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TRANSCRIPT OF PROCEEDINGS

O/N H-927215

MR B. WALKER SC, Royal Commissioner

IN THE MATTER OF THE MURRAY-DARLING BASIN ROYAL COMMISSION

ADELAIDE

10.01 AM, TUESDAY, 4 SEPTEMBER 2018

Continued from 30.8.18

DAY 24

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

<JUSTIN BROOKES, ON FORMER OATH [10.01 am]

<EXAMINATION-IN-CHIEF BY MR BEASLEY

MR BEASLEY: Commissioner, before we begin, we acknowledge the land that we're meeting 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 that their cultural and heritage beliefs are still as important to the living Kaurna people today. We also pay respects to the cultural authority of Aboriginal people visiting or attending from other areas of South Australia or Australia present here today.

Commissioner, this morning we have Professor Brookes back. His evidence was partially completed on 17 July, which does feel like a lifetime ago, so I will – I've done a coal mine case since then. So the cab rank rule was well and truly alive, compared to this. So I will just summarise some of the evidence that Professor Brookes gave the last time to assist all of us, including Professor Brookes, before completing his evidence.

We then have Dr Perry later this afternoon via Skype. He's a scientist based in the UK who will be giving some evidence about return flows. Tomorrow we have David Papps in the morning. We're commencing the hearing tomorrow at 9.30 am instead of 10. I've just discovered that looking at this schedule. It doesn't sound like a good idea, but I guess it's happening.

THE COMMISSIONER: Is that here or at the Town Hall?

MR BEASLEY: It will be at the Town Hall. Mr Papps is the former Commonwealth Environmental Water Holder. And then we have in the afternoon Professor David Paton, who has filed a submission dealing principally with one of the measures for South Australia and the condition of the Coorong. On Thursday, in the morning – and, again, on Thursday we're starting at 9.30 am – Mr Close, who is a former modeller and employee of the MDBA is giving evidence. And then, following him, Mr Modica and Mr Jenkins, who are members of the Mildura Council, who we met on one of our happier meetings with local councils on our tour of the Basin, one of the more informative, too. And they have lodged a submission and they will be giving evidence. That will complete the evidence for this week.

THE COMMISSIONER: Thank you.

MR BEASLEY: I'm told I forgot to tender some documents that were relevant to the evidence given by Ms Maywald last week. And so I will formally tender – are these references to tabs in her – yes. The document that was at tab 2 of the Karlene Maywald – Karlene is K-a-r-l-e-n-e – brief, the National Water Commission,

'National Water Commission Annual Report 2014 to '15'. The document behind tab 3 of Ms Maywald's brief, 'National Water Commission Planning Report Card 2013', but published in 2014.

And the document behind tab 4 of the Maywald brief, 'Reflections on the New Role of the National Water Commission (Water Law and Policy Conference Canberra 7 December 2012)'. And in relation to some other witnesses, Mr O'Flaherty wants to tender some documents.

MR O'FLAHERTY: Commissioner, I tender tabs 2 to 3 of the brief relating to the Nature Foundation of South Australia. I also tender tabs 1, 2, 4 through 15 inclusive and 20 and 21 of the brief relating to Dr Anne Jensen. I also tender tabs 3 through 6 inclusive of the folder relating to the Goyder Institute. And, finally, I tender the MDBA publication dated May 2018 entitled 'Icon Site Conditions: the Living Murray.'

THE COMMISSIONER: Okay.

MR BEASLEY: Commissioner, last Thursday, 30 August, the Productivity Commission published its draft report as part of its five year assessment into the Murray-Darling Basin Plan. That report is relevant to this Commission. While it's a report that deals with matters perhaps more concerning processes of the implementation of the Basin Plan, as distinct from addressing issues of merit and legality that are being considered by this Commission, it does – the draft report makes some very important observations about efficiency measures, supply measures, transparency and governance that, in my submission, are quite damning of the current management of the Basin Authority and its Board.

THE COMMISSIONER: That's a context which makes it interesting to observe what it is, if anything, that the MDBA supplies by way of response.

MR BEASLEY: Yes.

THE COMMISSIONER: This being a draft.

MR BEASLEY: Yes.

THE COMMISSIONER: And it will make all the more telling any silence by the MDBA in the face of the Productivity Commission's draft conclusions.

MR BEASLEY: Yes, it will.

THE COMMISSIONER: I'm not aware yet of any objection as a matter of law and administration by the MDBA to the Productivity Commission expressing opinions about the MDBA's conduct.

MR BEASLEY: Nor am I.

THE COMMISSIONER: But we will wait and see.

MR BEASLEY: Of course, the best way of getting a response to the MDBA or any other – well, the best way of getting a response from the MDBA in relation to the matters raised in this Productivity Commission draft report would be to have them examined at this Commission. Unfortunately, for reasons that it's yet to properly explain, the South Australian Government has decided not to extend your Commission, so that won't be happening. That should be a matter of great concern to anyone interested in the Basin Plan and particularly a matter of great concern to South Australians.

I know you've read this report, but for the purposes of the public record I think we should put on the record a couple of the matters that seem to be important observations and recommendations and findings made by the Productivity Commission in its draft report. They deal with – the Productivity Commission raises some concerns about efficiency measures at page 10 of the draft report. And some of the more notable findings are that the proposed – of course efficiency measures depend in part on constraints – some of them are constraints projects which the Productivity Commission finds are unlikely to be fully operational by 2024 and may not achieve the required flow rates at key sites to deliver the enhanced environmental outcomes. That's in some way consistent with the evidence called before this Commission, although the scientists that have given evidence here express the view that there's no hope of achieving enhanced environmental outcomes from the so-called 450 gigalitres of up-water related to these efficiency measures.

The Productivity Commission also notes that there has been no update to the modelling to estimate what environmental benefits can be realistically achieved in relation to the efficiency measures and that there is a material risk that the recovery of the additional 450 gigalitres could be significantly more expensive than anticipated. I – in relation to the evidence before this Commission, you could change "material risk" to the word "certainty" - - -

THE COMMISSIONER: Has there been any contradiction of the proposition it is cheaper to buy back?

MR BEASLEY: No, there's nothing in the literature. The literature – the – all of the evidence called, not only before this Commission, but that is in the published and peer reviewed scientific journals and whatnot, suggests that efficiency measures are at least two and a half times more expensive than a straight-out buyback. And they may be much more expensive than that. And, of course, they're depending on the kind of entitlement, water entitlement that is bought in a buyback. Buybacks are far more certain to deliver real water than an efficiency measure, which is in large extent – these are experiments. No one knows whether they're going to work properly.

And all of the evidence called in this Commission is that there's real doubts, because of issues such as return flow that you will hear about again this afternoon, that they will deliver anything like 450 gigalitres of the so-called up-water. The supply

measures are also in the nature of experiments that are in no more than a concept stage and yet the Parliament has seen fit to reduce the amount of water for the environment by 605 billion litres on the back of concepts.

THE COMMISSIONER: As I read the Productivity Commission, the Productivity Commission accepts that as the war currently stands with the environmental purposes, that is, protection and recovery purposes of which the Act speaks, if those supply measures are not effective in 2024, then the adjustment has to be reversed.

MR BEASLEY: It does, but I mean – I mean, this is a Plan that comes out of an Act that's designed to protect and restore the environment as its key thing – as its key purpose. It seems a very odd thing to take water out, to raise the Sustainable Diversion Limit, in other words, reduce the amount of water for the environment first and then wait six years and see whether that was a good idea or not.

THE COMMISSIONER: Maybe it's a strategy with respect to dealing with climate change.

MR BEASLEY: No. It's not a strategy.

THE COMMISSIONER: Getting people used to deprivation of water ahead of time.

MR BEASLEY: No. Climate change has been ignored in the Basin Plan in terms of any practical means - - -

THE COMMISSIONER: I don't think that's fair. It has been taken into account in deciding not to do anything.

MR BEASLEY: I said practical. It hasn't been totally ignored, but it may as well have been. There's a table at page 13 of the draft productivity report, that report, which contains the view of the Commissioner's concern in the risk to meeting the Basin Plan's objectives. In relation to supply measures, the risk is called high. In relation to efficiency measures it's a high risk. In relation to the northern Basin so-called toolkit it's for some reason, a medium risk. I would have thought on the basis of the evidence that we've received at this Commission that's also a high risk.

In relation to the northern Basin toolkit at page 20 of the Productivity Commission draft report, the Commissioners say this:

> *A lack of firm deadlines and checks and balances for implementing the northern Basin toolkit means accountability for outcomes is limited. A Basin government should ensure that the arrangements to implement the toolkit measures are transparent, enable progress to be tracked and ultimately to understanding the effectiveness of the measures.*

Well, all of that is consistent with the evidence that has been called by this Commission – to this Commission. What it lacks, of course, is the evidence before

this Commission that there is absolutely no scientific basis upon which you could reach any view whatsoever as to how these toolkit measures relate in scientific terms to a reduction in 70 gigalitres of water, from 390 – a recovery of 390 gigalitres down to 320 gigalitres. In relation to some of the recommendations that seem telling, on pages 30 and 31 of the draft Productivity Commission report, recommendation 4.1:

> *Basin governments must resolve governance and funding issues for supply measures.*

Now, if those matters haven't been resolved already, how are these supply measures already resulting in a reduction of 605 gigalitres of water for the environment? How is that lawful? Recommendation 4.3:

> *Basin Authority must devise a strategy for undertaking the reconciliation of supply measures against environmental equivalence.*

Now, these measures are not meant – the Basin Authority, in order to put these supply measures up and reach a figure for reduction in the amount of water for the environment, is meant to be satisfied of environmental equivalence already. This recommendation certainly suggests that some reconciliation must occur and that couldn't have happened. Again, that throws real doubts on the lawfulness of the supply measures.

THE COMMISSIONER: If as a matter of law the convoluted provisions in relation to the adjustment of the SDL did actually contemplate reducing water earmarked for return to the environment in advance of the realisation of the so-called supply measures – just assume at the moment that that were lawful.

MR BEASLEY: Yes.

THE COMMISSIONER: This Royal Commission is not confined to giving legal opinion about statute.

MR BEASLEY: No.

THE COMMISSIONER: Far from it. And South Australia's interest, of course, is as one of the states that has legislated to refer powers to the Commonwealth Parliament to support, at least on one view or at least ..... some part, the enactment of the Water Act. And so the terms of reference to this Royal Commission, with respect to what I will call generally the effectiveness of the Act and Plan from the point of view of South Australia as a referring State, must include, surely, matters of policy, so that even if it were lawful to reduce water to the environment in advance of any recovery whatsoever through supply measures - - -

MR BEASLEY: It may be a really bad idea.

THE COMMISSIONER: It may be a very bad idea, particularly given climate change, which we now know the MDBA regards has been sufficiently taken into account by no specific or peculiar response, but, rather, by the more or less annual or more frequent adjustments of the enjoyment of water entitlements according to seasons, which is what has been happening ever since there were water plans of any kind.

MR BEASLEY: Well, raising climate change is very appropriate with Professor Brookes here because as long ago as seven years he was one of the co-authors of a report reviewing the ESLT determination report of the Basin Review Authority saying that, "If you're not taking into account climate change, you might have to look at adjusting your SDL."

THE COMMISSIONER: I do stress – I don't mean this facetiously at all – the MDBA on the material before this Commission that makes it clear that they have taken into account climate change.

MR BEASLEY: By saying it exists, sure.

THE COMMISSIONER: But they say the periodic adjustments – I shouldn't say "adjustments". The periodic alteration of the actual enjoyment of water entitlements which occurs, in any event, routinely under any water entitlement system in this continent will suffice over the term of the Basin Plan. So they may or may not be right on that, but I do stress they say - - -

MR BEASLEY: Yes.

THE COMMISSIONER: - - - "We've considered it, as we have to in law, and we're not going to do anything."

MR BEASLEY: Well - - -

THE COMMISSIONER: That's what they've said.

MR BEASLEY: - - - they need to have a look at section 21(4) of the Water Act.

THE COMMISSIONER: That's no doubt going to be a focus of my report, yes.

MR BEASLEY: As the Productivity Commission has also noted in their report – and I'm referring now to page 110 in relation to constraints, a number of the supply measures are based on the assumption that - - -

THE COMMISSIONER: Depends on.

MR BEASLEY: Depend on them.

THE COMMISSIONER: Depend on them being relaxed, to use the jargon.

MR BEASLEY: Yes. And the evidence from this report itself, draft report itself, and before the Commission is that absolutely no progress has been made in relation to constraints in the entire time the Basin Plan has been law.

THE COMMISSIONER: I read the draft opinions of the Productivity Commission in relation to constraints relaxation as being – my words, not theirs, by way of paraphrase – very pessimistic about achievement. Now, if that's true, that is down to far more than the MDBA. Indeed, it's largely down to two state governments.

MR BEASLEY: Yes.

THE COMMISSIONER: Victoria and New South Wales. And, again, it will be significant to observe what substantive response is recorded in the final Productivity Commission report - - -

MR BEASLEY: Yes.

THE COMMISSIONER: - - - as having been received by either or both of New South Wales and Victoria concerning constraints relaxation and the prospects of success.

MR BEASLEY: Well, the Productivity Commission discusses the fact that of the 36 or 37 supply measures, six are properly responsible for half the 605 gigalitres. They mention specifically at pages 113 and 114 of their draft report two that on our analysis alone are almost responsible for half of the 605 gigalitres. And that's the Menindee Lakes Water Savings Project. I'm not going to spend any time on that, because there has already been evidence in relation to that matter before the Commission and particularly in relation to – and as the Productivity Commission notes, the need for a detailed environmental impact statement. I mean, how are you satisfied about environmental equivalency when the MDBA itself is saying itself about Menindee Lakes an EIS is required?

THE COMMISSIONER: Now, that statement by the Productivity Commission lends itself to two possible interpretations. They don't say they're inconsistent with each other. One interpretation is that they are unnecessarily saying that what a New South Wales statute requires before New South Wales development, namely an EIS, has to happen. I doubt that the Productivity Commission would have confined itself to that concern. The other is as you've just pointed out, but without something in the nature of an EIS, environmental equivalence is unlikely rigorously to be assessed as it has to be.

And, of course, both propositions can remain true. It would be a happy state of affairs that state law requires as a prerequisite that which Commonwealth law also happens to require by a different wording. If that be true, then it means the Productivity Commission has aligned itself in draft – I stress in draft – with much of the evidence before me in relation to the Menindee Lakes, which is that one presently

cannot opine that there was anything like satisfaction of a prerequisite for it to be a supply measure.

MR BEASLEY: I'm just wondering whether – yes. Yes.

THE COMMISSIONER: And yet, as I understand it, there has been something in the nature of agreement, political or otherwise, that it is such a measure that, in my view, raises a governance question of the kind that I gather the Productivity Commission also shares concerns about. And I want to stress publicly that, again, the response of the relevant governments, particularly in relation to Menindee Lakes, the New South Wales Government, to that extremely serious foreboding about the Menindee Lakes as a supply measure. That will be a very important as an act of governance in itself, because the Productivity Commission is reporting pursuant to a statutory requirement and it's required to bring some transparency to the exercise.

If the New South Wales Government does not respond, then the common sense inference will be overwhelming, that what the draft proposes is something that New South Wales can offer nothing about. And I'm sure that New South Wales has already had input from my reading of the draft report into the Productivity Commission's conclusions. That's the first thing.

The second thing is if New South Wales produces in response to the draft something which people wish to contradict to those conclusions, then there are massive problems of governance in terms of what I call delayed or grudgingly granted transparency on the part of New South Wales. Why would it be done so late as only after the release of the draft report, if they have information concerning the environmental merits of that program? Particularly in relation to what this Commission has heard from landowners, including Traditional Owners, in the Lower Darling, this is, I think, a serious and urgent matter.

It will be interesting to observe whether New South Wales provides its response, if any, only at the very last moment. That is another governance problem, namely every time limit becoming the actual period taken by a government to respond to matters which, if they were on top of them, they would be able to respond to almost immediately, subject, of course, to what this Commission has heard time and time and time again, namely resources, that is, where the government is allocating its funds to enable sufficiently skilled and available people to respond to these matters.

MR BEASLEY: Well, we know that – and I'm just thinking out loud here – in relation to page 114 of the productivity draft report in the second bullet point in relation to the Menindee Lakes they say there's a – there is currently a considerable list of issues to resolve prior to implementing the Menindee Lakes project which include, second bullet point, the need for a detailed EIS. Now, pausing there – sorry:

> *The need for a detailed EIS to assist potential impacts to the ecology of the Menindee Lakes and the Lower Darling.*

Pausing there.

THE COMMISSIONER: It has to be the whole Basin, doesn't it?

MR BEASLEY: The only places I've seen that, I'm not in – I will have to check whether it's mentioned in the business case about the need for an EIS. If it is, it doesn't link it to any particular environmental risk. The only place I've seen an EIS referred to and a risk to 23,000 hectares to Golden Perch habitat, which – I know some people may not be concerned about native fish, but I think we should make the assumption that we all should be.

THE COMMISSIONER: I've not heard anybody who has actually publicly said they don't care about that.

MR BEASLEY: No. But I make the assumption some people, but we should be, and it sounds like a big area. The only place I've seen that is in the Basin Authority's own analysis of the business case of Menindee Lakes, which was compelled for production in the Senate and as a matter in relation to which we've been warned about whether certain factual conclusions can be drawn by that given the privilege attached to that, but I'm wondering whether that document was given to the Productivity Commission. I need to chase that down because the only place I've seen that, an EIS link to real ecological impacts, is in that document.

So it appears as though it may have been given to the Productivity Commission. The Productivity Commission also goes on, just picks up something you've just mention about Aboriginal heritage, that there's a need for an Aboriginal heritage impact permit to assess and mitigate potential impacts to Aboriginal cultural grounds. It seems amazing to me that those issues have to be resolved still in relation to this project when (1) it's already been used to reduce the amount of water for the environment by 605 billion litres, and (2) Parliament was required to deal with this – the Senate was – without access to any of that information.

It seems amazing that our elected representatives are required by the Basin Authority, who could inform them of this but, because of its complete and utter lack of transparency, doesn't inform our elected representatives of the ecological risks. Doesn't inform the people.

THE COMMISSIONER: ..... also to make this point publicly: the material is full of statements on behalf of the MDBA that it is the whole assemblage of the supply measures that justifies the 605, and that one doesn't distribute or allocate to any particular supply measure any particular contribution to that overall recovery. If that is true, then the pessimism provisionally expressed by the Productivity Commission about a number of those supply measures is enough to cast doubt over the whole of the 605, not merely distributively or fractionally.

Now, I personally am doubtful about whether it is correct scientifically to – not to allocate, even with interdependence, a contribution to the overall 605 from any

particular measure. But leaving that doubt aside, it does seem to me that taking the MDBA at face value – which I don't suggest is an entirely appropriate approach – then the pessimism the Productivity Commission has evinced, suggests that in 2024, unless the law be changed by Parliament, with referrals from all states presumably, including South Australia, then in 2024 the 605 has to come back. How that would possibly conduce to appropriate social harmony and industrial certainty I have no idea.

MR BEASLEY: Hydro-cues is also mentioned on page 113 of the Productivity Commission draft report where – and this is an important supply measure that there's some evidence might amount to at least 200 gigalitres of the 605 gigalitres, and the Productivity Commission notes that it's a supply project that involves operational rule changes, aims to achieve environmental outcomes by increasing the ability of environmental water to coordinate environmental delivery with increase in natural flows caused by rainfall. Of course, that immediately raises the issue of constraints and as the Productivity Commission notes:

> *Realising the full benefits of hydro-cues is "critically dependent" on intermediate constraints projects which are highly unlikely to be completed by 2024 as outlined above. The project must also develop a strategy to engage stakeholders and communities and a detailed monitoring and evaluation plan. Given the issues to be resolved the likelihood of hydro-cues being fully operational by 2024 appears to be low.*

On the evidence we have, we would say extremely low.

THE COMMISSIONER: Those conclusions by the Productivity Commission expressed in draft and thereby inviting substantive responses from the MDBA, the Commonwealth, New South Wales, Victoria, Queensland and the ACT, as well as South Australia, rather suggests to me in this Commission that the slogan "in full and on time" is already disagreed in by the peak Commonwealth statutory reviewer of the Plan and its progress, namely the Productivity Commission. At least in draft.

MR BEASLEY: Yes.

THE COMMISSIONER: And if something is so serious and so central to the politically noble endeavour of the Water Act and the Basin Plan is to be supplied, then – by way of draft, then would expect those governments to respond sooner rather than later.

MR BEASLEY: And - - -

THE COMMISSIONER: In terms of governance, their failure to do so will be something that this Commission will take into account in drawing my inferences.

MR BEASLEY: And it's not just the Basin Authority because, moving away from supply measures and back to efficiency measures in the 450 gigalitres, at 145 the

Productivity Commission's draft recommendation 5.2 is relevant to the federal Department of Agriculture and Water Resources where they recommend that they should:

> *Release a new strategy for recovering the additional 450 gigalitres in a no regrets fashion in early 2019. No regrets water recovery requires that:*

Bullet point:

> *The strategy should plan for a range of scenarios for constraint easing or removing and costs and evolve as new information becomes available.*

Bullet point:

> *Water recovery should align with the progress in easing or removing constraints.*

I'm not going to go on and read the rest of them, but having even just read that draft recommendation, it throws into doubt the submissions that have been made to us, including submissions by the South Australian Government that the 450 gigalitres is going to be delivered. This suggests that not only is it probably not going to be, and that's the evidence before the Commission, but a new strategy is required.

THE COMMISSIONER: As I say, it makes anyone who is prepared to mouth "in full and on time" an appropriate object of critical attention by this Commission concerning the cogency of their thinking about the Plan and/or the quality of information they have been given by advisors.

MR BEASLEY: Now, I'm – by skimming over it, I don't mean to suggest for a moment it's not critically important, but one of the recommendations also made by the – one of the draft recommendations made by the Productivity Commission is dividing the MDBA up into two separate bodies in terms of governance. I will just find that draft recommendation, because I should read it out.

THE COMMISSIONER: One way to express that would be to abolish and disband the MDBA and create two new authorities with fresh recruitment, surely.

MR BEASLEY: Well, if this – if I was running the Basin Authority, and I read this report I would be resigning, but that's just me. Of course, it is only a draft, as you point out, and there may be an answer to all this. Yes. Draft recommendation 14.2 at page 305:

> *Basin Governments should agree to the restructure of the Murray-Darling Basin Authority to separate service delivery and regulatory functions into two institutions. The Australian Government should then embark on the necessary institutional reforms to establish (1) the Murray-Darling Basin Corporation as*

the agent for Basin Governments and (2) the Basin Plan Regulator, an independent Commonwealth Statutory Authority.

I won't make any further submissions about that. As I said before though, Commissioner, this Commission – as you point out, the Basin Authority, the Commonwealth Department of Agriculture and Water have got an opportunity to respond to this draft report. No doubt they will.

THE COMMISSIONER: I – I'm not at all sure - - -

MR BEASLEY: But the best place for these matters to be examined are here.

THE COMMISSIONER: I'm not at all sure they will.

MR BEASLEY: Well, they may not. They may not. But the best place – sorry, I'm just being told the Productivity Commission has called for further submissions by 10 October, and I've also been told that, because you've raised issues about the New South Wales Government, that the New South Wales Government doesn't appear to have made a submission to the Productivity Commission although - - -

THE COMMISSIONER: That's telling in itself.

MR BEASLEY: - - - they were consulted. They have, of course, made a submission of sorts to this Commission.

THE COMMISSIONER: I think I'm to understand that there is a resources problem.

MR BEASLEY: That's what people keep telling us.

THE COMMISSIONER: Which means, of course, a priorities problem. Choices made about what the money should be spent on.

MR BEASLEY: Yes.

THE COMMISSIONER: And alas it may be that people have preferred to spend money on redundancy packages for people with skills and experience rather than the continued expenses of maintaining and training and are recruiting skills and experience. That's a choice that has been made at a high level of government.

MR BEASLEY: Certainly. My point though in relation to this draft report is that as you point out, that the MDBA, the Commonwealth may or may not respond to the draft report and the draft recommendation.

THE COMMISSIONER: That's right.

MR BEASLEY: But the – the one chance for management staff board members of the Basin Authority and other Commonwealth agencies like the CSIRO to be examined publicly about these vitally important matters is at this Royal Commission.

THE COMMISSIONER: Certainly.

MR BEASLEY: That's important.

THE COMMISSIONER: Certainly before mid-2019 when everything is meant to be hitting the ground running.

MR BEASLEY: That's right, the Basin Plan is meant to be delivered in full and on time by 1 July 2019, which seems doubtful on the basis of the productivity's draft finding alone, but examining on oath the people I've just mentioned or of the kind I've just mentioned is important to the Basin Plan and the Basin as a whole, and it's really important for South Australia. It's important for its key environmental assets. We know that a 3,200 gigalitre plan, 3,200 gigalitres recovery from the environment, is a compromise in a sense in that that's probably not enough water, but as the plan stands at the moment we don't even have – probably don't even have a 2,100 gigalitre plan, and all of the scientific evidence including the Basin Authority's own scientific evidence is that that's nowhere near enough.

And we are talking about the expenditure by the Commonwealth government of only $13 billion. People are entitled to know why that money is being spent and in particular people in this State are entitled to know why that money is being spent and yet the current South Australian Government has chosen to deprive this Commission of the chance of examining these witnesses, and in my submission the South Australian Government needs to give an explanation as to why it has taken that view, because inferences can be drawn about that decision to not extend this Commission to enable the opportunity to examine these people.

THE COMMISSIONER: That's something that I will consider as a submission.

MR BEASLEY: Yes. There are a limited range of inferences in my submission that you can draw as a result of that decision and I will be expanding on that at an appropriate time.

THE COMMISSIONER: Thank you.

MR BEASLEY: That leads us to Professor Brookes. That's all I wish to say about the Productivity Commission. I'm just wondering whether we should tender the draft report; probably should.

THE COMMISSIONER: No, it's a public document. We will read it sooner rather than later.

MR BEASLEY: Yes, all right. Just before I begin with Professor Brookes because, as I said, it seems a long time ago since he was here, I just wanted to assist you as much as – and myself about what we covered the last time he was here. In particular, we dealt with his report – sorry, a report that he co-authored, which is exhibit RCE9 which is the – titled 'The Science Review of the Estimation of an Environmentally Sustainable Level of Take in the Murray-Darling Basin' CSIRO report 2011 that Professor Brookes co-authored with Mr Young, Mr Bond, Mr Gawne, and Mr Jones. I hope they're all listed. Are they? Think so. The witness is nodding. Which was a review of a draft of the MDBA's ESLT report which is the final version which is RCE6. Now, at transcript page 938 – so we refresh the memory, I took Professor Brookes to page 30 of the RCE9.

THE COMMISSIONER: Yes.

MR BEASLEY: I think it's worth just going over that which – there was in particular the top paragraph, page 30, where the panel noted that:

> *The panel understands that other reduction scenarios have been modelled, but the panel has not seen modelling results for these other scenarios, and thus it is not clear how the 2,800 gigalitre a year reduction proposal was arrived at. The panel assumes this proposal was arrived at as a result of socio-economic considerations by MDBA, but a consideration of socio-economic analyses is beyond the terms of reference for this review.*

Having refreshed my memory about that evidence, it just seems extraordinary that these group of scientists, including Professor Brookes, are asked to review the work of the Basin Authority and the Basin Authority doesn't even provide them with the modelling results for other scenarios and doesn't even make it clear to them how 2,800 gigalitres was arrived at.

THE COMMISSIONER: This - - -

MR BEASLEY: We still don't know, I should say. Seven years later, we still don't know.

THE COMMISSIONER: This 'Water for a Healthy Country' final report, Professor, would you regard this as being in the nature of a peer review?

PROF BROOKES: Yes. A review - - -

THE COMMISSIONER: I don't mean in the formal journal publication sense, but - - -

PROF BROOKES: It's a – yeah, a review of process and science.

THE COMMISSIONER: Yes. And so it's a group of scientists examining the methods and product of scientific colleagues at work.

PROF BROOKES: Yes.

THE COMMISSIONER: And providing commentary intended to be interested, expert and balanced. Is that right?

PROF BROOKES: Correct.

THE COMMISSIONER: Have I correctly read the conclusion that starts at the foot of page 29 in the paragraph:

While operational constraints preclude –

And I don't mean to leave anything out above that, but picking it up at that paragraph which, of course, refers back to outcomes seen in table 2, and then over the page on page 30, all of page 30. The third paragraph makes a suggestion that the MDBA has not yet followed what you describe as the feedback loops in its depiction of decision-making. Do you see that, page 30, third paragraph?

So that's a paragraph that seems to say, well, the process to be followed in order to understand ecological consequences and the prospects for the achievement of high level environmental objectives doesn't seem yet from the material made available to you to have been followed through. Is that correct? Have I understood that correctly? Figure 2, by the way, is at page 11. The feedback – I'm afraid I'm a person who prefers words to graphics, but the feedback is intended to be signified by the dotted line running up the right-hand side with an arrow at the top. Is that correct? So you keep going back, as it were.

PROF BROOKES: Yes.

THE COMMISSIONER: - - - in an iterative process; is that right?

PROF BROOKES: Yes.

THE COMMISSIONER: Have I understood that correctly, that in those four paragraphs you are saying the requisite feedback by way of an intellectual response to observed outcomes of modelling has not been followed through; is that right?

PROF BROOKES: Yes.

THE COMMISSIONER: Right. And then two paragraphs on, in a paragraph which somebody like myself clings to, because it starts with the words "in summary", have I correctly understood that as meaning that you and your co-authors regarded, even in the absence of future climate change, that the SDLs then being proposed for a 2,800 gigalitre recovery for the environment would be highly unlikely to meet the specified ecological targets. Have I understood that? That's the 2,800 limit of recovery?

PROF BROOKES: Yes, that's the wording. I can't recall exactly which of the specific ecological targets wouldn't be met under that SDL.

MR BEASLEY: Well, there's a table on page 29 where there's some – a number of targets reported against "met at low risk frequently", "met at high risk frequently", "not met, but likely", "improvement likely", "no improvement", "worse than baseline". It goes a bit further, though, Commissioner, than highly unlikely to meet the specified ecological targets, even in the absence of future climate change for a 2,800 gigalitre plan, because at transcript 954, commencing at line 1 Professor Brookes agreed that if you've got to – and I don't see why you don't have to, but if you've got to meet these environmental targets that had been sent by the Basin Authority itself, then a 2,800 gigalitre plan does not – does not represent an environmentally sustainable level of take.

THE COMMISSIONER: The next thing I want to ask you on page 30, Professor, is this. The second-last paragraph "in summary" on page 30 notes that the ecological targets don't seem to have been revised, notwithstanding assessment of achievability, and that an ecological interpretation of realistic achievements in prospect had not then yet been clearly articulated. Are you aware of anything since then that has supplied those deficiencies?

PROF BROOKES: By the MDBA.

THE COMMISSIONER: By the MDBA, yes, the statutory authority given responsibility to do things in accordance with best available science.

PROF BROOKES: Yes, I'm not sure where that – where that process is at.

THE COMMISSIONER: It would be a pretty significant step forward, wouldn't it, if that had been done?

PROF BROOKES: Yes.

THE COMMISSIONER: You would expect that somebody with your knowledge of your area of interest you probably would have come across it if it existed.

PROF BROOKES: Yes. I work across a broad range, so I'm not always into the detail of what's going on in the River Murray.

THE COMMISSIONER: But this would be, on any view of it, a pretty significant exercise for them to have carried out, the supply of that deficiency.

PROF BROOKES: Yes.

THE COMMISSIONER: Well, no doubt, if it has been done, in light of you're saying you've not heard of it and I saying I haven't come across it yet, if anybody

knows of anything which would give us information you and I don't have, they will no doubt supply it. Thank you.

MR BEASLEY: I asked Professor Brookes on the last occasion a couple of questions about climate change at transcript 964 and 965. But in relation to this report, RCE9 by the CSIRO, you have to – we have to look at page 20 first. This is important concerning the discussion I had with you, Commissioner, concerning the draft Productivity Commission report on climate change and the Authority's – how it takes it into account. You will see at the top paragraph on page 20:

> *MDBA has made a policy choice not to directly address the project that impacts the future climate change and water availability in the determination of SDLs for the proposed Basin Plan.*

Now, as you pointed out – and this is picked up in the next paragraph – that the Basin Authority's view is well, you can accommodate climate change, will get accommodated for in relation to allocations on entitlements. But, going back to paragraph 1, it's important to note that the MDBA has 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 proposed SDLs. So it has completely ignored, in relation to determining the ESLT and determining SDLs.

THE COMMISSIONER: Yes.

MR BEASLEY: Going on, the panel, including Professor Brookes, says:

> *If climate change impacts do unfold as projected, lower SDLs would be required to maintain the level of environmental protection offered by the currently proposed SDLs. This represents a significant risk in the longer term and a smaller risk in the short term.*

Now, let's remember this report was written in 2011, so the short term may have already gone - - -

THE COMMISSIONER: Yes.

MR BEASLEY: - - - by now and we may even be in the significant risk category now. I suppose I should ask the witness that. What's short term?

PROF BROOKES: I guess we see the short term, you know, the five to 10 year. The longer term being longer than that.

THE COMMISSIONER: Yes.

MR BEASLEY: Bearing in mind the CSIRO's – at the time, there was modelling by the CSIRO that looked at 2,030 scenarios and 2,050 and 2,070 scenarios, I think. Is that your memory?

PROF BROOKES: They're sustainable use.

MR BEASLEY: Yes, sustainable use project. Going back to the very last paragraph at page 30 of this report, the panel says:

> *With respect to climate change, it's recommended that the MDBA indicate whether, if the drying projections for the Basin come to pass, the MDBA's intention would be to revise the environmental objective for the Basin Plan, enforce more stringent SDLs to ensure environmental protection or adopt some compromise between the two.*

So this is the panel making that recommendation to the Basin Authority.

THE COMMISSIONER: Yes.

MR BEASLEY: I'm unaware of the Basin Authority acting on that recommendation. If it has, I will apologise and they can tell us.

THE COMMISSIONER: If they care.

MR BEASLEY: Yes.

THE COMMISSIONER: At page 20, Professor, third paragraph commencing "as clearly demonstrated", is it still your understanding that the way in which entitlements operate and in terms of buybacks, that 70 to 80 per cent of environmental water is not entitlement, or has that reduced?

PROF BROOKES: That would have reduced by now.

THE COMMISSIONER: Yes. I don't think it's wholly entitlement. Is that right? Or am I wrong?

PROF BROOKES: Environmental water?

THE COMMISSIONER: Yes.

PROF BROOKES: Environmental water is not fully owned by either – any of the states as environmental water or by the Commonwealth Environmental Holder.

THE COMMISSIONER: In a sense, some of it is just the river.

PROF BROOKES: Some of its river.

THE COMMISSIONER: Yes. Now - - -

PROF BROOKES: And unregulated flows are still environmental water.

THE COMMISSIONER: Yes. Quite. Well, you've no doubt heard, like everyone else, of proposals, both at the Commonwealth and State, New South Wales, level that during the current drought – well, perhaps I should say the drought that is understood not likely to break soon – that environmental water should be made available, I think, to irrigators, although it's a bit unclear. It appears some of the talk is concerning the watering of stock. I'm not quite sure what is really meant by that. Is that one of the, no doubt, multifarious ways in which environmental water might be understood to bear the brunt of the risk of a drying, temporary or permanent?

PROF BROOKES: I guess there's a couple of different ways of looking at environmental water and its benefits. It's good to use environmental water during wet years, as well, in order to build up resilience within the system. And then, the way the current water sharing agreements are, the allocations to the environment decreases along with other allocation. And then that means there's less water available to service whatever environmental asset you're trying to water. But it could also be a decision made that that water is then open on the water markets and for sale and then could be purchased like any other water and used however anyone sees fit. And so that's – you know, given the dryness of the country that may be an appropriate use of environmental water, if that's what the community decides.

THE COMMISSIONER: And when you and the panel use this expression:

> *Shifting the majority of the impact to non-entitlement water, especially during extended dry periods.*

What did you particularly have in – what does that describe? Second and third line to .....

PROF BROOKES: So I guess it's ..... may not have this completely right in the way – the intent in which this was written, but if we think about who bore the risk historically, because water didn't have an entitlement. When there was less water in the river entitlement holders got their water, but the environment didn't get their water.

THE COMMISSIONER: And what was left was left.

PROF BROOKES: And what was left was - - -

THE COMMISSIONER: And the residue reduced - - -

PROF BROOKES: Yes.

THE COMMISSIONER: - - - obviously, more than the entitlement.

PROF BROOKES: And so what has shifted now is that with the environment as a water holder it now shares risk with other irrigators. So it has an allocation and so it benefits when there's plentiful water and also has its allocation reduced when water is more limited.

THE COMMISSIONER: But that's reduced in line with reductions - - -

PROF BROOKES: In water - - -

THE COMMISSIONER: - - - for other entitlement - - -

PROF BROOKES: In water allocations.

THE COMMISSIONER: Yes. A proposal to take not for environmental reasons, but for drought relief reasons, water from that environmental entitlement would be a differential impact on environmental entitlement compared to irrigator entitlement, would it not?

PROF BROOKES: Yes. So I guess it's how that water would be taken and whether it's purchased. And then perhaps in – you know, that money is then invested for future years. So if there was an assessment made across the Basin of relative state of ecosystems and whether they need environmental water, then it could be for a one-off that water is sold to irrigators and then some assets don't get watered next year and then money is available for purchase of water in future years for more environmental outcomes.

THE COMMISSIONER: What you've just described is an ecologically driven stewardship decision; is that right?

PROF BROOKES: It would have to be ecologically driven. So you have to look at what's at risk, as we have with all the other planning. What's at risk, what would the benefits be, and is there – what are you trading off if you allocate water from the environment and sell it on the market?

THE COMMISSIONER: And are you thinking in terms of that being the kind of decision that under our present system would be made by the Commonwealth Environmental Water Holder?

PROF BROOKES: I think the decision would rest with them.

THE COMMISSIONER: Thank you.

MR BEASLEY: They were all the questions I had about exhibit RCE9. I wanted to turn to the independent review report that is behind tab 2 of the Professor Brookes brief which is a report of 30 March 2014. Which is a good day that was my 50th birthday. 'SDL Adjustment: Ecological Elements Method Development' ..... just noticed that.

THE COMMISSIONER: Which page, sorry?

MR BEASLEY: Sorry, tab 2.

THE COMMISSIONER: Yes.

MR BEASLEY: There should be a report.

THE COMMISSIONER: I've got it. Page?

MR BEASLEY: I haven't gone to the page yet. You're way ahead, as usual.

THE COMMISSIONER: No.

MR BEASLEY: 'SDL Adjustment: Ecological Elements Method Development Report'.

THE COMMISSIONER: Have you got it? Yes.

MR BEASLEY: Now, this report is actually a review of an exhibit which is RCE149, which is a report entitled 'Development of the Murray-Darling Basin Plan SDL Adjustment Ecological Elements Method', which has about 15 authors.

THE COMMISSIONER: Did you say 149?

MR BEASLEY: Yes, RCE149. It has got too many authors to read out.

THE COMMISSIONER: That's all right.

MR BEASLEY: And it's behind tab 6 of the - - -

THE COMMISSIONER: SDL.

MR BEASLEY: SDL adjustments folder. Before I ask Professor Brookes some questions about the independent review panel report, Professor, if I cut you off when I'm asking you a question and you haven't completed your previous answer, please let me know.

PROF BROOKES: Okay.

MR BEASLEY: Because I'm quite happy to accommodate that in this kind of hearing. If this was a trial you would be in a lot of trouble trying to do that to me, but in this sort of inquiry I'm very happy for you to say, "I haven't completed my answer." Or, "I would like to add something." Please don't hesitate, okay? Can I just – just looking at the front page of this independent review panel report, you're listed as the first. Is that just alphabetical, or - - -

PROF BROOKES: It's alphabetical.

MR BEASLEY: Right. You weren't – everyone contributed equally.

PROF BROOKES: I was – yes, there was – I guess in these panels not everybody contributes equally.

MR BEASLEY: Right.

PROF BROOKES: Gary chaired and then people have various expertise, the expertise that they contribute.

MR BEASLEY: All right. This review report, it's – it was entirely based – you weren't provided – and I don't even think they were in existence at the time, but you weren't provided with any business cases for supply measures or MDBA analysis. That wasn't the nature of what you were looking at. You were looking solely at is there any scientific integrity in relation to the scoring method.

PROF BROOKES: Correct.

MR BEASLEY: Correct. And you – as you say at page 3 in the bottom paragraph, you considered – the panel considered that the method devised, which is set out in schedule 6 of the Basin Plan, subject to further testing is scientifically fit for purpose. But you recognise that this – that what's set out in schedule 6 of the Basin Plan, as you say in this report is also novel and untried. And that might apply anywhere in the world, I think. Is that - - -

PROF BROOKES: That's correct.

MR BEASLEY: Yes. And as such, as you state, there are significant ecological and management risk involved in the application, and you mention some of those in section 4 of the report – sorry, and going back to page 4, you – the panel also noted that this scoring method is described as, in your words:

> *Complete, but not properly road tested, a new method ready for trial and use, but will nevertheless benefit from further testing review and refinement.*

I see, yes, and also 3.2:

> *SDL adjustment process and consequently the SDL-EE scoring method is without precedent in Australia or indeed elsewhere. This approach thus requires concerted and continuous assessment to ensure it passes the scientific common sense test at each stage of further development. By scientific common sense the IRP is posing the question, "Does the SDL-EE method give results for individual ecological elements (types of birds, fish, and vegetation) that would seem reasonable to another, appropriately qualified scientist?"*

What does that mean, if you elaborate on that?

PROF BROOKES: So under any given flow scenario, would you expect that the targets that are set for birds, fish or vegetation to be robust, and would they be met or otherwise under that flow? So given the knowledge that people have accumulated, these appropriately qualified scientists have accumulated over years of working in the system, does it make sense? So if you're watering vegetation, under those flows does it make sense that you would be watering the type of vegetation that you expect, or are you – are small bodied fish, are they getting the right sort of water requirement that they – that they need.

MR BEASLEY: Am I right, though, that the entirety of this scoring method relates back to – primarily relates to flow rates and then conclusions are drawn from that, ecological conclusions are drawn from that.

PROF BROOKES: Yes. Flow rates, but also duration.

MR BEASLEY: Yes.

THE COMMISSIONER: And timing.

MR BEASLEY: And timing, yes. Time of year, duration, how many days, space between, how many years, all that sort of - - -

PROF BROOKES: Yes.

MR BEASLEY: - - - data.

THE COMMISSIONER: How much, where, when, over how long.

PROF BROOKES: Yes.

MR BEASLEY: But - - -

THE COMMISSIONER: Which doesn't capture all the, what I call, hydraulic subtleties but is better than simply measuring an annual discharge.

PROF BROOKES: Yes.

MR BEASLEY: Yes. So – and what it won't capture, for example, is – it might show, for example, that a regulator can, by its operation, produce a particular flow for a particular amount of time, depending I suppose on how much water is in the system or based on a release of environmental water, but it won't show you necessarily – unless you investigate, for example, let's talk about some evidence we've had at the Commission – it won't necessarily show whether, because there's not a precise, or because there's a long way short of a precise mimicking of the use of a regulator and a natural flood, the scoring method won't show you, for example,

whether that use of the regulator produces an unnaturally large, for example, carp breeding event, which might impact on native fish.

PROF BROOKES: Yes.

MR BEASLEY: So that's something you've got to investigate on the ground and can't be judged merely on a scoring method that's dependent on flows that we've discussed.

PROF BROOKES: Yes. So for any adjustment you would need to look at what are the risks, and so carp spawning would be one risk, cyanobacteria or black-water events would be other risks, and that's where with any structure like this you would have a risk management.

MR BEASLEY: And that's the sort of example I've just given is why you and other members of this review panel said at page 3 that there's significant ecological and management risk involved in the application of – it's not so much the application, I suppose.

PROF BROOKES: Yes.

MR BEASLEY: But whether this scoring method will translate to proper – to real world results that justify the scoring method; is that fair?

PROF BROOKES: Yes. So we know we can – well, we have more certainty around particular measures.

MR BEASLEY: Yes.

PROF BROOKES: There's a new – well, given that this is untried both in terms of a model but also then its implementation and the development of these structures, then there has to be a risk assessment, a risk mitigation, adaptive management at every step of that process.

MR BEASLEY: Yes.

THE COMMISSIONER: Well, now, it appears to me on reading this that, in places too numerous for me to list, that is as a major theme of the advice your review panel was giving, is that it's an experiment and the essence of an experiment is learning by doing: observing, reflecting and adjusting, sometimes called adaptive management. Is that – have I understood that correctly?

MR BEASLEY: I think the best is page 5, for future refinement.

THE COMMISSIONER: Well, I could probably compete with you there, because I think there are other purple passages as well. And I think I understand them, but there was a particular aspect of – in my mind it's like a calibration question, which I

didn't really understand I am sure, and I would like you to elaborate it for me, explain it to me. Foot of page 4, under the heading 'Sensitivity to Initial Conditions'. I think I understand the first sentence, I think I understand the second sentence, and then I'm pretty sure I don't fully grasp the import of the third and fourth sentence. I understand the fourth sentence. Could you explain the third sentence to me?

> *Possible that future scores are inappropriately sensitive to this initial condition noting that ideally the test of equivalence should not be sensitive to an arbitrary choice of initial condition.*

But the limit of my understanding at the moment is that it's arbitrary in the sense that it's simply the whistle has been blown on not keeping records, and not making observations, so we're starting an empirical ground zero as it were with some what's called the initial condition and we need to be sensitive to the fact that arbitrarily, therefore, there may have been – and I use this word very cautiously – an atypical set of conditions which turn out to be treated as a kind of a baseline. Is that correct? Or, more to the point, is there anything else I should understand about what you're saying there? This notion of inappropriate sensitivity.

PROF BROOKES: Yes. Yes, I would have to – I have to revise exactly how that – how the method comes about. I guess the difficulty we have with modelling is that we often – spin up time. So it's how long until your model starts giving you what you consider to be reasonable results. And so you set your initial condition to be as reasonable as you think, and then you will have some spin up time. What I guess the argument here is that it's possible that future scores are sensitive to that spin up time, that initial condition, and that's just one of the concerns around the sensitivity of the model.

THE COMMISSIONER: So if the initial condition had been what I will call a time of great ecological prosperity for these species you're interested in, then you might be disappointed in the experience of incremental improvement. That is, you may not see anything, in fact, and so according to that model then whatever you're doing would be treated as a failure whereas, in fact, it may be fair, average quality. Is that - - -

PROF BROOKES: Yes. And I guess we're not highlighting that there was enormous sensitivity to this.

THE COMMISSIONER: No.

PROF BROOKES: But it's asking for a procedure that properly tests that initial condition to ensure that we're not making – well, we're not getting spurious results based upon that.

THE COMMISSIONER: Are you aware of that having been taken up and performed?

PROF BROOKES: I'm not sure that we reviewed that again.

THE COMMISSIONER: And are you aware of the suggestion or statement made in the second sentence of 3.2, namely the approach requires concerted and continuous assessment to ensure it passes the scientific common sense test, etcetera. Are you aware whether or not that has been carried through?

PROF BROOKES: I'm not aware that it was put to any other peer review.

THE COMMISSIONER: Right. And then on page 3, second last paragraph, there's a conclusion from the panel about the Sustainable Diversion Limits ecological elements method being scientifically fit, etcetera:

> *Subject to the completion of further testing by the Authority as described in section 3 below.*

Does it follow from your last couple of answers that you don't know whether that condition the panel imposed on its conclusion has ever been fulfilled?

PROF BROOKES: I don't know. That may – that would be an internal MDBA.

THE COMMISSIONER: When you say "internal".

PROF BROOKES: Well, they - - -

THE COMMISSIONER: As a matter of science, it ought to be published, shouldn't it?

PROF BROOKES: Well, it's – well, it could be published, if that was what they chose to do. But the method was taken from the CSIRO method and encoded by MDBA in their scenarios for run. And so I'm not sure about what checks they put across that when they were running the modelling.

THE COMMISSIONER: But this panel says, in effect, certain things have to be done in the future in order to justify a conclusion of fit for purpose. And you don't know whether that has been done.

PROF BROOKES: I'm – no.

THE COMMISSIONER: No. Thanks.

MR BEASLEY: So page 5, 'Future Refinements', section 4:

> *Dangerous to assume or insist that the SDL-EE method set out in the final report is not improved in any way prior to its final application for SDL adjustment purposes. Evidence-based requirements to input parameters of this type should be encouraged. For example, knowledge of how target species*

respond to the artificial flooding events and hydrological regimes provided by engineering infrastructure (or other human interventions) could inform risk-based adjustments to preference curves in the SDL-EE method.

That's what we were discussing before about whether the use, say, of a regulator might produce an unwarranted carp breeding event. That's the sort of risk you're identifying there that needs to be considered. Similarly, in 4.1:

Recognised that the current ecological elements represent a simplified sub-set of ecological outcomes for bird, fish and vegetation restricted by available scientific knowledge and consistent data across the southern Basin. The relationship between hydrology and ecology of an increasing range of taxa is currently a very active area of research. Some of these relationships, migration and dispersal of native fish may be highly sensitive to the mode of delivery of environmental water and some may operate only at spatial scales larger than sight or reach.

This is, again, the panel saying how water is delivered may cause unexpected results not picked up by flow modelling, and there needs to be real monitoring from what's occurring; correct?

PROF BROOKES: Correct.

MR BEASLEY: Yes.

THE COMMISSIONER: Well, at that perhaps uneasy meeting of governance and science I'm struck by the unsatisfactory nature of somebody with your skills and experience not being knowing as a matter of what I call public record whether this is – has happened. That's not a criticism of you. That is, it strikes me that one of the attributes of modern science is an availability to be scrutinised. Is that not true?

PROF BROOKES: Yes.

THE COMMISSIONER: Which involves something in the nature of publication or at least making it available, if only to the ..... is that right? Of which you are one.

PROF BROOKES: Yes, there may be – there may be publications, but I - - -

THE COMMISSIONER: You're not aware of them.

PROF BROOKES: I'm not aware. But that might be that I'm naive, not that they're not available.

THE COMMISSIONER: No. Thank you. Yes. Thanks

MR BEASLEY: Well, leaving aside what the MDBA has released, we know from Dr Mallen-Cooper's evidence – and it wasn't – these are publications he drew our

attention to, not his own publications, that at least on one occasion when the charter regulator was used it was a good result for some of the gum trees that needed water, but there were carp all over the place.

THE COMMISSIONER: It was a good result for the carp.

MR BEASLEY: Great for the carp, not so good for the cod.

THE COMMISSIONER: They're all God's creatures.

MR BEASLEY: Yes, that's true, but the carp aren't Australia's creatures, Commissioner. Well, I suppose they are now. Been here long enough.

THE COMMISSIONER: I don't know how you can say that. I'm not aware that anyone in this room is in a position to complain about immigrants.

MR BEASLEY: You won't be hearing anything along those lines from me. I consider myself an immigrant. I feel like an immigrant to South Australia these days. The place has changed a lot.

THE COMMISSIONER: You may be refused asylum, you know.

MR BEASLEY: I will probably be extradited back to New South Wales.

THE COMMISSIONER: Yes.

MR BEASLEY: That's all I wanted to ask about that report, Commissioner.

THE COMMISSIONER: Could I ask, however, one further question. Page 7, third paragraph commencing:

At the current transitional point –

There's a reference in the last sentence to the possibility by way of suggestion that further distillation of knowledge, gaps through another workshop or even a formal risk assessment. Have you any knowledge will that happened, whether that suggestion was taken up?

PROF BROOKES: So this is in the appendix?

THE COMMISSIONER: Yes, appendix A.

PROF BROOKES: Yes.

THE COMMISSIONER: Page 7. So third paragraph on the page. Commences "at the current transitional point". Last sentence talks about – makes a suggestion about,

perhaps, a workshop or formal risk assessment to – further to distil knowledge gaps. Do you see that?

PROF BROOKES: On the - - -

THE COMMISSIONER: You've got it. See the paragraph commencing:

At the current transitional point –

On page 7.

PROF BROOKES: Yes. Sorry. I was - - -

THE COMMISSIONER: Look at the last sentence of that paragraph, knowledge gaps, etcetera. That's part of what might be called an iterative or feedback process, learning as you – by doing. Is that right?

PROF BROOKES: Yes.

THE COMMISSIONER: Are you personally aware, whether you be naïve or not – are you aware of whether that was taken up by way of a process?

PROF BROOKES: I'm not.

THE COMMISSIONER: Thank you. Thanks.

MR BEASLEY: I then just wanted to ask a few questions about the report that's at tab 3. 'Murray-Darling Basin Plan SDL, Limits of Change Review Independent Expert Advisory Panel Report' September 2017. The authors are Peter Davies, the chair; Brett Tucker, Darren Baldwin; Justin Brookes; Trevor Jacobs ..... Thompson. Again, in relation to this particular report, Professor, did everyone have a say in all aspects of it or did people take particular responsibility for different parts?

PROF BROOKES: People took responsibility for different parts, but everybody reviewed the entire document.

MR BEASLEY: Yes. Now, it could be me, but I've had some trouble understanding the point of this report. And that's not a criticism of you. But the terms of reference are at page 43, appendix A:

The purpose of the expert panel is to (i) undertake ecological analysis to assess whether ecological outcomes consistent with the Basin Plan ecological targets for the site will be delivered without compromise to the integrity of the SDL judgment and its supporting methodology, provide advice to the Authority for the sites and specific flow indicators identified by the Basin Authority as to whether the analysis indicates schedule 6.07B(iv) of the Plan is applicable.

THE COMMISSIONER: That's a fairly snappy way of describing what you're doing, isn't it?

MR BEASLEY: Yes, isn't it. The first - - -

THE COMMISSIONER: Do you recall offhand what 6.07b(iv) refers to?

PROF BROOKES: No.

THE COMMISSIONER: That's a good sign of mental health on your part.

MR BEASLEY: It's the default method for – schedule 6 deals with the default method for the calculation of the supply contribution.

THE COMMISSIONER: Yes, it does.

MR BEASLEY: 6.07 is the limits of change. b(iv) relates to flow indicators. And that relates back to the second – to the first task and activity that the panel was asked to do, review the site specific flow indicators and associated limits of change at specific sites and for specific model runs, as advised by the MDBA.

THE COMMISSIONER: So this is for each reach. So these are limits of change to apply in the method under the historic climate conditions. So you've got this idea of initial condition and you've got what I might call permitted variance in order to get a tick in the box. That's so far correct? And then the particular one this report is aiming at is for each reach:

> *Where a supply measure or combination of measures can achieve the ecological outcomes –*

And I'm struck by the expression "can achieve". That's an assessment of capacity in prospect, I assume? It involves modelling. Yes.

PROF BROOKES: Yes.

THE COMMISSIONER: Yes: Sought by the:

> *…achieved the ecological outcomes sought by the Plan, as represented by an ecological target or targets*

Now, pausing there, that's what the SDL-EE method in large part is aimed at formalising. Isn't that correct?

PROF BROOKES: Yes.

THE COMMISSIONER: Yes. And a flow indicator, etcetera associated benchmark model results. Then, it's said, you don't have to satisfy 1 to 3. In other words it's a kind of a standalone tick. Is that right? Have I understood that correctly?

PROF BROOKES: Sorry, satisfy 1 to 3?

THE COMMISSIONER: You see, 4 ends up by saying, where a supply and measure can achieve the ecological of outcomes - - -

MR BEASLEY: I don't think the witness has got the Basin Plan.

THE COMMISSIONER: I'm so sorry.

MR BEASLEY: Yes. So we might help him out.

THE COMMISSIONER: I was just assuming you remembered its wording off by heart.

MR BEASLEY: Yes.

PROF BROOKES: Yes, and most dot points, as well.

THE COMMISSIONER: Yes. That's right.

MR BEASLEY: So go to page 222.

THE COMMISSIONER: Look - - -

MR BEASLEY: 221, 222.

THE COMMISSIONER: This aspect of it probably didn't concern the panel at all.

MR BEASLEY: I'm told the pages may be different. Need to go to schedule 6.

THE COMMISSIONER: It's around 222. It may not be that actual .....

MR BEASLEY: I might help. Schedule 6A. It's just back here.

THE COMMISSIONER: I'm not suggesting that the panel could have cared less about how this is expressed. I'm not suggesting it's a very nice phrase, but you will see that this is all about stipulating for limits of change in the method. And for each reach you've got 1, 2 and 3. You will see they're all linked by an "and" to cover different possibilities. But 4 seems to supersede each of 1 to 3, I think. You see the way 4 ends up:

> *And sub-paragraphs 1 to 3 do not apply.*

So that 4 appears to be kind of a package on its own in relation to limits of change, I think.

PROF BROOKES: Because you're achieving the ecological outcome.

THE COMMISSIONER: Exactly. Exactly. So that the advice the panel was providing for the science and specific flow indicators was to whether the analysis indicates that 4 would be applicable. I'm sorry for the language. I mean, it's really impenetrable legalese. But at the end of the day this boils down to whether, according to your expert panel, the supply measure or combination had the capacity to achieve the environmental outcomes, etcetera, etcetera.

PROF BROOKES: Based upon the modelling. Yes.

THE COMMISSIONER: Thanks. Assessing its capacity requires modelling, because it's all in prospect; it hasn't yet happened.

PROF BROOKES: Correct.

THE COMMISSIONER: You're not observing achievement; you are assessing a capacity for a future achievement.

PROF BROOKES: Yes.

THE COMMISSIONER: Thanks. Got that.

MR BEASLEY: Just going back to the terms of reference, though, so task 2 is to review the site specific flow indicators with associated limit of change, specific science and specific model rules and then, 3:

> *For these sites and models, undertake ecological analysis to assess whether ecological outcomes consistent with the ecological targets for the site will be delivered. Panel will advise whether there are any practical measures available, including changes to river operations that could mitigate any ecological outcome that are less than the target.*

THE COMMISSIONER: Does that include constraints, Professor?

PROF BROOKES: It could include constraints.

THE COMMISSIONER: Thanks.

MR BEASLEY: Yes:

> *Consider the data provided by the Authority based on the June model run. The panel will provide advice to the MDBA regarding additional hydrological*

analysis and other supporting information that will assist them in making their final assessment –

etcetera. And then you've got to provide a report. But can I ask you this. Although you're being asked to do these things and it's about the SDL Limits of Change Review. I understand that. But, as an example, in terms of further information about an SDL adjustment, the panel was not provided with any of the business cases for the actual supply measures. Correct?

PROF BROOKES: Correct.

MR BEASLEY: And it wasn't supplied with any of the MDBA's own analysis about the supply measures. Correct?

PROF BROOKES: Correct.

MR BEASLEY: So, for example, in relation to the Menindee Lakes supply measure – proposed supply measure, you weren't given any information about high level of risk to Golden Perch habitat, as an example.

PROF BROOKES: Correct.

MR BEASLEY: I know you're doing a different – but you're not given that information. Equally, in relation to the Murrumbidgee River Yango Creek supply measure, you're not told that there's a risk to cod and trout from the supply measure. Not told that?

PROF BROOKES: No.

MR BEASLEY: No. So is that surprising to you, that you weren't provided with that information or is it such a limited terms of reference that that sort of information is not relevant?

PROF BROOKES: I guess with the process there's the modelling to assess the ecological targets against flow.

MR BEASLEY: Yes.

PROF BROOKES: And then for each structure and each business case then, as we recommended in our previous document, there needs to be a risk assessment or risk mitigation adaptive management associated with each of those. And so we're looking at a different process.

MR BEASLEY: Yes.

PROF BROOKES: We're looking at is the – is there a possibility that flow can be predicted in a particular way or with particular structures that achieve ecological

equivalence? We are not necessarily looking at how each individual structure may impact upon the ecology.

MR BEASLEY: Right. So the terms of reference are narrow, but the narrowness of the terms of reference excludes the need to provide you with actual, real information about – sorry, with information about risks in relation to supply measures.

PROF BROOKES: Yes.

MR BEASLEY: Looking only at flow indicators and what can be achieved.

PROF BROOKES: We're looking at flow indicators and the modelling.

MR BEASLEY: All right. I just wanted to take you to page 7 of this report in the section uncertainty in errors:

> *A range of uncertainties affect the evaluation of the materiality of the ecological effects of breaching limits of change within the SDL adjustment mechanism. These uncertainties pertain to issues of ecological knowledge, flow event characterisation, hydrological data and model performance, spatial representation, target frequency selection and breach definition. They collectively amount to a substantial error space in relation to making judgments about relatively small differences in frequencies of flow events and the reality of consequent ecological effects.*

What does "substantial error space" mean?

PROF BROOKES: It means there's no uncertainty bounds around any these estimates. So we've got a model which is giving us a very specific answer.

MR BEASLEY: Yes.

PROF BROOKES: We're not giving any uncertainty bounds, which is what we normally expect: some uncertainty bounds around how accurate that - - -

THE COMMISSIONER: Are they the same as confidence levels, confidence limits?

PROF BROOKES: It could be the same as confidence limits.

THE COMMISSIONER: On page 10, is that what you – the second paragraph on page 10:

> *Especially the case since the limits of change are linked to the high uncertainty frequency bounds identified for each SFI.*

Could you just tease that out for me, explain that more. I think I may be faltering at the expression the "high uncertainty frequency bounds".

PROF BROOKES: Yes. So the high uncertainty frequency. High uncertainty is a ..... term. It's a high uncertainty of meeting your target, and so you could say it's an increased probability of not meeting your target.

THE COMMISSIONER: Well, if it's high uncertainty, as a matter of English, you're probably not going to do it; isn't that right?

PROF BROOKES: That's right.

THE COMMISSIONER: Yes. So the high uncertainty frequency bound identified means that the – I will call it achievement, although the word is now becoming very problematic in this context, the achievement is mapped or designated or ticked so long as the scores or results fit within the bounds beyond which there is high uncertainty of achievement; is that right?

PROF BROOKES: Say that again?

THE COMMISSIONER: Something is treated as achieving the relevant limit of change so long as the score in question is within the bound of high uncertainty.

PROF BROOKES: If the – if it's within it would – if the modelling run compared to the baseline run is within the limit of change, then - - -

THE COMMISSIONER: It is within the limit of change. So the limit of changes are linked to the high uncertainty frequency bounds, it says.

PROF BROOKES: Yes.

THE COMMISSIONER: That means that an acceptable limit of change takes you right up to the point where high uncertainty - - -

PROF BROOKES: There's a high uncertainty of not achieving an ecological outcome, yes.

THE COMMISSIONER: Exactly. So an achievement is designated as, the prospect of achievement is designated, notwithstanding it includes results that indicate you probably won't achieve it.

MR BEASLEY: Plus 10 per cent.

THE COMMISSIONER: Is that not right? It's not a criticism. I'm just trying to work out whether I've understood it.

PROF BROOKES: Yes, I'm trying to make sure I understand it as well. Yes. So you're pushing right up against your - - -

THE COMMISSIONER: High uncertainty.

PROF BROOKES: High uncertainty.

THE COMMISSIONER: Now, in the sentence beforehand there's a reference to "large breaches". What order of magnitude? What should I understand that expression to mean, a "large breach"?

PROF BROOKES: A large breach is, well, not achieving ecological equivalence.

THE COMMISSIONER: So it's something beyond the high uncertainty frequency bound; is that right?

PROF BROOKES: Well, we have – we – there was two examples identified where there was breaches, but they weren't massive breaches.

THE COMMISSIONER: But you use the expression on page 1 that they were sufficiently close to their targets to be either within the limits of modelling and assumptions made within the models or measurement precision within the capacity of river operators to mitigate and within the limits of our current understanding in any event.

PROF BROOKES: In setting those targets, yes. So even with, you know, the uncertainty around the target setting, there's uncertainty there.

THE COMMISSIONER: Now, I take it that that means that there is a lot of – there are gaps of knowledge which preclude confidence as to whether the state of affairs is or is not detrimental to the ecology; is that right?

PROF BROOKES: Yes, because uncertainty isn't just – there's not just uncertainty around where we have the breach. There's uncertainty around method, and so – yes.

THE COMMISSIONER: Yes.

PROF BROOKES: It would be good to have confidence limits around each of those indicators.

THE COMMISSIONER: Is it practicable, assuming what are called 'resources' were made available, for that to be addressed?

PROF BROOKES: Yes. But probably on a case-by-case basis. So the modelling, the refinement within the modelling, is maybe as far as it can go at the current point given that it's a simplification of both hydrology and ecology, but then the application of any of these structures would need some assessment monitoring to

ensure you are meeting the indicators you think you're meeting and that you've developed the plan in order to meet.

THE COMMISSIONER: So it's more than a modelling sophistication. It also involves, what, observation and rethink?

PROF BROOKES: I think this modelling has been pushed as far as it can go.

MR BEASLEY: Have a look at page 22. I think that will help you, because I think that's a recommendation. Go to page 22 under the bullet points, you recommend a well-designed long-term surveillance monitoring be conducted across the Lower Darling reach.

THE COMMISSIONER: This is for adaptive management.

MR BEASLEY: Yes. All three ecological components .....

THE COMMISSIONER: ..... Mr Beasley, right, that's really where you're headed so far?

PROF BROOKES: Yes.

THE COMMISSIONER: Thank you.

PROF BROOKES: And that's monitoring, I think, also before any structure is put in place, the risk assessment and monitoring to fully identify how flow is going to change in that site in a really practical, refined precise way.

THE COMMISSIONER: Yes. And site specific and - - -

PROF BROOKES: Site specific.

THE COMMISSIONER: - - - ecology are answered. Yes. Thanks.

MR BEASLEY: Well, in terms of leaving aside legality issues of the SDL adjustment, the policy issue of taking 605 gigalitres away from the environment first, and then putting in supply measures in place, runs up fairly starkly against this recommendation that it's really important that there has got to be regular assessment, long-term surveillance monitoring to work out what is actually happening, because these supply measures are an experiment, an experiment with the environment.

THE COMMISSIONER: Do you agree with that?

PROF BROOKES: Yes.

THE COMMISSIONER: I'm again struck – and I don't say this at all by way of criticism, to the contrary – this is another report where there are repeated and

emphatic suggestions, recommendations made in terms of improving knowledge and analysis. One of them is found on page 39 in the section headed 'Other Issues and Observations'. Again, I don't ask this with any suggestion of criticism at all. That first sentence, could – would I be right in describing that as a very polite way of saying that one should not be too ambitious to claim ecological reality for apparently favourable modelled results in this area:

> *A major issue in assessing compliance of SDL adjustment outcomes with the Plan requirements.*

Pausing there, that involves ecological equivalence, doesn't it? Yes?

PROF BROOKES: Yes.

THE COMMISSIONER:

> *Is the mismatch between adjustment rules and the associated indicators and the reality of level of uncertainty of the tools used and knowledge available.* So this is a familiar circumstance for everyone who resorts to models, namely the model won't cure the deficiency, if there be one, in empirical data; is that correct?

PROF BROOKES: That's correct.

THE COMMISSIONER: So I was struck three paragraphs down:

> *The panel found a lack of inquiry and investment in documenting and clarifying the types of magnitude of uncertainty.*

You mean in the Authority's work?

PROF BROOKES: In the Basin's hydrological models.

THE COMMISSIONER: Which is the Authority's work.

PROF BROOKES: They sit with the Authority but they have been developed over a range of time by eWater, a number of – all the States have contributed to developing those.

THE COMMISSIONER: And then the suggestion in the next sentence for targeted, well designed and funded support effort in information and model management, should I read that as being a suggestion for something to be done which you didn't think had been done yet?

PROF BROOKES: Yes. So information model management, I guess there's two types of models. There's the hydrological model and then there's the ecological model sort of coupled to it.

THE COMMISSIONER: Yes.

PROF BROOKES: I think when we deal with physics we have the hydrological model there's a greater certainty around it.

THE COMMISSIONER: Yes.

PROF BROOKES: Even with a Basin of this scale there's still uncertainty in the hydrology. And then the ecology, the models we have are fairly simple species preference curves and so we're a long way from modelling process. We're modelling observation.

THE COMMISSIONER: So you – I read this paragraph as a recommendation that work, not yet done, be done in order to achieve an acceptable level of scientific basis; is that right?

PROF BROOKES: Yes, I think it's – it's an investment, because we keep running up against the same problem. We – when we're developing the Plan we're dealing with large volumes of water and so little bit of imprecision on where the hydrology or where the modelling ends up is okay, because you're still dealing with a large volume of water. As you get further and further and keep asking more and more refined questions you need to have greater certainty because the risk of error becomes greater. You're dealing with smaller volumes.

THE COMMISSIONER: Yes.

PROF BROOKES: And so the chance of exceeding a threshold or a real breach, not just a model breach, a real breach in achieving an ecological outcome becomes greater because you're asking more and more sophisticated questions on smaller volumes and looser modelling.

THE COMMISSIONER: Further on, next paragraph which starts with the striking expression:

A culture of reactionary information management.

By reactionary you're not talking about Colonel Blimp, you're talking about making a response to something that has occurred; is that correct? What do you mean by "reactionary information management"?

PROF BROOKES: I guess it's the way we receive information modelling, but also the way in which information is gathered. So it's when we run across a problem, all of a sudden there's a scramble to try and invest into an area.

THE COMMISSIONER: Yes.

PROF BROOKES: Whereas if we had invested into this when we put the cap in place, in 1994 perhaps, then we would have had a much greater historical body of evidence to draw upon to come up with more sophisticated models and much better information with which to make these decisions.

THE COMMISSIONER: Thanks. The next paragraph speaks for itself.

MR BEASLEY: Sorry. I just want to - - -

THE COMMISSIONER: "Is most likely to be - - -"

MR BEASLEY: I just want to ask "that lack rigorous" – the words "that lack rigorous testing and transparent documentation." Is that a comment by the panel that insufficient information is released by the Authority to enable proper testing of its conclusions, or something else?

PROF BROOKES: Well, it wasn't available to us, so whether it's not released or whether it's just not available.

MR BEASLEY: Right. All right.

THE COMMISSIONER: Well, now, this was as recently as September 2017. Are you aware of anything that has addressed uncertainty, to use the expression in 9.1, in line with these suggestions since then?

PROF BROOKES: To directly address this?

THE COMMISSIONER: Yes, to directly address this, the SDL adjustment.

PROF BROOKES: No.

THE COMMISSIONER: Thank you.

PROF BROOKES: There's targeted risk assessment and monitoring around particular sites, so Chowilla has a dedicated monitoring program. There's risk assessment around Lindsay and Katarapko, and sophisticated hydrological modelling, and there's also work by the Commonwealth Environmental Water Holder who fund the long term intervention monitoring.

THE COMMISSIONER: Thank you.

PROF BROOKES: Which is building a body of evidence around how the various organisms respond.

THE COMMISSIONER: Thank you.

MR BEASLEY: I don't have any further questions for Professor Brookes.

THE COMMISSIONER: Well, neither do I.

MR BEASLEY: All right. Is there anything you would like to add to your evidence?

PROF BROOKES: I guess just to point to you, I noticed that under theme 7 there is work on the progress of environmental outcomes which relate to the Plan.

MR BEASLEY: Yes.

PROF BROOKES: And one point under that is the ecological health of the Murray-Darling Basin, and the work which is relevant for that is the monitoring – on the long term intervention monitoring by the Commonwealth Environmental Water Holder.

MR BEASLEY: Right.

PROF BROOKES: And there's now four years of data collection, modelling and monitoring that would help to inform that point. And just that, you know, this planned ..... wallet has – yes, perhaps flaws in its development, is delivering ecological outcomes, and so I would recommend that you perhaps look to the Commonwealth Environmental Water Holder and the data there.

MR BEASLEY: Sure, yes.

PROF BROOKES: One point in particular is some of the work we do where we model - - -

MR BEASLEY: When you say "we".

PROF BROOKES: We. So myself and some colleagues from the University of Western Australia are contracted by the Commonwealth Environmental Water Holder to look at this, and in the dry years in particular the environmental water which has been recovered under this plan is delivering environmental outcomes, and a significant amount of water which is flowing down the river. And so - - -

MR BEASLEY: Is there any report you would like to or publications you would like to draw to our attention? You don't have to do it now. You can tell us later.

PROF BROOKES: Yes. So I can point to you some reports.

MR BEASLEY: That would be helpful. Just on that though, just pausing there, because you mention dry periods and environmental water. What do you think of the idea of – in a drought using environmental water to be provided to irrigators?

PROF BROOKES: I guess I wouldn't want it all to go to the – I wouldn't want all of environmental water to be taken, when there's still environmental assets that require some environmental water. The – one of – again, the benefits of this plan is

that there is now – we're able to have that conversation because there is a pool of water which isn't allocated to irrigators. Previously, we would never have had that conversation because there wasn't any water available. So if a case can be made that the water is put to good use, and to benefit communities and enable farmers to survive through drought, and at the same time a case is made that it's not going to compromise either in the short term or the long term the intent of the Plan, then, you know, perhaps we could as a community look at some of those solutions.

THE COMMISSIONER: Well now, just to put that in context of the Water Act, the Commonwealth Environmental Water Holder has functions under subsection 105(2), I will paraphrase, to dispose of water and water access rights, and you're referring to that as a possible response either in times of feast or famine; is that right?

PROF BROOKES: Yes.

THE COMMISSIONER: It has related powers of contracting, and it has a function of maintaining an up to date record of the environment – the Commonwealth's holdings. In relation to that, section 107 makes it clear, quite specifically, that there is not what I call political direction able to be exerted against the Commonwealth Environmental Water Holder in relation to those functions, not subject to the direction of the Secretary of the Department or the Minister in relation to any of those things. And then we come to section 114, which is the annual report, and is that what you're referring to by way of the material you urge us to look at?

Because under subsection (2) of 114, the Commonwealth Environmental Water Holder must include in an annual report to the Minister for tabling in the House – in the Houses of Parliament – particulars of the achievements against the objectives of the Environmental Watering Plan for each disposal of water, among other things the amounts of the proceeds, and then for disposal, the purposes for which those proceeds have been used. In other words, public reporting on the stewardship of these Commonwealth holdings of environmental water. So it has either been used, effectively or not, for the environment or it has provided money which has then been used for a purpose which we can assume needs to be within the functions of the environmental holder. Which might mean, for example, buying temporary water for an environmental purpose. Is that not right?

PROF BROOKES: Yes.

THE COMMISSIONER: In fact, that would be a paradigm of the use of such funds, do you think?

PROF BROOKES: I think that or to improve environmental – or improve scientific knowledge in order that they make better use of environmental water in the future.

THE COMMISSIONER: But at the moment, at least, I don't understand how the idea of making water available for drought stricken would-be irrigators falls within any of that.

PROF BROOKES: If it's disposal of water.

THE COMMISSIONER: .....

PROF BROOKES: Disposal of water, then if it's on an open market.

THE COMMISSIONER: You're quite right ..... a politically directed disposal. If you put together the provisions I've just noted, that's a matter for the Environmental Water Holder exercising environmental water functions.

MR BEASLEY: I didn't want to – yes.

THE COMMISSIONER: Not a matter for the Minister or Secretary.

MR BEASLEY: I didn't want to take it up with the witness, but sorry, 105(3).

THE COMMISSIONER: Yes.

MR BEASLEY: How does that allow - - -

THE COMMISSIONER: Well, it doesn't.

MR BEASLEY: - - - water that – the CEWHs functions are for the purpose of protecting or restoring environmental assets.

THE COMMISSIONER: I gave ended up using my red ink on subsection (3), because I could have underlined every word of it.

MR BEASLEY: I'm not sure how the CEWH could exercise a lawful function of allocating water to a farmer.

PROF BROOKES: It could – no, if - - -

THE COMMISSIONER: In order to produce proceeds, the proceeds of which are going to be used for subsection (3). This is a legal question. Mr Beasley has indicated that there are tensions: on the one hand they have powers to sell, on the other hand everything has to be done, subsection (3) of section 105, for the purpose of protecting or restoring the environmental assets. I think the reconciliation is you can sell water to raise funds which you think – that is you, the holder, think will be able better to be put to the purpose of protecting or restoring the environmental assets so as to give effect to relevant international agreements.

MR BEASLEY: Interesting decision.

THE COMMISSIONER: Yes.

MR BEASLEY: Because if farmers are in drought the environment is in drought, so - - -

THE COMMISSIONER: Well, quite. But more to the point neither the Minister nor the top bureaucrat can direct that.

MR BEASLEY: No, no.

THE COMMISSIONER: And the holder has to report to Parliament about any directions given by the Minister and the Secretary. So I've proceeded – I hope I'm not being naïve, that we will find in the CEWHs section 114 reports the official account of the relative success or failure of environmental watering by the CEWH; is that correct?

PROF BROOKES: Yes. There would be reports available on the long-term intervention monitoring.

THE COMMISSIONER: Yes.

PROF BROOKES: So it's a difficult task, because they have to demonstrate what their additional environmental benefit is from their water.

THE COMMISSIONER: Yes.

PROF BROOKES: So that's where our modelling, where we're just looking at salt export is a good indicator of the benefits of that environmental water, because what we're – what the river does also is it moves salt out of the landscape. So there's a lot of salt there, historically. The river transports it out.

THE COMMISSIONER: Prehistorically.

PROF BROOKES: Prehistorically. And it's also continually replenished. So as rain is coming in we've got new salt coming in all the time, and so in order to maintain productivity in the Basin we do need to continue to remove salt from it. And that's one of the functions now that environmental water does, and it's contributing – well, the environment water in 2015/16 contributed in the order of 500 million tonnes of salt export from the Basin.

THE COMMISSIONER: Have I understood at all correctly that that is a very simple way of explaining why water is not wasted if it travels out of the Mouth of the Murray into the ocean.

PROF BROOKES: That's one of the benefits; otherwise that salt stays in the landscape - - -

MR BEASLEY: It's essential.

PROF BROOKES: - - - and reduces productivity.

MR BEASLEY: Yes.

PROF BROOKES: And there is a target of 2 million tonnes a year on average.

THE COMMISSIONER: Thank you.

MR BEASLEY: All right. If you can just provide us, outside of the hearing, any information – sorry, any reports or documents that you think we should read, we would be grateful for that. Did that conclude everything - - -

PROF BROOKES: Yes.

MR BEASLEY: - - - you wanted to say. Thank you very much for coming.

THE COMMISSIONER: Can I thank you very much? I've really benefitted from your explanation and your evidence.

PROF BROOKES: Thank you.

THE COMMISSIONER: Thank you very much.

MR BEASLEY: The next witness is at 3.30.

THE COMMISSIONER: We will adjourn to a Skype session which, at our end, is here.

MR BEASLEY: It is.

THE COMMISSIONER: At 3.30 this afternoon.

MR BEASLEY: 3.30, yes.

THE COMMISSIONER: Thank you very much. Thanks, Professor Brookes.

<THE WITNESS WITHDREW [11.58 am]

ADJOURNED [11.58 am]

RESUMED [3.33 pm]

MR BEASLEY: Now, I haven't got a CV for Dr Perry so whoever was responsible for putting the brief together .....

THE COMMISSIONER: ..... specialising in water resources management ..... 20 years.

MR BEASLEY: I have got that.

THE COMMISSIONER: Etcetera, etcetera.

MR BEASLEY: So what are we doing now? We've got a request in, have we? Well, when the Commissioner is ready.

THE COMMISSIONER: I'm ready. Well, let's go.

MR BEASLEY: Dr Perry, I'm Richard Beasley, Counsel Assisting the Royal Commission. Are you able to - - -

DR PERRY: I can't see who's speaking to me. I guess you're off to the left. I can see you.

MR BEASLEY: There I am. Can you see me waving my hand?

DR PERRY: I can see your waving hand, but not .....

MR BEASLEY: Don't worry too much about it. And the Commissioner is – Commissioner Bret Walker can introduce himself.

THE COMMISSIONER: Hello, Dr Perry. Thank you very much for arranging to do this.

DR PERRY: Not at all.

THE COMMISSIONER: Much obliged.

MR BEASLEY: Now, are we able to swear?

THE COMMISSIONER: Doesn't matter. Don't worry.

MR BEASLEY: Don't take the affirmation?

THE COMMISSIONER: It just doesn't matter.

MR BEASLEY: All right. We're not going to do that.

THE COMMISSIONER: Just proceed.

<CHRIS PERRY, CALLED [3.36 pm]

<EXAMINATION-IN-CHIEF BY MR BEASLEY

MR BEASLEY: Dr Perry, we're now going to take some evidence from you. Thank you for supplying us with the documents you have. Can I just ask you to – I understand you're variously described in some of the publications we have from you as a Consultant Water Resource Economist and former Co-editor in Chief of the Agricultural Water Management Journal. And I know you worked at the World Bank for 20 years.

DR PERRY: Yes.

MR BEASLEY: And that you had been Head of Research at the International Water Management Institute. Can you just outline your formal tertiary qualifications, though, please.

DR PERRY: Tertiary, I have a degree in Mechanical Engineering from Imperial College and then a Masters degree and a PhD in economics from the University of Stirling.

MR BEASLEY: Thank you. And what role or roles did you have when you worked at the World Bank?

DR PERRY: I was an Economist. And, unusually for most people who work in the World Bank, I worked almost continuously in the water sector throughout my career. Yes.

MR BEASLEY: Go ahead.

DR PERRY: Well, I – that's what I happened to do. The first project was – first program I was involved in when I joined in 1974 was a Water Irrigation project in India. And I found that fascinating, so I kind of stuck with that sector throughout my career.

MR BEASLEY: Well, one of the areas of your expertise, clearly, because you've written about it often in journals and the like, is the topic of irrigation efficiency and water accounting.

DR PERRY: Yes.

MR BEASLEY: That has largely been the main topics of your career, has it – have they?

DR PERRY: Well, the irrigation efficiency water accounting topic really came to the fore when I was working for the International Water Management Institute in the 90s.

MR BEASLEY: All right. Just pausing there, can you tell us what the International Water Management Institute is? I know it has been set up and its head office is in Sri Lanka.

DR PERRY: Right.

MR BEASLEY: Can you explain a bit about it, please?

DR PERRY: It was set up in the 1980s when Robert McNamara was the President of the World Bank and he was a bit baffled by the vast amounts of money the Bank was putting into irrigation and nobody seemed to be able to clarify precisely what the impacts of these investment were. And so this Institute was funded initially by the World Bank and I think the Ford Foundation. And it then in the 1980s joined the CGIAR the Consultative Group on International Agricultural Research, which is a consortium of 18 research institutes across the world, including the International Rice Research Institute, for example, which is probably the most famous and CIMMYT the Wheat and Maize Research Institute in Mexico and various other, now 18 institutes around the world. And IWMI the International Water Management Institute became one of those. These institutes are generally recognised as being at the forefront of research in their various agriculturally-related fields.

MR BEASLEY: And, as Head of Research for the International Water Management Institute, what was your main role there, and how long did you have it?

DR PERRY: I had that role for approximately four years. And we – I joined shortly before a new Director General arrived, who was called David Sekler. And we just got interested in this issue, which has been summarised as 'crop per drop'.

MR BEASLEY: Yes.

DR PERRY: Scarcity of water was becoming an issue all over the place in ways that probably wasn't such a key topic when I started working in irrigation in the 1970s. Everybody was just talking about food security and rural poverty and improving agricultural incomes and so on. And over that sort of 20 years between then and when I joined IWMI, progressively, scarcity, competition for water and so on became at the top of the agenda.

MR BEASLEY: Yes.

DR PERRY: And I guess the realisation that we had, was that if you ask an agriculturist what's a good yield of wheat, anybody in the world will tell you, six or eight tonnes is good, four tonnes is not very good, two tonnes is awful. But if you

ask them what's the good productivity of water, how many cubic metres of water do you need to produce a kilogram of wheat or a tonne of wheat - - -

MR BEASLEY: Yes.

DR PERRY: - - - there was nobody who had a ready answer. If the topic you're interested in was scarcity of water, that's something you need to be thinking about.

MR BEASLEY: Right. Okay. I think Cotton Australia uses the phrase more crop per drop as though they invented it, but, obviously, that's not the case.

DR PERRY: That phrase emanated from IWMI in the mid-90s.

MR BEASLEY: Righto. Okay. Well, they should footnote that. One of the things you've done recently is act as a Consultant for the United Nations Food and Agricultural Organisation. Correct?

DR PERRY: That's right.

MR BEASLEY: And last year, along with a co-author, Mr Pasquale – is he a doctor, as well, Pasquale Steduto?

DR PERRY: Yes, Dr Pasquale Steduto.

MR BEASLEY: Yes. S-t-e-d-u-t-o. You were involved in writing a report for the FAO entitled 'Does Improved Irrigation Technology Save Water, a Review of the Evidence.'

DR PERRY: That's correct.

MR BEASLEY: And that report is largely centred on whether – and I'm summarising, obviously, but whether irrigation efficiency projects actually do result in a saving of water for the environment. Correct?

DR PERRY: Yes. Yes.

MR BEASLEY: And I've read, for example, the foreword to this paper. Do you have a copy of the document?

DR PERRY: Not to hand, but I'm pretty familiar with it.

MR BEASLEY: Right. Okay. The foreword indicates that there has been a traditional assumption that increasing irrigation efficiency through modern technologies like drip irrigation leads to substantial water saving, whereas the evidence from research and field measurement shows that that's not necessarily the case. And the paper is investigating that topic. Correct?

DR PERRY: Correct.

MR BEASLEY: And one of the – there were – no doubt there were several drafts of this paper prepared, but there were two significant versions. One had a section in it dealing with Australia and the irrigation efficiency program under the Murray-Darling Basin Plan.

DR PERRY: Yes.

MR BEASLEY: And – but the final published version had that section dealing with Australia removed. Correct?

DR PERRY: Correct. That's correct.

MR BEASLEY: Now, I'm not particularly interested for the time being as to why Australia was removed, but in the section dealing with Australia and the – in the report that was not published - - -

DR PERRY: Yes.

MR BEASLEY: - - - the – that section of the report deals with the Irrigation Efficiency program under the Murray-Darling Basin Plan.

DR PERRY: Yes.

MR BEASLEY: It begins, though, with discussing the fact that Australia participated in the formulation of the UN system of environmental economic accounting for water.

DR PERRY: Yes.

MR BEASLEY: Now, one of the things that is particularly important in relation to working out whether any particular irrigation efficiency measure is actually achieving a saving of water for the environment is proper water accounting. Correct?

DR PERRY: Yes.

MR BEASLEY: In fact, it's fundamental, so that there are several things you've just simply got to know if you're going to have any fundamental understanding of what water is being saved for the environment. And they are – first of all, you've got to know – sorry – I'm just getting the page up – what are the beneficial and non-beneficial uses of water. Correct?

DR PERRY: Yes.

MR BEASLEY: How much water the farmer is actually using to produce his crop. And - - -

DR PERRY: Well, can we use the word consuming?

MR BEASLEY: Yes.

DR PERRY: 'Using' is the most confusing word in this whole business.

MR BEASLEY: All right. How much water the farmer is consuming to produce a crop, which is the beneficial use of water – sorry, beneficial consumption of water, correct? And you've also got to know how much there is of non-consumptive consuming of water, ie, things like return flow, water into the – going into the groundwater; correct?

DR PERRY: Yes, that's right.

MR BEASLEY: And then there's the – you've also got to know about non-recoverable flows, in other words where the water might go into a salty aquifer and it's lost or it flows out to sea.

DR PERRY: Right.

MR BEASLEY: Correct?

DR PERRY: Correct.

MR BEASLEY: And unless you have a good record or a good accounting of all of those things, you are in a position where you simply won't know how much water is being saved, if at all, from - - -

DR PERRY: Yes.

MR BEASLEY: - - - an irrigation efficiency upgrade to a farm or farms.

DR PERRY: That's correct.

MR BEASLEY: Yes. Okay.

DR PERRY: Can I just qualify that a little.

MR BEASLEY: Yes, you can. Yes.

DR PERRY: What happens to water when you deliver it to a farm is actually pretty complicated.

MR BEASLEY: Yes, go on.

DR PERRY: You used the word, "We need to know this, and know that," etcetera.

MR BEASLEY: Yes.

DR PERRY: What we always start with is the best estimate we can make of what those flows are and where those flows are going.

MR BEASLEY: Yes.

DR PERRY: And I wouldn't criticise anybody for not knowing what the non-recoverable return flow or whatever was. I would criticise them, though, for failing to recognise that it likely exists and making a competent estimate of its magnitude. Right? So we're not talking about knowledge and ignorance. We're talking about doing our best to get these things clarified and sorted out and to put the best labels we can on the various flows that take place when water is used in irrigation or for any other purpose.

MR BEASLEY: Sorry, does that mean that what your criticism really is in relation to, for example, any modelling that has been done to estimate how much water has been saved from an efficiency measure, that that has got to incorporate some form of best available science estimate of what might be lost as a return flow? For example, in relation to a farm that is near a river and clearly - - -

DR PERRY: Yes.

MR BEASLEY: - - - with an inefficient irrigation system clearly would have had return flows back to a water course or river.

DR PERRY: Exactly.

MR BEASLEY: Yes. Or in relation to a farm, for example, that is known to have aquifers in the groundwater that contain potable water or water suitable for agricultural use, and an inefficient system is clearly going to have some water that would have returned to those groundwater aquifers and would have been available for further use at some other stage.

DR PERRY: Exactly. Yes.

MR BEASLEY: Yes, okay. And those were the matters that you were – that you incorporated into the report in the section for Australia that - - -

DR PERRY: Yes.

MR BEASLEY: - - - were ultimately withdrawn at the request of the Australian Government?

DR PERRY: That's right. And there's one further clarification. The report you're – the FAO report that you're referring to was a review of the available peer reviewed papers and reports and studies and so on. We did not do original research. We didn't go out and take a measurement and so on ourselves.

MR BEASLEY: No, but at page – in the executive summary of this report and I'm looking at the one which had the section on Australia at page (xi) you've stated:

> *In the process of arriving at this paper more than 150 experts were addressed with requests for evidence about the impact of high tech irrigation on water consumption and water productivity. Experts ranged from individual researchers to institutions such as the IWMI, the World Bank, Asian Development, FAO, etcetera.*

So there was a fairly comprehensive review of experts that have been in the field of, no doubt amongst other things, irrigation efficiency measures and what the results from them are.

DR PERRY: Correct.

MR BEASLEY: Yes. Okay. And no doubt part of the reason you didn't do groundwork in relation to every aspect of your report is that it covers a fair part of the globe.

DR PERRY: Yes.

MR BEASLEY: Yes.

THE COMMISSIONER: Doctor, can I just ask you: can you just elaborate for me the rebound effect which you describe in the now absent Australian section as being - - -

DR PERRY: Yes.

THE COMMISSIONER: - - - one whereby when water deliveries to the farm are more valuable the demand for water actually increases?

DR PERRY: Yes.

THE COMMISSIONER: Could you just elaborate that for me, please?

DR PERRY: If you imagine a very simple case. Let's say a farmer is pumping water from an aquifer, and he's got plenty of land, and he pumps water from the aquifer to the extent that the depth he's pumping from and therefore the associated cost of pumping would be equal to the marginal production of the water that he pumps; right.

THE COMMISSIONER: Yes.

DR PERRY: Now, if he has to pump 100 units of water to generate 50 units of beneficial use that would determine the value of the water to him on the farm and hence the cost that he's willing to incur to pump; right?

THE COMMISSIONER: Yes.

DR PERRY: If we now improve his on-farm technology so he's able to consume 90 per cent of the water beneficially, rather than 50 per cent, he can obviously afford to pump from much deeper.

THE COMMISSIONER: Yes.

DR PERRY: So by making the on-farm use more beneficial we generate an increased economic demand for the water, until the farmer runs out of land or runs out of labour or some other constraint. The rebound effect was actually originally described by a British economist in the 1800s called Jevons, and it was related to the efficiency of steam engines.

MR BEASLEY: It's called the Jevons Effect isn't it? It's called – it's still called the Jevons Effect, isn't it?

DR PERRY: Yes. It's still called the Jevons Effect.

MR BEASLEY: Yes.

DR PERRY: Some people call it the Jevons Effect, some people call it the Rebound Effect.

MR BEASLEY: Yes.

DR PERRY: Some economists argued that as the steam engines were getting more efficient, they would need less coal to produce a certain amount of power, therefore as they get more efficient the demand for coal will fall. Similarly, some people argue that, as irrigation gets more efficient, the demand for water will fall. Jevons said no. He said as the steam engine gets more efficient energy will get cheaper and more people will want to buy energy for more uses, that we can't envisage at this moment, and so the demand for coal would increase. And that was the rebound effect, and indeed that's what turned out to be correct.

In irrigation there's both the increased economic demand because it's more valuable and there's increased consumption of what is delivered, and hence the reduction in return flow, so in irrigation I argue there's sort of a double rebound effect. In the case of coal the surplus heat the inefficient steam engines were generating was clearly all non-beneficial. In the case of water you

reduce your return flows and you increase the economic demand, so there's a physical and economic impact of improving your irrigation efficiency.

THE COMMISSIONER: Thank you very much.

MR BEASLEY: And the example you've just given is one that was contained – first of all contained in the section dealing with Australia that was removed from the FAO report; correct?

DR PERRY: .....

MR BEASLEY: The example of 100 - - -

DR PERRY: I'm sorry.

MR BEASLEY: The example of 100 water units was one that you actually had in the section that was for Australia and the FAO report; do you recall that?

DR PERRY: No. That – the example of the 100 and the increasing from 50 to 90 and so on, as best I know, because I – you said you're not interested specifically in what took place between Australian officials and FAO.

MR BEASLEY: I'm a little bit interested, but go on.

THE COMMISSIONER: Dr Perry - - -

MR BEASLEY: The Commissioner might be very interested.

THE COMMISSIONER: I'm very interested. We will come back to that.

DR PERRY: All right.

MR BEASLEY: But I've actually – I've got the report in front of me and you don't have the benefit of that, but I can see the example you've given about the 100 water units is actually in there, and I think you've also supplied to the Commission a base case, a document that's sort of extracted from that, where a farmer has an allocation of 100 units of water, his efficiency is 50 per cent, so 50 units of water is consumed by the crop, 50 units goes somewhere else and we need to know where that somewhere else is, and the upgraded technology case, the efficiency goes to 90 per cent. He now – the amount of use is reduced by 44.5 units.

DR PERRY: Yes.

MR BEASLEY: Etcetera, etcetera. And the key question you say is whether the 50 unconsumed units in the base case when he – when the farmer had an inefficient irrigation system contributes more or less to – water to the environment than the 22.5 – 22.25 units that are left - - -

DR PERRY: Yes.

MR BEASLEY: - - - in the upgraded technology case, and in order to know that you need to know whether the farm in the inefficient case with the 50 units that were going somewhere else, whether that was actually flowing back in a river, for example, and hence going back to the environment or going down into an aquifer where that water could be used again, or whether it was water that was just simply lost and not available for potential further – future use because the farm's too far from a water course or it just goes into a saline aquifer that's no good for any form of agricultural use.

DR PERRY: That's correct.

MR BEASLEY: Yes. Okay.

THE COMMISSIONER: Dr Perry could - - -

MR BEASLEY: Now, I will let the Commissioner deal with the absence of Australia from the FAO report.

THE COMMISSIONER: Could I ask you just to give me your account as you understand it of how the brief section in your review for Australia on the basis of the documents that commence that section came to be removed from the final product.

DR PERRY: Yes. And I will have to really qualify this by saying it's sort of hearsay, because I wasn't in Rome, I wasn't party to the exact exchanges which took place. My joint author, Pasquale Steduto, is a senior FAO official and he was much more – although, he's not based in Rome, he's based in Cairo, but he was much more involved in what happened. But – so with that qualification, my understanding is that the first version of the report was cleared and endorsed by FAO and was put up on their website. I – because it was a public domain document, I immediately – and entirely innocently – put that original version up on ResearchGate, which is a public domain website where people can put either abstracts of their research if it's not fully available in the public domain, or you put the whole thing if it's in the public domain.

So that original version went up on ResearchGate. Shortly after the FAO – shortly after the original version was put onto the FAO website, as I understand it, there was an approach from, I think the Australian Embassy in Rome or whoever is the lead person between Australia and FAO based in Rome, objecting to the way Australia ..... objecting to the Australian section, basically. And – and asking that the report be amended or withdrawn, and – anyway, so it was agreed by FAO, because Australia is a member in very good standing of the FAO and the UN organisations that, pending an agreement on a revision to the Australian section, the report would be taken down from FAOs website, which it was.

But, of course, the original remained on ResearchGate because you can't take it down, as far as I know. There were then a series of exchanges, some of which I saw and some of which no doubt I didn't see, and I certainly was not party to any discussions associated with those exchanges, where the Australian authorities presented their view of what the benefits of the investment in the Murray-Darling Basin had been. But they were centred around this, you know, say simplistic accounting that if you reduce withdrawals, you know, whatever increase in efficiency you make is clear – is entirely a benefit to the environment which, as I understand it, is what the Murray-Darling Basin program is supposed to be achieving: it's supposed to be releasing water to the environment.

And that debate went to and fro for a while, but in the end we could not agree, because I would characterise what the Australians presented to us as being assertions, you know, "We assert that this happened, we assert that water has been saved, we assert that water quality has improved," or whatever, but with absolutely no data. And one of the points I think is very important, standing back from this, is that we – that is to say myself as a scientist, and my co-author I'm sure, would absolutely have welcomed science, data, analysis, to demonstrate how – what is the context within which improved irrigation efficiency can create the benefits that are sought? And if we had had some examples of that which are very hard to come by, as that FAO report demonstrates.

MR BEASLEY: No doubt one of the reasons you would have welcomed the Australian Government being able to establish to you, at a level that had scientific integrity, that an efficiency measures program does actually save water for the environment is that these measures are being undertaken in large scale in other parts of the world, so it's important to know whether they work or not; correct?

DR PERRY: Absolutely. I mean, our concern and FAOs concern is probably more with the Indias and Chinas of this world, who are wondering about following these examples, and what the outcomes for them might be.

MR BEASLEY: Yes.

DR PERRY: And Australia is seen as something of a leader in water resources management, so what's going on there is significant.

THE COMMISSIONER: Do I take it that so far as you're aware and including from Dr Steduto, none of the response on the Australian side was presented by scientists?

DR PERRY: I don't know. Certainly I didn't get any reports from hydrologists, I just saw what was presented to us. Who was the author of that, I don't know. One of the comments – I'm not – one of the comments I made in passing to my colleague was I could have written a hell of a lot better defence of what the Murray-Darling Basin investment program is about than was presented to us in the course of those discussions about the FAO report.

THE COMMISSIONER: I take it by - - -

DR PERRY: I would. Go on.

THE COMMISSIONER: I take it by your use of the word "assertion" you intend to distinguish from what you would call good science.

DR PERRY: Absolutely.

MR BEASLEY: So amongst the things they possibly could have said to you is, "Look, we're – the bulk of these efficiencies have been put in. It's a long way from a river or the groundwater is no good, so there was no saving for the environment when the farmer was inefficient"?

DR PERRY: Absolutely. There was no – I mean, in the original report there's something about – in the introduction, you know, there is no – there are no priorities in deciding where to make these investments, and even where – even in locations where the water is – is totally likely to be recovered it's probably not 100 per cent, you know.

MR BEASLEY: Sure?

DR PERRY: There's just a lack of subtlety in spending a lot of money.

MR BEASLEY: Well, even with – I think in a submission you made to the Australian Government that one of the things you pointed out that even in relation to a straight water buyback - - -

DR PERRY: Yes.

MR BEASLEY: - - - you actually do need to know not – and you use an example I think from Idaho?

DR PERRY: Certainly.

MR BEASLEY: That you need to know not the entitlement on its face, but you need to know exactly how much water the particular farmer was consuming, and that's what should be credited for the environment if the entitlement is bought?

DR PERRY: Yes.

MR BEASLEY: Yes?

DR PERRY: That .....

THE COMMISSIONER: Doctor, could I ask you this. I'm sorry that this might appear naïve, but maybe it is: why isn't it just extremely obvious that when you buy

something back which is conventionally described in a volumetric entitlement, what you've actually recovered by way of advantage to the environment is nonetheless only the actual use which is thereby diverted? Why isn't that just obvious?

DR PERRY: Sorry, can you restate the question a little bit and use the word "consumption" somewhere and not "use".

THE COMMISSIONER: Of course. When an entitlement to consume the water is purchased in a so-called buyback, it is normally for something which one way or the other more or less conventionally has a volumetric description?

DR PERRY: Yes.

THE COMMISSIONER: Now, of course, they're always heavily qualified by reference to the likely disappointment that a variable climate such as Australia's will administer year after year, hence fractions of the 100 per cent being available actually for consumption. Doesn't it therefore follow, that is, is it not obvious, that if you want to know whether on a long-term average basis, or any other meaningful basis, how much water otherwise consumed by agriculture will be available for the environment after the buyback, you look not to the conventional volumetric description but to some estimate of what's actually been consumed using that entitlement until it was bought back?

DR PERRY: Yes. That's an absolutely correct description.

THE COMMISSIONER: I don't currently understand how anybody could harbour any different view. That is, it would appear to be in the nature of a fiction, that is a knowing fiction, to say that, "I have now, by my buyback, bestowed on the environment a volume of water which is described by the conventional designation of the entitlement." That would seem to be knowingly false, would it not?

DR PERRY: Well, it's pretty naïve.

THE COMMISSIONER: Because the same – the people who are responsible for such statements are the very people whose registers and directions record the less than 100 per cent enjoyment of the conventional volumetric entitlement. They're the ones with the history. They know that that farmer rarely gets 100 per cent, for example?

DR PERRY: Correct. Let me present a little bit of background. The idea of irrigation efficiency, and the benefits of improving it, started, or originated when projects were being designed. You built a dam or you built a well and you wanted to maximise the benefit you would derive from that infrastructural investment and that was - it seems to me - was a perfectly legitimate objective of the people who had made the investment. Those people at that time, perhaps when water was not scarce, not competed for, not an environmental issue, focused on the field, focused on the farm and they made legitimate practical decisions at that level.

Over time as competition for water has become wider, more general, and then with concern for the environment, the perspective that was legitimate at the farm scale is no longer legitimate at the environmental scale because the off-site implications of an investment and the use of water and the consumption of water suddenly enter into the equation, but the whole paradigm of irrigation efficiency, saving water and so on, which was and remains legitimate from the farmer's local perspective suddenly – well, has become just the way that people talk about irrigation. Irrigation is a – widely described as a wasteful, low-value use of water etcetera etcetera, because of on-farm efficiencies being so low, but suddenly the perspective changes, and we are worried on a wider scale, and that particular indicator becomes misleading.

In the meantime, of course, if you look at the parties involved in these discussions the farmer likes on-farm efficiency because it allows him to increase the amount of crop he can produce per unit of water delivered to the farm. Engineers like to see nice high quality technical management of water, politicians like to say that we've got plenty of water for everybody and not have to take it away, which is very hard. The people who sell the equipment like to promote the idea that we're saving water and making everything better. On the international scale the donors like to have something to finance and equipment is a lot easier than funding changes in policy which take water away from farmers. So you get quite a constituency centred around the old paradigm that high efficiency saves water. You know, and when you're trying to make a new case that you want water for the environment, you need to look a bit differently at all these things, because a number of people aren't very comfortable with that perspective.

THE COMMISSIONER: Can I ask you about return water.

DR PERRY: Yes.

THE COMMISSIONER: And, in particular, what I will call is measurement. I confess, it strikes me as a very challenging exercise, given the very large variety of ground conditions, to understand how specialists, experts, how they go about estimating the volume of return water.

DR PERRY: That's a very good question and you're absolutely right. It's very complicated. Water that infiltrates into the soil and goes below the root zone may get stuck in a perched aquifer which is readily accessible to the farmer the next day. It may go into a saline aquifer, or it may not be very saline and you can use it at certain times of the year. And it may go into the so-called unsaturated zone where it can just sit for decades and centuries before it hits the groundwater. It may hit the groundwater and go sideways into the river. It's very, very complicated.

But the extreme assumption that none of it is recoverable is clearly wrong, just as the extreme assumption that all of it is recoverable is clearly wrong. It's somewhere in the middle. And the science of hydrogeology can help us determine where are the areas where it is likely we will generate a lot of genuine savings, and the areas where we will not. And that, analysis might be a sensible input into

setting priorities. There are some cases which are extremely simple. In northern India with a monsoon climate and a high groundwater table, inefficient flood irrigation of rice in the monsoon season generates immediate recharge for pumping in the dry season from an otherwise overstressed aquifer. So to assume 100 per cent there for the return flows is probably not far off. Maybe it's 90. Maybe it's 80.

But the blanket assumption of zero return flows from some irrigated areas near a river or over a good aquifer, compared to some remote areas as the Counsel suggested, far distant or with a saline aquifer and nowhere else for the water to go, they're entirely different scenarios. And one would expect some thought about setting priorities before (a) investing and altering the incentives and subsidies everywhere, and (b) assume 100 per cent savings based on the simple arithmetic.

THE COMMISSIONER: So that if the focus, as it is for me, is, in particular, upon estimating a return to the environment from these so-called efficiencies, and we strike this both conceptual and actual difficulty of the reduction in recovered water, return water, it seems from what you've written and told me that there is a methodological and current scientific deficiency, namely, at least in the Murray-Darling Basin, we just don't have either the means reliably to estimate and certainly we don't have actual measured data. And, second, it follow from that that as a matter of administration or policy to make an assumption at one extreme of the possibilities has no scientific or rational foundation at all. That is, you know you must be wrong if you assume zero per cent, for example, or 100 per cent?

DR PERRY: I agree with you.

THE COMMISSIONER: Thank you.

DR PERRY: In any complex water system, if you are trying to achieve an outcome such as the flow at the river – sorry – at the sea – at the outflow to the sea, or a specific flow rate at particular locations and particular times, the only indicator that you have achieved that is to measure that outcome that you want.

THE COMMISSIONER: Yes.

DR PERRY: You can make assumptions about what levers you can pull to achieve that outcome, but the linkage between those levers and the outcome is a bit diffuse.

THE COMMISSIONER: Yes.

DR PERRY: And your characterisation, you know, an assumption at one extreme is, obviously, wrong, I would wholeheartedly endorse.

MR BEASLEY: Do I understand it correctly, then, that, based on a knowledge of local conditions for where an irrigation efficiency upgrade has been made, for example, farms close to rivers with – and knowing the soil conditions and knowing

the groundwater aquifers and with input from hydrogeologists or hydrologists or any other relevant expert, that you may not be able to say in precise volumetric terms, "This is the water saving and this is the return flow", but you would be able to make a reasonably – reasonable science-based estimate of return flows and water savings and the like?

DR PERRY: Yes.

MR BEASLEY: Yes.

DR PERRY: You would be able to make a reasonable estimate. And you certainly would identify quite readily the areas where savings – genuine savings are likely to be substantial - - -

MR BEASLEY: Yes.

DR PERRY: - - - and where genuine savings are not likely to be substantial. And that would not be difficult.

MR BEASLEY: Yes. Can I ask you another question that comes out of the report, not this – the FAO report, not the Australian section, though. One of the things you've said in the report – and this is consistent I think with some other evidence that has been presented to the Commission, that in terms of when there is a – an irrigation efficiency upgrade, it doesn't only result in more – I will use the colloquial term – more crop per drop. But the evidence is that it often causes a change in the kind of crops that farmers might grow. In high yield crops and in Australia we've seen the example of people changing from – to a permanent planting crops.

DR PERRY: Yes.

MR BEASLEY: For example, almond trees on irrigation efficiency upgrades.

DR PERRY: .....

MR BEASLEY: In other words, it – an irrigation efficiency upgrade can lead to a change of behaviour and perhaps even a higher risk taking by the irrigator or farmer by going to a crop that constantly requires water.

DR PERRY: Yes. A crop that you can't abandon readily.

MR BEASLEY: Yes.

DR PERRY: And they're facing exactly – I contributed to a consultation with the National Academy of Science in Washington a few months ago talking about the western US. And they have exactly this problem that farmers are switching. And they call it 'hardening up' the demands, a nice phrase. It means that you cannot readily, you know, abandon a field of rice or wheat or similar. If you've got a seven

year old almond tree, you will do a hell of a lot to protect it. And what's happening in the western US is the groundwater is disappearing, because whenever there's a surface water drought, the farmers there may have better access to groundwater than you have in Australia. I don't know. But the farmers are turning to groundwater, which is very difficult to control. And so they've got aquifers falling all over the place, in part because of this, what they call, hardening up of demand.

MR BEASLEY: All right. I don't think I had any questions for Dr Perry on any of the papers. I'm going to tender them. Do you have any questions on any of the individual papers in the brief?

THE COMMISSIONER: I'm interested to know, have you had any feedback or for that matter fan mail from your – what do you call it? Your Myth Versus Truth editorial in the Global Water Forum?

DR PERRY: Yes.

THE COMMISSIONER: And your colleagues commend the work?

DR PERRY: Yes.

THE COMMISSIONER: I found it very useful. Thank you.

DR PERRY: Thank you.

THE COMMISSIONER: It's – and I am going to try and repair my wrong use of the word "use"?

DR PERRY: Thank you.

MR BEASLEY: No. We will be using "consumption" from now on.

THE COMMISSIONER: Could I, in particular, go back to this question of the FAO acquiescing in Australian objections to publication. I'm a little puzzled as to why it would matter, bearing in mind the cat was out of the bag. This version is publicly available. Is there some milieu in which there is extra credibility given to what I call a final version? Or, put another way, why would scientists pay any regard to the fact that a government had managed to have a section removed when they've already seen what it is that was removed?

DR PERRY: I have – I know that the version of the paper that was on – or is on ResearchGate has been downloaded or read more than 1500 times, which is pretty high, over a relatively short period of time. I have no idea how many people will have looked at or seen the – you know, quote, "official" version on FAOs website. It may be much higher. I don't know. But I guess FAOs position would be that that's the officially endorsed one, the one on their website is the officially endorsed one. And – you know, and the outcome was essentially that we felt it was better to put

nothing than to continue a long debate which wasn't going very far and wasn't resulting in the presentation of facts which, as I repeat, we would have welcomed. So the easy way out to resolve that impasse was simply to remove that section. Yes. I – it doesn't reflect terribly well on either side in my opinion. That is my opinion, and there we are.

THE COMMISSIONER: It strikes me, if I may say so, as understatement but that will be a matter for my comment later, yes?

DR PERRY: You can say that. I couldn't possibly comment.

THE COMMISSIONER: No.

MR BEASLEY: The ultimate recommendation in the FAO report though, whether it's the final one or the one which had the section in Australia is that – and I'm looking at page 37 under 'Policy Implications' is that you and Dr Steduto were of the view that investing in higher tech irrigation schemes should not be the lead program in relation to a plan that is designed to recover water for the environment; rather, you need to – and these are your conclusions – rather, you've got to first establish a proper water accounting system but secondly, and probably most fundamentally, set limits on water allocations?

DR PERRY: Yes.

MR BEASLEY: And thirdly, no doubt in many complex ways, encourage and support people that use water to maximise the net benefit of allocated water, and I assume that's not just by irrigators, but also by people charged with watering the environment.

DR PERRY: Correct.

MR BEASLEY: Yes.

DR PERRY: Yes. And when you set the caps you will induce the demand for high tech and whatever from the farmers, and they will be making a rational decision themselves about that, rather than being told it by researchers and equipment sellers and governments and so on.

MR BEASLEY: That's all I have, Commissioner. Do you have any further questions?

THE COMMISSIONER: No.

MR BEASLEY: That's all the questions I have for you, Dr Perry. Is there anything though that you would like to say in addition to what we've asked you about, or anything you think should be elaborated on?

DR PERRY: No, I don't think so. I think it's been a comprehensive discussion with you.

MR BEASLEY: All right. Thank you. Thank you very much for the information you've provided us, and thank you for agreeing to give evidence to the Commission. It has been very useful.

THE COMMISSIONER: Dr Perry, I – it's hard to overstate my gratitude for not only what you've written but also your assistance. It really has been most incisive. I'm much obliged for your assistance. Thank you very much.

DR PERRY: Thank you.

MR BEASLEY: Thank you?

DR PERRY: Good day.

THE COMMISSIONER: Good day.

<THE WITNESS WITHDREW [4.25 pm]

MR BEASLEY: Just for the record, before we adjourn, I will tender each of the reports and documents that are in the Dr Perry brief with the sections of the file notes. I also tender Dr Perry's submission to the Inquiry into Water Use Efficiency in Australian Agriculture, which is not dated, but submission number 47, whatever that means. And yes, this morning I forgot to tender the document – the reports behind tabs 2 and 3 of the brief for Professor Brookes, so I will do that as well. I won't read out the titles. And I think that completes the tender and the evidence for today, and tomorrow we begin with Mr Papps. Yes, Mr Papps, former head of the CEWH. That's all for today.

THE COMMISSIONER: Thank you. We will adjourn to Town Hall at 9.30. Thank you very much.

MATTER ADJOURNED at 4.26 pm UNTIL WEDNESDAY, 5 SEPTEMBER 2018

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