper behind tab 12? If you have a look there. I just want to make sure a future proof Basin.

PROF YOUNG: You make this hard.

MR BEASLEY: I don't put these together. Trust me.

PROF YOUNG: Yes, it is.

MR BEASLEY: Mine are usually in a different order. You should see how hard that is. But go on.

PROF YOUNG: So essentially what we said was, yes, send every farmer a cheque and say in two years' time we will reduce allocations by whatever percentage it is. And it is all over. Every farmer would have then had to have sit down with on average a cheque of over half a million dollars each, at the kitchen table and talk with their partner or family about what they would do with the cheque of half a million dollars. They could go into the market and buy more water, they could upgrade and become more efficient or they could do whatever else. But the sum of money that was being offered was massive. And if you gave people – an income tax benefits for this which apply through compulsory acquisition, we thought it was a pretty good deal. And we could have had the state of the art Plan in place within 12 months.

THE COMMISSIONER: Now, perhaps unfortunately they didn't accept that advice. Speaking today in the position we are today, would you favour removing the cap on buybacks?

PROF YOUNG: Definitely.

THE COMMISSIONER: Now, should I understand correctly that - - -

PROF YOUNG: Let me just explain one of the other reasons why I think it is very –

MR BEASLEY: I was going to ask you why.

PROF YOUNG: One is where there are willing buyers and willing sellers involved, the only people who are disadvantaged are the people in the communities who receive no benefit from doing that, either through the reinvestment of savings back locally. There is an argument then to complement the buyback of water with some other investments in local communities. But if your aim is to protect a local community and ensure its viability, then I am unsure as to why the most logical thing to do is always to invest in on-farm infrastructure or in lining canals and things like that rather than investing in – it could be the development of nursing care or whatever – of art facilities, whatever is in the local community.

THE COMMISSIONER: Correct me if I am wrong, I'm not aware of any social movement let alone political decision which compensated anybody for jobs lost by mechanising agriculture. In the half a dozen - - -

PROF YOUNG: That is one of the perverse effects of many government programs.

THE COMMISSIONER: You have half a dozen ploughmen and their families and 25 horses and their attendants were replaced by two tractors. I can't remember anyone saying this is terrible it should not be permitted and there should be compensation for the Swiss cheese effect in the housing along the main street of the village.

PROF YOUNG: I'm not aware of anybody doing that. But behind the scenes there have often been - - -

THE COMMISSIONER: There may be anguish, grief and loss. I've got no doubt about that. That's been going on probably for thousands of years with changes in technology and settlement patterns.

PROF YOUNG: And swaps in technology, for example, when cotton is replacing rice. If you were the owner of a rice mill, you suddenly have a problem because now you are growing cotton.

THE COMMISSIONER: Well, when you improve the mechanised harvest of cotton which has happened recently - - -

PROF YOUNG: Yes, very recently.

THE COMMISSIONER: - - - you have a major impact on the amount of contract labour at harvest time. I'm not aware that any cotton farmer has joined a street demonstration to the effect that this should not be allowed because of the social effect it has on the settlement and that they will not be taking up the improved mechanised harvesting. They will continue to do it the more labour intensive way. And you can tell from my tone of voice I have become a little impatient with being told about social effects of water policy changes when nobody talks about the social effects of the use of chemicals or other technology or better improved mechanisation of farming.

PROF YOUNG: I agree totally with you. If a government though wishes to supply assistance to a community for regional development, then I would argue if that's all they want to do they would be better off to spend it on things other than farm infrastructure. That's the point I'm making. If your aim is to create local jobs, create local jobs. Don't increase - - -

THE COMMISSIONER: It may well be that city voters would be among the most enthusiastic to subsidise decentralisation. I can see the point.

PROF YOUNG: When you are in Europe, you can find a very strong movement towards doing exactly that. So while we don't talk about it in Australia I can take you to places in Europe where urban taxpayers are very keen to pay farmers to sit in on farms.

THE COMMISSIONER: Look at the picture postcard, Swiss summer pastures and most of them are government supported.

PROF YOUNG: Yes.

MR BEASLEY: The point you have just been making, Professor, could you – so we tick this box about where you have made this point in writing, it's tab 9 of that folder. There is one of your publications. It looks like it's a chapter in a book, chapter 27 'Improving the Basin Plan Options For Consideration'. Can you help us – over the page, page 440 'Basin Futures'. Was that the title of the book? The top left-hand corner – I see, what's it called? 'Basin Futures: Water Reform in the Murray-Darling Basin', ANU in press. If you go to page 446 - - -

PROF YOUNG: Yes.

MR BEASLEY: One of the criticisms made of these two mechanisms, that is, we are talking about purchasing water entitlements for the environment only from people prepared to sell some. Investing in projects. You then say:

> *Instead of directly funding infrastructure projects the Commonwealth Government could decide to take a broader regional approach and plan to assist all communities to adjust to the new regime –*

etcetera. That's – you are making the same point in writing that you were just making in your evidence then.

PROF YOUNG: Yes.

MR BEASLEY: Do you want to ask anything about that, Commissioner?

THE COMMISSIONER: No. That's very interesting, all of it. But I understand it.

MR BEASLEY: I just want to get a slightly better understanding of the point you are making at paragraphs 19 and onwards of your statement. Consumptive water entitlements as shares in terms of designing a robust water allocation system. At the document – sorry, the publication behind tab 3, 'Sharing Water: The Role of Robust Water Sharing Arrangements in the Management of Water Scarcity' which is a publication of – no, that must be a print date because it has got 21.9.18. That can't be right. I'm not quite sure when this – 21 March 2018 I think it might have been put together.

PROF YOUNG: In fact this document which is at tab 3 is one that is yet to be published.

MR BEASLEY: Okay.

PROF YOUNG: It's about to be published as a little bit of background to that.

MR BEASLEY: Go ahead.

PROF YOUNG: I made this available to your staff, Commissioner, because I have been commissioned by the Global Water Partnership to write a document on how to share water anywhere in the world.

MR BEASLEY: And this is it.

PROF YOUNG: And this is it. There are some minor changes that have been made since the draft I gave to them. Some of the artwork has been improved but the word changes are probably only 20 or 30.

THE COMMISSIONER: I'm grateful to you sharing that.

PROF YOUNG: I wanted to share it because it has things like an update of the data, Perth actual data through to this year. It points out a lot of things and asks in terms of – sets up questions for each thing. So rather than writing a long tome sets an environment.

MR BEASLEY: What I was looking at at page 19 of this paper, you start talking about supply and risk management. You have got three levels of shares: high priority shares, medium priority shares and low priority shares. We have got a – the table you have produced or the figure you have produced at page 20 with the flood water, low priority shares, medium priority shares, high priority shares and then the hands-off flow. And a similar type table on 23 where we've got the flood – sorry, figure 6 flood water, low priority shares and environmental shares. General priority shares, environment shares and high priority shares and then the hands-off water. Can you describe for me the difference between this kind of system and people being – having a water entitlement that they may in a particular year get a 50 per cent allocation or they might get a 70 per cent allocation depending on rainfall in a particular year? How would this operate differently? What is the nature of the share? Is it a percentage of a pool or - - -

PROF YOUNG: It would be exactly the same. There is no difference. So, in fact, if you take the figure 6 which is on page 23 – is probably the most complicated version of it. If you look at this document, it rolls through and gets more and more complicated and more and more layers get added on.

PROF YOUNG: Figure 6 is almost the answer. If there is only a small amount of water, then there would only be enough to say supply water to three-quarters of the high-priority pool.

MR BEASLEY: Right.

PROF YOUNG: And if that was the case then high-priority shareholders would get .75 of the full entitlement of the maximum amount to that pool. Shares would be defined as unit shares, not proportional shares. I can go into the reasons if you want me to. But - - -

MR BEASLEY: Yes, go ahead. Yes.

PROF YOUNG: One of the things that is critically important in sharing systems anywhere in the world is to have a capacity to actually redefine boundaries. And there is a very good reason why in the corporate world company shares are defined as unit shares. You are never told that you own .36 of actually BHP or Westpac or whatever it is. You hold a number of shares in it. And you have got to go somewhere else to find out the number of shares. That's done so that you can amalgamate companies and put it together in the same way with water resources. Often, you need to move boundaries.

THE COMMISSIONER: So you can issue new shares.

PROF YOUNG: You can issue new shares, cancel shares, and – but that will particularly – actually adjust the boundaries getting into – well, no. I won't get into the detail .....

THE COMMISSIONER: No. I understand those concepts.

PROF YOUNG: Yes.

THE COMMISSIONER: ..... yes.

PROF YOUNG: And one of the classic ones which happens in a lot of water resource management systems is where you draw the line between groundwater and surface water systems. In the River Murray, one of the tragic things that was happening in the early 2000s was a number of people who worked out that groundwater was tradeable. So they went particularly in Victoria and purchased groundwater and traded the groundwater licence within 50 metres of the river, and they then converted what was a groundwater right into effectively a surface water right called a groundwater right. So in times when given high priority, water people would get no water. They still have 100 per cent allocation. And around the world, you build in mechanisms and shares – systems like this so when that starts to happen, you can redefine where the boundaries are.

MR BEASLEY: And that – a water allocation system in this case, for example, where you've designed a share system as the example you've given for Diamond Valley behind tab 18 which is a management plan that you were engaged to draft in an area where, for a considerable number of years, the groundwater table has been dropping through people taking too much.

PROF YOUNG: Yes. I should stress that the plan at tab 18 was drafted by the local community. I wrote a first draft for them, passed it to them - - -

MR BEASLEY: Yes.

PROF YOUNG: - - - and they then rewrote significant bits, but that's part of what I think is very important, that systems that are robust are owned by local communities, and they understand all of the fine print. I spent a lot of time - - -

MR BEASLEY: This was a relatively small community, wasn't it?

PROF YOUNG: Yes.

MR BEASLEY: Yes.

PROF YOUNG: But even with a large community – and they're communities I've been working at in the United States and California now that are going through the same processes of taking over ownership of a – and rewriting significant bits, but the framework is consistent.

MR BEASLEY: Does that – does the framework for the Diamond Valley groundwater management plan – does that contain an adaptive mechanism for if rainfall continues to drop, or is that not relevant for this, or - - -

PROF YOUNG: It has a perfect one for that.

MR BEASLEY: Right. Can you just tell me where that is?

PROF YOUNG: They track depth to groundwater and as the groundwater drops down.

MR BEASLEY: Right.

PROF YOUNG: So they have a rule that's built in.

MR BEASLEY: Changes. Yes.

PROF YOUNG: It's much easier than groundwater that if there's a rule in there that says if the depth to groundwater drops, then the next year, the – a managing board must – the word is must – must reduce allocations per share. And in the same way,

I'm almost saying that if mean flows out – the mouth of the river go down, then the Authority must reduce all SDLs.

THE COMMISSIONER: I understand.

PROF YOUNG: And that forces them to have a discussion around how much they should do it.

THE COMMISSIONER: Yes. Which includes projections about recovery.

PROF YOUNG: Yes. And also, while we are into detail, but it's important, recognising the immense lags in things like the relationship between groundwater and surface water, if you irrigate or flood irrigate a long distance from the river, then the effect on groundwater flow back into the river has significant lags.

THE COMMISSIONER: Yes.

PROF YOUNG: And many of the affects that I now think we are seeing in the Basin are a result of land use changes that occurred soon after the development of water markets in the 19 – in the second half of the – 1990s through until 2000.

MR BEASLEY: The Commissioner took you to paragraph 28 of your statement and where you give the evidence that – and it doesn't – I don't think it mentions Victoria, but we were discussing before Mildura and Sunraysia generally about a considerable increase in the area planted to almonds, although the example I'm about to give could mean – could apply to any permanent plant. And you say:

> *Suspect the majority of water used to grow almonds under drip irrigation will come from land previously used to flood irrigate pasture.*

I'm just wondering, and please tell us if it's not an area that you have given any thought to, but there is no – seemingly no planning laws that prevent the ongoing transition, for example, from annual crops to permanent plantings. Is that something you think should be considered in a planning regime?

PROF YOUNG: No. I would leave that totally to market forces.

MR BEASLEY: Market. Yes.

PROF YOUNG: With the caveat that if you look into the design of robust systems the people who plan to use water must get a use approval. And while as a general principle you might not have restrictions, there are good arguments why you would not allow certain types of water use in certain areas because they could, for example, cause massive salinity problems or flooding problems. So - - -

THE COMMISSIONER: So that's what might be called nuisance style restraint. You might limit use by reference to the kind of nuisance that it might cause. Nuisance in the legal sense.

PROF YOUNG: Nuisance in a legal sense.

THE COMMISSIONER: Yes.

PROF YOUNG: And in particularly pollutants, so in some areas if you're going - - -

THE COMMISSIONER: Yes. Which, believe me, is nuisance in the legal sense.

PROF YOUNG: Yes.

THE COMMISSIONER: Yes.

PROF YOUNG: And the other bit is also an obligation that says, "If we give you permission to irrigate in our area it's done on the understanding that you then commit to all of the rules in Water Resource Plans," and so forth, which would include metering of any water you take. So if you're looking for a mechanism to penalise somebody who is stealing water, then that – that is done through a use approval which is separate to the allocation and separate to the shares.

THE COMMISSIONER: It could also – call me old-fashioned – be done through a Crimes Act. But basically, people who are stealing water are not just committing a crime in colloquial usage. They're probably actually committing a crime of some kind.

PROF YOUNG: Yes. And there is a difference between managing water in this way and the managing the water in the way it has often been done in the past that water managers have considered that if somebody is stealing water then their water shares should be taken away from them or their allocation should be taken away from them. In the framework I tend to recommend, where allocations and shares are tradeable, then those assets remain tradeable and can be used to repay debts, and even pay fines, or whatever is appropriate.

THE COMMISSIONER: Well, except that - - -

PROF YOUNG: But you don't cancel the share.

THE COMMISSIONER: Why not?

PROF YOUNG: You don't cancel the allocation.

THE COMMISSIONER: Why not? Drug dealers have their cars taken.

PROF YOUNG: Yes.

THE COMMISSIONER: We have, around this country now, statutes misleadingly called Proceeds of Crime Act, and they do deal with proceeds of crime, but they deal with a whole lot more than proceeds of crime. So tools of trade.

PROF YOUNG: Yes.

THE COMMISSIONER: And also - - -

MR BEASLEY: Other reasons.

THE COMMISSIONER: - - - anything you've bought. So major deal drug deal – not even major drug – drug dealers in New South Wales, and I'm sure in Adelaide, will lose their houses.

PROF YOUNG: Yes. But - - -

THE COMMISSIONER: Even though they never traded - - -

PROF YOUNG: But in that mechanism the title to the house is not extinguished.

THE COMMISSIONER: Yes, it is.

PROF YOUNG: It goes to somebody else. It gets sold to somebody else.

THE COMMISSIONER: And the money goes to the Crown.

PROF YOUNG: In old style water law, the water licence was cancelled and extinguished, and it didn't remain the property of anybody. So it was a windfall gain to all the other people.

THE COMMISSIONER: I see. Well, that would be perverse.

PROF YOUNG: Yes. So that's why - - -

THE COMMISSIONER: Something that has been allocated for a social good would be diminished – that which is obviously - - -

PROF YOUNG: So there is a subtlety here.

THE COMMISSIONER: I'm sorry. We were talking at cross-purposes.

PROF YOUNG: We are very close. Yes.

THE COMMISSIONER: The thing will remain in existence; it will not be enjoyed by the malefactor.

PROF YOUNG: Exactly. In old water – old-fashioned water law, the thing no longer remains in existence.

THE COMMISSIONER: I see. All right.

PROF YOUNG: So there's – and ..... manager would - - -

THE COMMISSIONER: The drug dealer's car and house remains in existence. They are sold for the public benefit.

PROF YOUNG: Yes. So in the old system a person who held a water licence, it was a licence, not property, and it was just cancelled.

THE COMMISSIONER: Yes. No. You are right. Yes. Yes.

MR BEASLEY: I don't have any further questions.

PROF YOUNG: It is fun talking to a lawyer.

THE COMMISSIONER: Not everyone thinks that.

MR BEASLEY: People don't say that very often.

PROF YOUNG: I have to laugh.

MR BEASLEY: I haven't been on many dates where that was said.

THE COMMISSIONER: Professor, I have really greatly benefitted from listening to you and reading you, and I know I will from re-reading you. Is there anything that you feel after listening to Mr Beasley and me ask you questions or make comments for your consideration, that either you think you should emphasise or that you think we have got hold of the wrong end of the stick, because now is a good time for to you add anything you want to add.

PROF YOUNG: I think I have covered all the things that are of deep concern to me. I would like to in closing stress that I think that the Basin Plan and the Water Act is a very good Act. There are bits I would argue over, but its development has done a lot for the world as a whole in terms of showing people what is feasible. I hope very much as we go forward in the journey that Australia started that we continue to move towards improving the Act, and the biggest challenge now is to work out how to improve it. I am concerned about some of the debate around return flows, while I have raised it, that in many cases the horse has bolted. And we now have very, very efficient water use throughout the Basin, so most of the damage of failure to account for that has been done and it needs to be managed as we go forward. I think I have stressed to you the importance of building a mechanism that account for those bits that are not well accounted for now.

THE COMMISSIONER: Because if – as I put to you earlier, if the plan conceptualised hands-off water by reference to – I will call it the achievement of environmental goals, then anomalies like the unaccounted return water with efficiency measures – or the unaccounted loss of return water with efficiency measures, can be caught up in the – a continuous calibration, if you like, to ensure that the hands-off water remains such that, that is in volume, location and timing.

PROF YOUNG: Yes.

THE COMMISSIONER: Remains as such that, to use the statutory language, the environmental values aren't compromised. If you do that then it will have an effect, won't it, perhaps not justly as between allocates, but certainly as between the environment and consumptive use. It will have the effect of cutting back consumptive use to ensure enough hands-off water.

PROF YOUNG: Yes. The only issue which – I agree. The only issue which we haven't discussed which I think is very important for everybody to understand is the importance of carrying forward water from season to season.

THE COMMISSIONER: Yes.

PROF YOUNG: Where you have a market, people allocate within the suite of opportunities that are given to you. One of the biggest lessons that came out of the water market in the height of the drought was in fact how important it was to save water for next year and I think there is a very important role in the marketplace for the management of essentially dams and dam heights. A lot of that is done under rules, but if people save water then they should be encouraged to do that to save it for next year rather than always use it within this year, and Donna Brennan did some fantastic work in the middle of the last Millennium Drought where she showed in fact that water trading was making the drought worse or the impact of the drought worse rather than better. In fact, there were no benefits to trade because of the essentially over-allocation, overuse of water in a drought.

THE COMMISSIONER: How do you avoid carryover producing over-allocation?

PROF YOUNG: When the dam is full, it spills, and then the water is spilt – actually is lost.

THE COMMISSIONER: As you say, it is all driven by - - -

PROF YOUNG: When you hit the limit, if there is space – if there is air in the dam, and importantly, as Brisbane learnt, if that air space is not needed for flood control - - -

THE COMMISSIONER: Well, that's right. Yes.

PROF YOUNG: Then - - -

THE COMMISSIONER: ..... Sydney ..... to learn.

PROF YOUNG: You can put water in it, yes. There is a big risk you can end up storing too much water. So you need to have in dams essentially an absolute limit where when water gets above that water that's being carried over spills, but with that caveat.

THE COMMISSIONER: So water can get depleted by reference to the level of dam storage. Is that - - -

PROF YOUNG: Yes.

THE COMMISSIONER: Thank you.

PROF YOUNG: And also adjustment for evaporative losses, but in most of our dams the increase in evaporation as a result of putting in a bit more in the dam is trivial.

THE COMMISSIONER: So the – I should think of carryover water as water that always has a tangible presence in dam storage.

PROF YOUNG: Yes. In the same way as you can have carryover salary. Many of the people in this room are paid a salary and we don't have a rule that says you must use it – actually all your salary this year, so that have you no money at the end.

THE COMMISSIONER: You are talking about savings.

PROF YOUNG: Yes. In the same way that carryover of water makes sense, so does carryover money make sense, or your income.

THE COMMISSIONER: I see.

PROF YOUNG: And for many years – and we still in fact have restriction on carryover and very convoluted ways of carrying over water when it should be very, very simple.

THE COMMISSIONER: Yes.

MR BEASLEY: Just so I do have to do it at another time, I will tender the witness statement of Professor Mike Young. I will tender the submission by Professor Young to the Murray-Darling Royal Commission. I will tender, even though I don't have a copy – we will have to get it – droplet 19 dated 25 July 2011. And without running through the titles I will tender the documents that are behind tabs 3 to - - -

THE COMMISSIONER: 18, I think.

MR BEASLEY: Yes. I don't know whether I need to tender them all. I will tender 3 to 13 and also 18.

THE COMMISSIONER: Thank you.

MR BEASLEY: And that's the witnesses for today. Tomorrow is the three witnesses I mentioned in the morning.

THE COMMISSIONER: I thought you were about to say another day. You are right. Professor, thank you so much for your attendance. I really appreciate it greatly.

PROF YOUNG: Thank you for listening, and thank you for all your work that you are doing. This is very important for the future of Australia.

THE COMMISSIONER: Thank you. Thank you. And the staff. We will adjourn until 10 o'clock tomorrow morning here. Thank you.

<THE WITNESS WITHDREW [3.48 pm]

MATTER ADJOURNED at 3.48 pm UNTIL WEDNESDAY, 26 SEPTEMBER 2018

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