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TRANSCRIPT OF PROCEEDINGS

O/N H-910731

MR B. WALKER SC, Royal Commissioner

IN THE MATTER OF THE MURRAY-DARLING BASIN ROYAL COMMISSION

ADELAIDE

10.04 AM, THURSDAY, 5 JULY 2018

Continued from 3.7.18

DAY 5

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

MR BEASLEY: Sorry, Commissioner.

THE COMMISSIONER: That's all right. When you're ready.

5 MR BEASLEY: I'm ready, Commissioner. In the opening statement I made 18
June, I only raised, in detail, issues of construction of the Water Act and potential
unlawfulness matters that were raised in Issues Paper 2. I only briefly touched on
other aspects of the inquiry and the public hearings relevant to the terms of reference.
We have here today Associate Professor Rebecca Lester, whose expertise is in
10 aquatic ecosystems. She's from the Deakin University and she's going to give
evidence in a moment relating to environmental water requirements of South
Australia, the work of the MDBA in relation to its various scenarios in the Guide and
the Plan and, also, an explanation of some changes to – her views about some
changes to the Multiple Benefits Report that Dr Colloff gave evidence about.

15
But before I call her I would like to just provide a brief summary of the evidence
that's already been called, including the scientific evidence and, also, a summary of
the evidence to come, which I'm now more certain about, and provide a brief
opening on that evidence. To the extent that any excuse is needed that I didn't open
20 in any real detail on some of these matters before, we have had to make a series of
scheduling changes as a result of the High Court proceedings. That was the result of
the absence of witnesses we thought would be compelled to be here, and documents
we thought we would have here dealing with matters of construction and
administration and policy processes and reaching decisions such matters as the
25 setting of the ESLT, the sustainable diversion limit, amending the Basin Plan on the
basis of the Northern Basin Review and the supply measure adjustment.

If I can just discuss for a moment the evidence that has been called so far and give a
summary of that and to read some possible findings that are open to you as a result of
30 that evidence. Mr David Bell was the first witness called. He was a former Director
of Environmental Water Planning at the Basin Authority. His witness statement is
exhibit RCE14. He gave evidence that when he was first employed by the Basin
Authority, there was a clear understanding that the environmentally sustainable level
of take was to be determined on the basis of environmental criteria only and was not
35 to be compromised or determined by having regard to social or economic outcomes
or considerations.

That evidence is consistent with the advice that was clearly given to the Chair of the
Basin Authority in 2010, Michael Taylor, because he said so when he resigned. He
40 made a statement saying that the advice the Authority had been given is that the
environmentally sustainable level of take cannot be compromised by social and
economic considerations. And that was the clear understanding, Mr Bell said, of the
staff of the Basin Authority as far as he was aware. He then gave evidence of a
change in that position after Mr Taylor left. And the general conversation that was
45 being held amongst staff of the Basin Authority was that whatever the number was
for the ESLT, it had to be a number that started with a two, in other words, two

thousand and something gigalitres. He said that was a board-driven direction, and gave evidence at transcript 61 about jokes among the staff about it being a postcode reference.

5 Now, if Mr Bell is telling the truth, and if his memory is reliable, and I can't give you a single reason to suggest that he was anything other than a truthful and reliable witness, then however else the process of determining the environmentally sustainable level of take is described, it was not reached in accordance with the standards of the Water Act, which is meant to be on the basis of "best available
10 science" section 21(4). Dr Colloff gave evidence on 27 June. He is a former research scientist at the CSIRO. His witness statement is exhibit RCE15. He worked at the CSIRO for many years and he worked on a report that the MDBA commissioned called the Multiple Benefits Project, which is exhibit RCE16. He led the team that wrote chapter 3 which was a chapter entitled 'Ecological Benefits', principally
15 dealing with the ecological benefits of a 2,800 gigalitres plan. He provided to the Commission an earlier draft of that report which has become RCE17.

There were significant deletions textual changes between the draft and the final report. Some of those deletions, Dr Colloff told you, were made at the insistence of
20 the MDBA. And he talked about and demonstrated that graphical or symbolic charts in the draft report showing where environmental watering requirements were not met in a 2,800 gigalitre plan had been removed because the MDBA, both executives and other employees, did not like it. The textual changes were more sinister. Dr Colloff believes they were made by people at the MDBA, he considered the process involved
25 both a manipulation and an interference by the MDBA with the CSIRO's modelling results. He gave that evidence at transcript 169, line 38. He considered the deletion of the symbolic tables to be "scientific censorship", transcript 170, line 33. He considered changes made by the MDBA to the CSIRO report to create inaccuracies in terms of representing the CSIRO's views based on their results, see generally
30 transcript 174.

For many textual changes, had he known they were being made, he said he would not have agreed to them, transcript 186, line 15. He described what the MDBA and CSIRO did in combination as not just censorship but, in his words, deceptive,
35 transcript 190, line 37. The evidence of Dr Colloff raises really serious matters about both the conduct of the MDBA and the CSIRO. Public money has been spent on a process that Dr Colloff says involved scientific censorship and deception. And he has contemporaneous notes about all of these matters. They are in evidence at exhibit RCE19. They back up his reliability and his recollections. Furthermore, we
40 have the draft and we have the very different final version of the report. There is no evidence, as we know, from either anyone from the CSIRO or the MDBA challenging either Mr Bell's evidence or Dr Colloff's evidence. I make no comment about that, other than it raises the question that at least one finding open to you is that there is no answer to that evidence.

45

THE COMMISSIONER: In relation to that – the witness statements of each of Mr Bell and Dr Colloff have been published.

MR BEASLEY: They have, before they gave evidence and submissions.

THE COMMISSIONER: And - - -

5 MR BEASLEY: And, I should say, submissions of all the other witnesses I'm about to come to.

THE COMMISSIONER: Yes. So in relation to all the evidence that you are - - -

10 MR BEASLEY: Notice isn't an issue.

THE COMMISSIONER: - - - referring to, the same procedure has been followed as the Commission has announced publicly applies generally.

15 MR BEASLEY: I can guarantee you that if someone from the MDBA or the CSIRO contacted the Commission and said, "Mr Bell's wrong, Dr Colloff's wrong", I would have got them in here, helped them prepare a statement if they wanted that help or allowed them to have a statement prepared on their behalf or by their solicitors and I would have called them to give evidence.

20

THE COMMISSIONER: But even leaving aside answering evidence - - -

MR BEASLEY: Or they could have sought leave to have a solicitor or barrister here or some other representative to challenge the evidence here.

25

THE COMMISSIONER: You anticipate me there. There can be no doubt that if there are officers at the MDBA or the CSIRO or legal or other professionals assisting them who have been following the processes of this Commission - - -

30 MR BEASLEY: Well, we know they have because the CSIRO has put out a press release about something I said and has written to us about something I said.

THE COMMISSIONER: Strictly speaking, that shows that they followed that much of the process. If one infers - - -

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MR BEASLEY: Well, I would have been the least interesting but, go on.

THE COMMISSIONER: I won't comment on that. But if one infers that what they could always have done has been done, namely, follow what's published by the Commission, then they will have - - -

40

MR BEASLEY: Which includes the transcript.

THE COMMISSIONER: Exactly. Then they will have seen witness statements, submissions and transcripts, which include, among other things, what you've already noted from Mr Bell and Dr Colloff. Is that correct?

45

MR BEASLEY: That's right.

THE COMMISSIONER: They probably will have then noted that from time-to-time, I've asked questions of witnesses, including those two witnesses - - -

5

MR BEASLEY: You've asked a lot of questions of witnesses, Commissioner.

THE COMMISSIONER: - - - as to whether there has been any – as to whether those witnesses are aware of any published material from the MDBA or the CSIRO, particularly the MDBA, germane to a topic then under discussion in a hearing.

10

MR BEASLEY: Yes.

THE COMMISSIONER: Now, has the Commission received any communication of any kind from either the MDBA or the CSIRO, or on their behalf - - -

15

MR BEASLEY: You mean other than the summons to you to the High Court?

THE COMMISSIONER: I will pass over that – in relation to the taking up an opportunity either to seek leave to be heard to put on a late submission to cooperate in relation to further evidence?

20

MR BEASLEY: No, no and no.

THE COMMISSIONER: Thank you.

25

MR BEASLEY: I hadn't quite completed Dr Colloff's evidence, because in addition to expressing his views where he raised the very serious matters about changes to the Multiple Benefits Report, he also gave evidence concerning the MDBA's publications, Guides to the Basin Plan, published in October or November 2010 and, also, the ESLT report that was published, I think, in November 2011. And, in particular, in relation to the change in those reports between the amount of water said to be required for the environment in the Guide, which you will recall expressed the view that to meet environmental watering requirements for the Basin, the Guide suggested that there would be a high uncertainty of success with the recovery of 3,900 gigalitres and a low uncertainty of success with a recovery of 6,900 gigalitres. And I think there was an exchange between you and – I haven't had the time to turn it up – between either Professor Williams, who I'll come to, or Dr Colloff – I think it was actually Professor Williams, where the expression "high uncertainty of success in 3,900 gigalitres" is another way of saying "won't be achieved".

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MR O'FLAHERTY: Professor Williams.

MR BEASLEY: It was Professor Williams, I'm being told. Now, those changes changed dramatically between the Guide to the ESLT report which suggested that only 2,750 gigalitres of water was required for the environment to be – to represent

45

or reflect in the sustainable diversion limit, an environmentally sustainable level of take. What Dr Colloff said was that he discussed those matters with people within the MDBA for the purposes of the work that he was doing with CSIRO and was never provided with any satisfactory scientific justification for 2,750. Now, that is a
5 form of wording that has been repeated by other witnesses you've heard and will be repeated, at length, by every scientist that is being called – no scientific justification for 2,750.

10 He told you that he asked but was never told how social outcomes or economic outcomes or constraints were factored in to the determination of 2,750. He described the ESLT report as not being science, because the MDBA's framework for setting an ESLT is (1) not transparent and, (2) as required by science, can't be replicated.

15 His evidence about it is generally at transcript 100 to 101. And as I said, that's not the last time you have heard that evidence, nor will it be the last time. Mr Cosier gave evidence via Skype on 27 June and he will again later in his position as head of the Wentworth Group of Concerned Scientists. His witness statement is RCE20. When Mr Knowles became the chair of the Basin Authority in early – I think early
20 2011 or certainly after Mr Taylor's resignation in December 2010, Mr Cosier was one of a number of people asked to go on a committee, which he told you, Commissioner, was set up by Mr Knowles to try and calm the community down, the Basin community down, there having been a fairly outraged response to the publication of the Guide, including the Guide being burnt at, I think, Griffith.

25 Mr Cosier was a senior bureaucrat in both South Australia and New South Wales, an adviser to Senator Hill when he was the Federal Environmental – Water and Environmental Minister, and Minister for the Environment, and as I've said, head of the Wentworth Group. He gave evidence that in 2011, he attempted to get Mr Knowles to agree – attempted to get the Murray-Darling Basin – sorry, attempted to
30 get the Basin Authority, through Mr Knowles, to agree to having the environmentally sustainable level of take determined by an independent science committee or panel, rather than by the Basin Authority itself. After that was refused, and a newspaper report was published suggesting that Commonwealth officials were asking their Victorian counterparts whether they would “wear” an ESLT in the 2000s, Mr
35 Cosier's evidence was that the he and the Wentworth Group lost faith in the process, and hence he resigned from the Basin Consultation Committee he'd been invited to join.

40 That evidence about – that was – and I know it's only a newspaper report, but it rings very similar to Mr Bell's evidence of “it has got to start with a 2.” Professor John Williams gave evidence on 28 June. He is from the Australian National University. He is a hydrologist. There might be more qualified people to discuss the Basin Plan and the work of the Murray-Darling Basin Authority, but they would be hard to find. He is a former Chief of the CSIRO's Land and Water division. He is a former
45 Commissioner of Natural Resources in New South Wales. His PhD is in soils and hydrology. Despite all his qualifications and experience, he was also unable to

explain to you, Commissioner, how the Basin Authority reached 2,750 as the reduction amount in the baseline to produce an ESLT.

5 That was not because he has not asked the Basin Authority on many occasions and persistently. He not only does not understand how social and economic outcomes get factored in to an ESLT determination; he does not think it can be done. I'm going to read a couple of extracts from his evidence, Commissioner, if I may, commencing at transcript page 244. This is a question from you, commencing at line 30, in relation to the ESLT report. Question:

10 *Have you read anywhere an explanation of how these numbers, that is, the 2,750, are meant to be factored in for socio-economic?*

Williams:

15 *No, I haven't and that's one of my concerns, and a deep concern is that I haven't seen how you do that sum. I don't think it's possible, and I think it's mixing apples and oranges.*

20 Commissioner:

Well it sounds to me it's even more alien than apples and oranges are to each other, and I mean that seriously.

25 Williams:

30 *They just don't work together. You have an ecological hydrological reality, and that is the reality. Now, socially, you can determine to ignore it and reduce the number of birds and the breeding occurrences. That's the social choice.*

Commissioner:

35 *Well, that is, in effect, what we all have done, speaking collectively and historically. We've decided to, borrowing the language of the statute, to degrade the environment and the basin.*

Williams:

40 *Yes.*

Commissioner:

45 *In order to produce economic outcomes thought to be favourable.*

Williams:

Yes, that's exactly what we have done, and this Act was to try and restore the damage we've done, so to me the first thing is what are the flow regimes you need to establish the healthy condition of those birdlife or in the –

5 Commissioner:

Yes.

Williams:

10

And that's you what need. Now, if you choose to do something else, that's a societal choice, but the science and the best we can do with that science can tell you what flow regimes you need to maintain that functionality.

15 On page 250 of his evidence, in terms of setting an ESLT, first of all, Williams said this:

20 *So you need to recognise that this is what the environment needs. How do we manage the social and economic and the land issues and the legal issues around that sensibly and with public investment to deliver what is needed for a healthy river? And that is I think you cannot muck around with the science. The science might give you a certain probability of success. That's best it can do. But once you've got that, you then need to move towards how do we adjust those socio-economic issues and those legal, and the way we've changed the floodplain, we have challenged it, etcetera.*

25

Again at 263, Commissioner:

30 *Have you ever heard, privately or publicly, any explanation from the MDBA as to any reason, any reason at all, for a failure to make material relating to social and economic considerations publicly?*

Williams:

35 *I haven't heard a good reason why it isn't available.*

Commissioner:

40 *Have you heard any reason?*

Williams:

I haven't heard any reason why we shouldn't.

45 Commissioner:

No one has said it's commercial in confidence, have they?

Williams:

Not to me.

5 Commissioner:

I'm trying to think of a reason.

Williams:

10

I cannot see why the analysis has not been explicitly laid out and opened to inquiry and critique.

Commissioner:

15

Well, let me suggest a possibility which I am, obviously, considering whether I should infer – that it has not been revealed for fear that if it were, weaknesses could be demonstrated.

20 Williams:

You get that impression.

Commissioner:

25

Well, I get that impression provisionally.

Williams:

30

But as a scientist, I find it just so disappointing when we are a very able community scientifically as Australians, that we are investing all this money and we do not have the scientific analysis open and before us and available to scrutiny.

35 He also said the setting of the ESLT was simply not science. 287. Question from me:

40 *Has the MDBA ever given you an explanation in any of the discussions you have had with them what role, what precise role optimising socio-economic objectives played in the determination of the ESLT, and, in particular, what impact did it have on the volume that they determined is the ESLT of 2,750?*

Williams:

45

No, I haven't, and Quentin Grafton, who is an economic and social scientist, has tried to find this out, and we've both had no success, so to me, muddling the hydrological ecological requirements that our river system needs and their

functioning – muddling that up with socio-economic is very unsatisfactory. It's unscientific. There's no basis, I understand, in science for coming to those conclusions at all. What we know in ecological science is we need to say what the science says and then work through the management of the socio-economic issues we have dealt with.

Now, society may make the call that the socio-economic difficulties are too difficult to achieve, so we shall accept a degraded environment outcome, but the two things are separate, and whenever you mix them up there's a good theoretical framework in science not to mix them up and here we see it mixing them up. Compared to the claim that the end of flow is simple, they're implying that it's less quality of science is a nonsense. Compared with the muddle that's page 17 –

that's page 17 of the ESLT report which is the framework for setting the ESLT, which includes the consideration of socio-economic outcomes:

...it's an absolute scientific muddle and not defensible, in my view, on any sort of socio-economic science or hydrological and ecological science.

Now, with respect, this is not evidence from some maverick. This is a really distinguished scientist, a really distinguished hydrologist, giving this evidence in the context of a huge amount of public funds being expended, and saying the whole process is unscientific. He talked about – Professor Williams also talked about other matters, including the failure to incorporate climate change in the modelling and the determination of the ESLT and SDLs, and he described that as:

Not the right thing to do according to science.

That's at transcript 281. And also significantly, he referred us to a peer review of the Guide by a number of international scientists who came out to Australia in 2010 and spent some time talking to scientists at the MDBA. Their peer review report is exhibit RCE38, and I would like just to read and remind you of an extract from that report, where the international panel of scientists said this, having spent some time with the MDBA:

It is a fundamental tenet of good governance –

sorry, this is at transcript 282, line 30:

It is a fundamental tenet of good governance that scientists produce facts and that the government decides on values and makes choices. We are concerned that scientists in the Murray-Darling Basin Authority working to develop "the facts", may feel that they are expected to trim those so that the sustainable divergence limit will be one that is "politically acceptable". We strongly believe this is not only inconsistent with the basic tenets of good governance, but it's not consistent with the letter of the Water Act. We equally strongly

believe that governments need to make the necessary trade-offs and value judgments and need to be explicit about these, assume responsibility and make the rationale behind these judgments transparent to the public.

5 Now, that, as I said, was an extract from a peer review report of the Guide in early
2011, and, in my submission, it still rings true today. Professor Williams also raised
the issue of return flow that will be dealt with by other witnesses, and you also gave
evidence at transcript 301 to 302 about the fact that the CSIRO's evidence is that
10 2,750 just is not able to reach critical environmental watering requirements in any
event. Now, as I said, Commissioner, that's evidence from an experienced, highly
qualified hydrologist who has held the most senior positions in water at the CSIRO
and at Natural Resources in the New South Wales bureaucracy. Absent someone
telling you he's wrong, in my submission, there is no basis for you not accepting all
of that evidence.

15 But I want to make something clear about this. We are not cherry-picking witnesses.
No member of the Commission staff is doing that, and I am not doing that. We
haven't found a scientist with appropriate qualifications that says something contrary
to what Professor Williams says. Or Professor Kingsford, who I will come, to or
20 Professor Williams – sorry, Wheeler, or some of the other witnesses I will be calling.
If there a scientist in private practice or academia in Australia, or the world, that
wants to come here who's qualified in hydrology or is a modeller or an ecologist or
an economist or with some other relevant discipline and wants to say the MDBA's
entirely right, and all these other witnesses are wrong, I will call them.

25 But no one resembling that has been breaking the door down of the Commission, and
we have received over, I think now, 150 submissions, many from scientists, and no
one is offering any support for the Basin Authority's work, and no one is suggesting
in any significant degree, or at all, that the witnesses we are calling are in any way
30 wrong or misguided.

THE COMMISSIONER: The one thing that's occurred to me in reviewing the
evidence, including the passages you've just drawn to attention, is that another
possibility altogether is that, in truth, read carefully, both the MDBA and the CSIRO
35 have, in fact, effectively said that the ESLT initially set at – sorry, the ESLT, initially
set so as to require recovery of 2,750 gigalitres, would not achieve environmental
watering requirements. Now, so as to make it plain so that those at the MDBA and
CSIRO monitoring this Commission can be in no doubt as to the course of our
processes and the things that I am considering as possible inferences, I draw attention
40 particularly to what the MDBA Guide to the Draft Basin Plan said in the passages
about which you and I each questioned Professor Williams at 275 to 277.

MR BEASLEY: Yes. This is a high level of uncertainty.

45 THE COMMISSIONER: In particular, a bottom line where the MDBA publishes a
corporate statement as follows, and you quoted at line 34 on page 275 and following:

The MDBA, therefore –

that's a reference back to announced and disparate results of compliance or not with environmental watering requirements at various flow scenarios:

5

... therefore believes the environmental water requirements for key environmental assets and key ecosystem functions can be achieved with a high level of uncertainty with diversions of 3,000 –

10 meaning 3,000 gigalitres.

MR BEASLEY: In other words, they can't be achieved.

15 THE COMMISSIONER: And I, in particular, tried to understand, being a mere native user of English and a lawyer and not a scientist - - -

MR BEASLEY: Yes.

20 THE COMMISSIONER: - - - whether those words should be understood as a native user of English and a lawyer would understand them, can be achieved with a high level of uncertainty would mean, to a lawyer's way of thinking, more likely than not will not be achieved.

25 MR BEASLEY: Yes.

THE COMMISSIONER: That is, probably won't be achieved.

MR BEASLEY: Yes.

30 THE COMMISSIONER: Professor Williams didn't, coming from the other side of the two cultures, didn't think that I was wrong in that regard.

MR BEASLEY: He embraced it.

35 THE COMMISSIONER: Yes. The CSIRO, in commenting on the ESLT process, in its report, about which you and I again were asking Professor Williams questions, starting at transcript 300 and going on for a few pages, says this, that:

40 *In summary, the modelling indicates that the proposed sustainable diversion limits –*

and the transcript records me interpolating that that, of course - - -

45 MR BEASLEY: Yes.

THE COMMISSIONER: - - - is in direct connection with the calculation that produces 2,750 gigalitres for recovery - - -

MR BEASLEY: Yes.

THE COMMISSIONER:

5 ... would be highly unlikely to meet the specified ecological targets, even in the
absence of future climate change.

MR BEASLEY: Correct.

10 THE COMMISSIONER:

*Operational constraints are a key reason for this but a large number of
achievable targets are also not met in the modelling.*

15 And Professor Williams goes on to give some details.

MR BEASLEY: Yes.

20 THE COMMISSIONER: Now, it just has occurred to me as you've addressed these
remarks this morning that it would be perhaps unfair to the MDBA and the CSIRO
for me to be contemplating as a possible inference that they have been, to put it
bluntly, simply wrong, and that the overwhelming consensus of published, reported,
peer-reviewed expert opinion is to the contrary effect concerning the environmental
outcomes to be expected from recovery at 2,750 gigalitres, rather than some high
25 figure. It may be unfair because, in truth, the language I've just drawn to attention
might actually be better read as those taxpayer-funded groups, that is, the MDBA and
the CSIRO, both of which have some scientists responsible for this work, as well as
others. They've actually never said that those levels would probably achieve the key
environmental outcomes.

30 MR BEASLEY: That - - -

35 THE COMMISSIONER: In which case, of course, something very serious emerges
in relation to either a question of interpretation or a question of obedience in relation
to the statute.

MR BEASLEY: Correct. What you're reading from is, of course, a CSIRO report
not an MDBA report. And, as you're aware - - -

40 THE COMMISSIONER: But it quotes the MDBA.

MR BEASLEY: I know, I know, I know.

45 THE COMMISSIONER: A report that we know was produced in close, some might
think, I might end up thinking, excessively close liaison between CSIRO and
MDBA.

MR BEASLEY: Yes - - -

THE COMMISSIONER: In other words, it's wording that I would be highly likely
5 to infer the MDBA was aware of before it was published, and it's wording which
attributes a belief to the MDBA.

MR BEASLEY: There wouldn't be many other possibilities than that, I wouldn't
have thought. But we always have to bear in mind, as I know you do, that the statute
10 though requires the SDL to reflect an ESLT and the ESLT has a definition that
doesn't allow you to say, "Well, we will get there with a high level of uncertainty" –
in other words, we won't get there.

THE COMMISSIONER: What I have in mind is this. I have not read anywhere,
15 including in the legal advice that was published by the Commonwealth - - -

MR BEASLEY: Yes.

THE COMMISSIONER: - - - I have not read anywhere anything suggesting that a
20 standard that requires a level to be set beyond which, among other things, key
environmental outcomes would be compromised – I have not read anything to the
effect that those outcomes would not be compromised by the environmental watering
requirements probably not being reached. That sounds to me like a paradigm case
- - -

25 MR BEASLEY: "Probably" is too – not strong enough.

THE COMMISSIONER: Perhaps.

MR BEASLEY: Because that can mean 51 per cent. This is "high uncertainty."
30 That's beyond - - -

THE COMMISSIONER: I understand. Beyond 66, I think. But what I think was
significant is that if you simply say something will probably not happen, that sounds
35 to me like a perfect case for saying the outcome sought to be protected has been
compromised, because - - -

MR BEASLEY: I agree.

THE COMMISSIONER: Because it probably won't be achieved.
40

MR BEASLEY: In those circumstances, it would be unlawful.

THE COMMISSIONER: Could I just indicate at the outset in relation to Associate
45 Professor Lester's evidence - - -

MR BEASLEY: I apologise for holding it up too.

THE COMMISSIONER: I'm sorry. We're trying to make sure this is done in an orderly fashion and your evidence is heard in an appropriate context.

ASSOC PROF LESTER: I understand.

5

THE COMMISSIONER: I am particularly interested in understanding the significance from a scientific outcome, if you like, administrative point of view or the prior or antecedent setting of the environmental watering requirements against which you then test the modelled scenarios.

10

MR BEASLEY: Yes. Well - - -

THE COMMISSIONER: I don't want an answer from you but I just flag, I'm very interested to hear the witness' explanation of that.

15

MR BEASLEY: I think - - -

THE COMMISSIONER: As a tool of intellectual inquiry.

20

MR BEASLEY: I think Professor Lester knows all about that and she's also been involved in setting environmental watering requirements that are called the South Australian Environmental Watering Requirements.

THE COMMISSIONER: Yes.

25

MR BEASLEY: And has done analysis in relation to both the MDBA's scenarios and the South Australian Environmental Watering Requirements.

THE COMMISSIONER: You can assume I've read, among other things, the Goyder Institute's technical report series number 13/2.

30

MR BEASLEY: Yes. There's two Goyder reports that I'm going to ask Professor Lester to help us with.

35

THE COMMISSIONER: Thank you.

MR BEASLEY: But in terms of – without going into the detail, I think the setting of key environmental assets, the outlining of the indicator sites and very brief explanations of the modelling of the MDBA is contained in parts of both the Guide and the ESLT report. Professor Kingsford, Richard Kingsford, gave evidence, also, on the 28th of June. He is the Director of the Centre for Ecosystem Science at the University of New South Wales. He has a PhD from the University of Sydney in Waterbird Ecology. He provided a submission to the Commission which is exhibit RCE39. In it, he outlines his experience, publications and academic achievements. And it would take me five minutes to go through them, so I won't. Like Professor Williams, Professor Kingsford has not seen – I will read from the transcript – question 306, line 35, from me:

40

45

Do you have a different view to Professor Williams who indicated that he has not ever seen any scientifically justifiable explanation for the figure 2,750 in the MDBA's ESLT determination report?

5 Answer, Professor Kingsford:

I have not seen anything justifiable on scientific grounds for that figure and changes to that figure.

10 And I think by that, he meant the Northern Basin Review and the recent SDL adjustment.

THE COMMISSIONER: Thank you.

15 MR BEASLEY: Now, I will repeat: if there is a qualified scientist in Australia or elsewhere who has seen a scientifically justifiable explanation for the MDBA's work on either, (1) setting the ESLT, (2) the Northern Basin Review or, (3) the 605 gegalitre adjustment, I will assist them, the team will assist them and we will call them to give evidence.

20

THE COMMISSIONER: Thank you.

MR BEASLEY: Professor Kingsford in his evidence was particularly critical of the Northern Basin Review and, again, the failure to include climate change in
25 projections. But I won't go on any further because much of his evidence was similar in relation to Professor Williams'. Professor Sarah Wheeler, from the University of Adelaide, gave evidence on the 3rd of July. She provided a submission to the Commission which is RCE52, which she co-authored with four other economists: Professor Jeff Connor, Professor Quentin – Jeff Connor from the school of
30 commerce, University of South Australia, Professor Quentin Grafton from the Crawford School of the Australian National University, Professor Lin Crase from the University of South Australia and Professor John Quiggin from the School of Economics, University of Queensland. But Professor Wheeler was the principal author of the submission.

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Her evidence was this. First, the Murray-Darling Basin Authority's socio-economic publication in relation to the Northern Basin Review regarding impacts on buyback is fundamentally flawed and contains a misunderstanding of basic economics. Her
40 word, in fact – basic was my word, her word was common economics but she agreed basic is another way of saying it. She criticised them for failing to consider very important and, frankly, obvious matters required to be considered if one is to properly model and analyse the economic impacts of water reduction. She also made some pretty strong criticisms of reports commissioned for the MDBA by KPMG and a report prepared by RMCG for another group. Both of those reports, and the
45 MDBA report, sought to draw a proportional link between reduction in water and farm production. Professor Wheeler and the co-authors of her submission consider that to be, again, contrary to common economic principles. In other words, just

wrong. And the tone of her evidence was, frankly, “embarrassingly wrong”. She indicated that farm revenues - - -

5 THE COMMISSIONER: You’re not saying her evidence was wrong, her evidence was - - -

MR BEASLEY: I think it would be a fair summation of her evidence to say that she thought – her opinion was that the MDBA’s work and that of its consultants was embarrassing wrong, fundamentally wrong.

10 THE COMMISSIONER: I think her evidence also included a critique - - -

MR BEASLEY: I want to emphasise the word “embarrassing” is mine, not hers.

15 THE COMMISSIONER: Certainly. But her evidence also included a critique of the work of consultants not for the MDBA - - -

MR BEASLEY: That was RMCG.

20 THE COMMISSIONER: Yes. But also consultants for another catchment authority.

MR BEASLEY: She did. That was Murrumbidgee and that was Marsden Jacobs who she actually said had done a proper job.

25 THE COMMISSIONER: Thank you. And the conclusion in that report by Marsden Jacobs was that buybacks have little or no negative impact, in fact they may have positive impact which is also Professor Wheeler’s view. And also her view that buyback of entitlements is far preferable to recovery. Allegedly, for recovering water from efficiency measures.

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THE COMMISSIONER: Thank you.

35 MR BEASLEY: When I asked her whether, bearing in mind that the Water Act requires not only the Basin Authority to exercise its functions on the basis of best available science, but also best available socio-economic analysis, she not only agreed that the work of the Basin Authority and its consultants was not the best available socio-economic analysis; she said – she agreed it was “not even close”. As I said, Commissioner, her evidence – and this is important – is that buybacks are far more preferable to efficiency measures in terms of recovering water. She said that because they don’t have the negative impacts that they are said to have. They have many positive features. Buybacks are more commonly only partial buybacks, so the farmer or the irrigator remains on the land and sells only part of their entitlement.

40 The money from that is usually spent locally. Debt is reduced. Interest payments are reduced. You get a reduction in business failure. You also get river water recovered. Efficiency measures, her work has shown, and this is based on ABS – the statistics

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from – sorry, data provided from the Commonwealth Department of Agriculture – efficiency measures are two and a half times more expensive to the taxpayer than a buyback and, her evidence is, and that of others, far less reliable in terms of the recovery of water. In fact, there may be no water recovery from them, and there will
5 be evidence from other experts in relation to that. There has already been evidence from Professor Williams on that, and there will be evidence from Professor Grafton and others.

10 The reason why that is really important is first of all, huge amounts of public money have so far been spent on efficiency measures said to have recovered something in the order of seven to eight hundred gigalitres of water for the environment. The issue is that that (1) may not have occurred, and secondly, that money may have been wasted, and that's the reason why – and thirdly, there has been very little
15 transparency in relation to some of these programs in some of the states, which is why Professor Wheeler and her colleagues have called for a – sought from you a recommendation for a complete audit on the efficiency measures program.

This is also very important for the citizens of South Australia, because they have been told that, at the moment, 2,100 gigalitres or so of water has already been
20 recovered from the – for the environment, but we know that something like, as I said, seven to eight hundred gigalitres of that is attributed to efficiency measures, in relation to which the evidence before the Commission is that there is real doubt that that figure is accurate, but moreover, the extra 450 gigalitres of water that is meant to be provided for South Australia for largely South Australian enhanced environmental
25 outcomes, principally the Coorong, the Lower Lakes and the Murray Mouth, is to be recovered through efficiency measures.

So the evidence before the Commission is that the efficiency measures are vastly more expensive than buyback, and far less reliable, to the extent that, as the evidence
30 presently stands, accepting Professor Wheeler's evidence and the evidence of other scientists, which, I will repeat, at the moment has no challenge and there is no reason not to accept, there is very real doubt that South Australia will receive the extra 450 gigalitres of water from efficiency measures. There is very real doubt that what has been claimed to have been achieved so far has been achieved, and it will be a hideous
35 waste of taxpayers' money, as compared to a buyback.

THE COMMISSIONER: Could I just make one comment.

40 MR BEASLEY: Yes.

THE COMMISSIONER: It starts with a pedantic correction.

MR BEASLEY: Yes.

45 THE COMMISSIONER: I won't be taking into account a group of people called the citizens of South Australia.

MR BEASLEY: That's fair enough.

THE COMMISSIONER: Citizens is a word described a status in relation to the nation.

5

MR BEASLEY: Yes.

THE COMMISSIONER: And I'm not going to leave out of account anybody who lives and works within South Australia.

10

MR BEASLEY: No.

THE COMMISSIONER: So by your reference to citizens, I want to make it clear, I'm talking about residents, but I also include artificial persons, business entities - - -

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MR BEASLEY: Yes, you're right.

THE COMMISSIONER: - - - who are greatly affected in many ways by this, but I want to emphasise something that you've correctly pointed out at a number of our public occasions. This is a Royal Commission with the authority of the South Australian Government, that is, it's the South Australian Governor who, under a South Australian statute, has constituted this Royal Commission, and I will report to the South Australian Governor, but the subject matter concerns the Basin, which involves - - -

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MR BEASLEY: Yes.

THE COMMISSIONER: - - - New South Wales, Victoria, Queensland and the ACT, as well as South Australia.

30

MR BEASLEY: Yes.

THE COMMISSIONER: And it particularly concerns compliance by Australia with its international obligations - - -

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MR BEASLEY: Yes.

THE COMMISSIONER: - - - which I don't think I am being pious or naive in saying is a matter of national concern, that is, equally concerns persons concerned - the persons interested in Australia's performance of its international obligations, whether they live in Perth, Darwin, Sydney or within the Basin.

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MR BEASLEY: And just following on from that, when I mention the enhanced environmental outcomes for South Australia, emphasise the Coorong, the Lower Lakes and the Murray Mouth, that Ramsar site is important not just for South Australia but there has been evidence that its ecological state is important nationally and internationally - Coorong.

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THE COMMISSIONER: Globally, literally.

MR BEASLEY: It wouldn't be a Ramsar site if it wasn't, and migratory birds is just one – habitat for migratory birds is just one of the reasons for that, and you've
5 already heard some evidence about how flow through the Murray Mouth is important not just for Goolwa but for the entire Murray system.

THE COMMISSIONER: Well, one of the givens that I am using in my thinking in this Royal Commission is that what Australia has signed up to with those treaties and
10 conventions, particularly in relation to the Ramsar Convention and the – what I will call compendiously the Coorong, the Murray Mouth, I'm treating that as a given from which it follows that expressions of sentiment to the effect that "let's forget the Coorong" - - -

15 MR BEASLEY: Yes.

THE COMMISSIONER: - - - or "the Coorong is too difficult to accommodate with all the other calls on Basin water resources", I am not going to be considering that at all, apart from noting it as a matter which is outside my remit, because I am looking
20 at the Basin Plan, the Basin Plan comes from a statute which calls for compliance with treaty obligations, and I've not heard anybody seriously advance the notion of Australia repudiating its treaty obligations.

MR BEASLEY: You're emphasising the word "seriously", obviously.

25

THE COMMISSIONER: I am.

MR BEASLEY: Yes. I'm still going to ask Professor Lester a couple of questions about that, because she has looked at that issue. You've also reminded me, by
30 mentioning that this is a South Australian Royal Commission but its remit is Basin-wide, that we, as I mentioned in opening address, have had significant assistance from the South Australian Department of Environment and Water, as we did from their Victorian counterparts and also from that Primary Industries. Primary Industries. And I know, Commissioner, you're extremely grateful for the assistance
35 that has been given by those South Australian departments and Victoria, but the reason I raise that is that the government – South Australian Government has filed a submission which I have tendered.

I think the covering letter from the Honourable David Speirs MP, Minister for
40 Environment and Water, to that submission, must have got separated from it and so it wasn't tendered on the last occasion. I've been asked to tender it, so I will tender Minister Speirs' letter to you of 26 June 2018, attaching the South Australian Government's submission. But I do need to raise this. As I said, we've had a great deal of help from the Minister's department, from people within it, but the South
45 Australian Government's submission and the Minister's covering letter expressed confidence in a 3,200 gegalitre plan being delivered, and expressed confidence in the

recent sustainable diversion limit adjustment, and expressed confidence in the extra 450 gigalitres based on further efficiency measure programs.

5 As I've just gone through, the evidence that's been presented to the Commission so far throws doubt – let me just summarise it this way: throws doubt not only on the legality of those things, but on their merits, their scientific merit. In fact, them being unscientific, and throws doubt on whether any of this either has been achieved or, in relation to the 450 gigalitres, throws real doubt (a) whether it will be achieved and (b) whether it will be a great waste of taxpayer money, and whether it's frankly done
10 for political reasons rather than scientific reasons.

THE COMMISSIONER: Thank you.

15 MR BEASLEY: Now, my invitation to the government of South Australia and the department is we just don't have and cannot find a qualified expert, as I said before, that supports the Basin Authority and throws doubt on the evidence given by people like Professor Kingsford, Professor Williams, Professor Wheeler, evidence that will be coming from other scientists, etcetera. If the government – I'm not suggesting the Minister come and give evidence himself, but – unless he has the right qualifications;
20 I don't know – but if the South Australian Government can even put us in contact with scientists that would justify confidence in a 3,200 gigalitre plan, confidence that the sustainable diversion limit has merit and legality, and confidence that the 450 gigalitres said to be coming will be delivered and that efficiency measures are the best way of doing that and can achieve 450 gigalitres, I will call evidence from
25 whatever person we're put in touch with.

THE COMMISSIONER: Thank you.

30 MR BEASLEY: But it will be of no assistance if the response is, "We trust the Basin Authority."

THE COMMISSIONER: I should say, Mr Speirs' letter continues – in its closing three paragraphs, continues to make clear the high level of assistance and cooperation that you referred to earlier has already been forthcoming from
35 departmental officers.

MR BEASLEY: Yes, and it also says if the Commission does require a witness to attend the government of South Australia will respond in a timely manner.

40 THE COMMISSIONER: Yes.

MR BEASLEY: So what I'm saying is if you've got someone outside of the Basin Authority or the CSIRO who we know won't be coming here, for the time being, at least - - -

45 THE COMMISSIONER: Yes.

MR BEASLEY: - - - we would like to hear from them and present them. I mean, one of the things I - - -

THE COMMISSIONER: I'm grateful to the - - -

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MR BEASLEY: Yes.

THE COMMISSIONER: To the Minister for re-expressing that level of assistance, which we have received in the past, and I'm confident we will continue to receive.

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MR BEASLEY: As am I, and the only thing that needs to be done now is to confirm where the Minister is saying, if the Commission does require witnesses, I'm saying, yes, please, we do require witnesses.

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THE COMMISSIONER: Thank you.

MR BEASLEY: And what I have in mind – I should say this, and this also applies should the High Court decide that you do have powers of compulsion in relation to MDBA and Commonwealth witnesses. What I would have in mind, if we do get any
20 scientists coming to us to express a contrary view to the scientists that have already given evidence and will give evidence, or if the South Australian Government can put us in touch with relevant people in that regard, or anyone else, or if the MDBA and CSIRO scientists and executives and board members change their mind and volunteer, or they are ultimately compelled, what I would have in mind as to the
25 process is to put them in the witness box with the witnesses that have already been – given evidence and, in effect, hot-tub and allow a debate to occur in front of you.

THE COMMISSIONER: I won't commit to that yet.

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MR BEASLEY: No, I'm

THE COMMISSIONER: Hot-tubs have sanitary consequences.

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MR BEASLEY: They do. It is at least something I am contemplating as the best means of assisting you.

THE COMMISSIONER: I do understand.

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MR BEASLEY: It may not be something you want to adopt ultimately. I've seen it work well, and I've seen it work horribly.

THE COMMISSIONER: Well, now, can we - - -

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MR BEASLEY: Now - - -

THE COMMISSIONER: With that reference to hot-tubs, can we move a bit closer to the salinity of the Murray Mouth?

MR BEASLEY: We can. Can I just finish this, though. Again, I want to emphasise that in relation to Professor Wheeler's economic evidence, we have not cherry-picked. She is the only one – sorry, it's all one-way traffic in relation to that. So a summary of the evidence so far would be that the Basin Authority's alleged science is, in fact, not science. It is open to find that they know that. It's a – it is open to find that they have supplanted policy or a political position for scientific evidence. It's certainly open to find that their science and economic analysis just does not stack up. It's open to find that the ESLT has been determined by the MDBA inconsistently with the Act, and has no merit in any event, and that the figure for the ESLT was chosen as part of a political process rather than based on science.

It's also open to find that, in relation to the Multiple Benefits Report, the MDBA, with the CSIRO's cooperation, prepared it to finesse or, in fact, doctor the expert report so that the real results had been censored and are inaccurate and deceptive. That's the evidence so far. There will be further evidence from – and I'm not going to go into too much detail about this. There will be evidence from a series of scientists next week from – is it next week from the Wentworth Group? From the Wentworth Group, who will give evidence on all of the topics I've just raised. There will be evidence from Maryanne Slattery, who is a former employee of the Murray-Darling Basin Authority, particularly in relation to the SDL adjustment, but also on a range of the issues that I've already discussed; evidence from Bill Johnson, who is also a former employee of the Murray-Darling Basin Authority, largely in relation to work he did on the Northern Basin Review; Professor Quentin Grafton, who is an economist, will give evidence in relation to return flows. That will be by Skype because he's overseas. Return flows and efficiency measures.

I'm also going to call a number of representatives of Aboriginal nations, Fred Morgan from the Northern Basin Aboriginal Nations, Monica Morgan from the Yorta Yorta people, Grant Rigney from the Ngarrindjeri Nation and representatives from MLDRN, Murray Lower Darling Indigenous Nation. They will all give evidence. I'm told now Professor Grafton will be here in person, not on Skype. That's good. They will all be giving evidence about the consultations that they had with the Basin Authority concerning the Basin Plan. They are going to express to you their views concerning the wording of the Water Act and the Basin Plan, and express their views in relation to cultural flows, and there was a publication put out yesterday about cultural flows that I haven't read yet, but I understand it's significant and may even talk about specific volumes of water, but I haven't got on top of that yet.

In particular, as you're aware, Commissioner, the Water Act and the Basin Plan requires the Basin Authority to "have regard to" various Indigenous issues. I can tell you that the evidence from the people I've just mentioned will be that they regard that as mere tokenism, and they want to recommend to you significant changes to the Act and the plan in terms of an engagement that is a far deeper and more meaningful process than the Act requires or the plan requires, and that they have had so far. There is one matter I've got to raise, though, Commissioner, that was brought to my

attention by Rene Woods from MLDRIN, who I think is the chair of MLDRIN. It's a Murray-Darling Basin publication that's available on their website.

5 It's not for me to tell the Basin Authority what they should and shouldn't put on their website. But this document, which is publicly available, is a position statement they have prepared to indicate what their understanding is or what is required by the term "have regard to", and in relation to a number of different categories in the Basin Plan, they refer to the need to have regard to objectives and outcomes based on Indigenous values; cultural flows and Indigenous consultation and preparation of
10 water resource plans. This document then categorises that level of having regard to as category A, which is less than category B and category C, and says that the "having regard to" in relation to Indigenous views is a matter that requires regard to a specific matter "with no additional requirements".

15 As I said, it's not for me to tell the Basin Authority what to put on their website, but – and I won't label it what this document is. I will leave that to people that are – Aboriginal people, not a white person, but even as a white person, I think I can make the submission that this is an incredibly insulting document. The need to have regard to Indigenous views should not be labelled as category A, the lowest category; at
20 best, this should be an internal document, and I suggest that the executives or board members of the MDBA give consideration as to whether this should be a publically – this document should be on their website. And there will be evidence about the reaction to document as well.

25 Steve Whan, who is the CEO of the National Irrigators Council will be giving evidence in support of a submission they've provided to the Commission, and we are also calling representatives from Cotton Australia in support of a detailed submission we've received from Cotton Australia. Alan Whyte, W-h-y-t-e, and Rachel Strachan, who are irrigator farmers on the Lower Darling will give some evidence concerning
30 the impacts on their farming businesses and lives as a result of low flows in the Darling, and Mal Peters and others who were on the advisory committee for the Northern Basin Review, will also be giving evidence at some stage in late July, I think. There are other witnesses, but we're in the process of preparing them.

35 The only other things to cover before I get to Professor Lester – and I'm sorry this has taken so much time. I do have to refer, however, to a letter that was sent to you by the CSIRO, 29 June 2018, from Peter Mayfield, the Executive Director, Environment, Energy and Resources. In that letter, having already done so, the CSIRO again wishes to emphasise that they are not cooperating with the
40 Commission because they wish to remain:

Respectful of the High Court and its legal process and to allow it the benefit of issuing its decision before taking further steps in relation to this matter.

45 And they consider that the High Court may be:

5 *Considering significant issues in relation to the Royal Commission, including whether it has the power to summons current and former employees of the Commonwealth, and that the High Court may make a range of comments in relation to the Royal Commission and its operations which are relevant to the CSIRO and its staff to consider.*

10 I said in opening address that – I think it was opening address or it might have been hearings day 2 – that whatever else the High Court was doing, it would be completely uninterested and no matter would be before it concerning voluntary participation of the CSIRO in this proceeding. You have – sorry. Joanne Masters, a Senior Instructing Solicitor of the Commission, has responded to the CSIRO by letter dated 4 July 2018. I will quote part of that letter.

15 *As a matter of fairness, the CSIRO should be in no doubt that the Commissioner may be inclined to draw serious adverse inferences against the conduct of the CSIRO, in particular, in relation to the setting of the ESLT and in relation to the drafting and finalisation of CSIRO reports prepared for the MDBA. CSIRO has the opportunity to make timely contributions to the Royal Commission’s inquiry into and considering these issues by way of evidence, submission and, possibly, closing address. Given the circumstances, the time limits or targets announced generally nor much steps to be taken would not, of course, apply so as to prevent participation of the CSIRO.*

25 *This invitation is not, it should be stressed, for anything other than voluntary cooperation by the CSIRO. The distinct issue whether the Royal Commissioner can compel, say, evidence from the CSIRO is a matter for the High Court and must await that court’s decision. Whatever you may intend to convey by your reference to the possibility of the High Court making “a range of comments in the relation to the Royal Commission and its operations which are relevant to – for CSIRO and its staff to consider”, it should be clear that voluntary cooperation by the CSIRO with the Royal Commission could not even arguably be disrespectful of the court and its processes.*

35 That is very much what I intended to convey last time I made a statement about this. It is – in no way would be disrespectful of the High Court for the CSIRO to voluntarily come and give evidence about scientific matters and its reports to this Commission. And I say again that if they wish to come and give such evidence, the staff and I will assist that process. I tender the letter to you from CSIRO, 29 June 2018, and from Dr Peter Mayfield, Executive Director of Environment, Energy and Resources, CSIRO. And I tender the letter from the Murray-Darling Basin Royal Commission signed by Joanne Masters, Senior Instructing Solicitor to Dr Mayfield, 4
40 July 2018. I was going to deal with something on Menindee Lakes but I think we’ve made Professor Lester wait far too long, so we might get on with her.

45 THE COMMISSIONER: Yes, please.

<EXAMINATION-IN-CHIEF BY MR BEASLEY

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MR BEASLEY: Now, Professor Lester, you are an Associate Professor in Fresh Water Ecology at Deakin University, Geelong Campus at the Centre for Regional and Rural Studies.

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ASSOC PROF LESTER: That's right.

MR BEASLEY: That's right.

15

ASSOC PROF LESTER: Regional and Rural Futures.

MR BEASLEY: I'm glad. That means I've got the right witness. Your area of expertise is management of aquatic ecosystems?

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ASSOC PROF LESTER: That's right.

MR BEASLEY: In other words, you describe yourself as an aquatic ecologist?

ASSOC PROF LESTER: Yes.

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MR BEASLEY: Prior to Deakin University, you worked at the CSIRO. Correct?

ASSOC PROF LESTER: That's right.

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MR BEASLEY: And what years did you work at the CSIRO?

ASSOC PROF LESTER: I worked for them between 2010 and 11 and had a one-year half-time appointment with them that was concurrent with

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MR BEASLEY: Don't take this as a criticism but - - -

ASSOC PROF LESTER: I'm sorry. You can't hear me.

MR BEASLEY: - - - you're going to have to talk as loudly as you can.

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ASSOC PROF LESTER: I had a half-time appointment at CSIRO between - sorry, 2009 and 2010 that was concurrent with an appointment at Flinders University.

MR BEASLEY: And before CSIRO, is that when you were at Flinders?

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ASSOC PROF LESTER: That's right.

MR BEASLEY: And what was your – what position did you have at Flinders?

ASSOC PROF LESTER: I had a research fellow position at Flinders University, and I was there for five years, including the year that I was part-time.

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MR BEASLEY: All right. And can you just outline your tertiary qualifications for the Commission?

ASSOC PROF LESTER: I have a Bachelor of Science, a Bachelor of Engineering with Honours and a PhD in Aquatic Ecology.

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MR BEASLEY: Thank you. Where's the PhD from? Flinders?

ASSOC PROF LESTER: It's from Monash.

15

MR BEASLEY: Monash. Right. Thank you. A lot of your work has involved investigating, studying, analysing ecosystems and environmental water requirements in the Coorong and Lower Lakes and Murray Mouth. Correct?

ASSOC PROF LESTER: Yes. That's correct. Yes.

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MR BEASLEY: And you are the author and co-author of a number of reports and journal articles in relation to that area of study and investigation?

ASSOC PROF LESTER: That's correct.

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MR BEASLEY: And you are also involved, as part of the chapter 3 Ecological Benefits Team, in relation to the Multiple Benefits report that the CSIRO prepared for the MDBA that you have heard me discussing in the address I just gave.

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ASSOC PROF LESTER: Yes. That's correct.

MR BEASLEY: And Dr Colloff was the head of that team?

ASSOC PROF LESTER: That's correct.

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MR BEASLEY: How did you – you left the CSIRO, I think, by the time you did your work on the Multiple Benefits Report. How did that come about?

ASSOC PROF LESTER: That's correct. I had moved to Deakin at that stage. And that came about, predominantly, because of my work in the Coorong. But I was – I remained the person who was best qualified to provide – or to comment on the Multiple Benefits Plan for that region but also because I maintain and continue to maintain good working relationships and collaborations within CSIRO.

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MR BEASLEY: So they asked you to stay on?

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ASSOC PROF LESTER: They did.

MR BEASLEY: Before I get to the Multiple Benefits Report, you would have heard the Commissioner talking about suggestions of allowing the Murray Mouth to silt out and the lakes to salt up and the Coorong to salt up. You have, I think, been involved in work in looking at the potential effects of opening the barrages and flooding the lakes with seawater. Is that correct?

ASSOC PROF LESTER: That's right.

MR BEASLEY: Can you just give – and I hate to phrase it in this way, but can you give the Commissioner a response to these areas. Why it's important for flow to go through the Murray Mouth, both including for the entire system and, also, within your area of expertise, the importance of that flow to the Coorong and the Lower Lakes, and why, in general – and we know they're a Ramsar site but why, in general, their ecosystems are important.

ASSOC PROF LESTER: So flow through – flow in the Coorong is a complex thing. It is a very interesting system from a hydrodynamic perspective. The common perception, I think, is that flow crosses the barrages, flows down through the Coorong and then comes back out through the Mouth. And that's quite incorrect. What happens is that the flow over the barrages goes directly, more or less, out the Murray Mouth. And so the impact that it has on the Coorong hydrodynamics is more complex than, simply, a flow-through system.

THE COMMISSIONER: Just as a matter of terminology - - -

ASSOC PROF LESTER: Yes.

THE COMMISSIONER: I noticed in one of your publications, the expression is used CLLMM, meaning Coorong Lower Lakes and Murray Mouth.

ASSOC PROF LESTER: That's correct.

THE COMMISSIONER: Should I understand that as always the assemblage that you're referring to?

ASSOC PROF LESTER: Most of the time, I will be referring to the Coorong and Murray Mouth and then I will be more specific when I'm including the Lower Lakes.

THE COMMISSIONER: Thank you very much.

ASSOC PROF LESTER: So the flow through the system – fresh water flows from the Murray affect the Coorong in a couple of different ways. The first way is by maintaining the connection with the Southern Ocean via the Murray Mouth. So as Counsel Assisting said, what will tend to happen in that system in the absence of flow is that sand will, through longshore movement, silt up the Murray Mouth and it

will close. And that is a natural seasonal process that happens, to some degree, even with flow. But the lower the flows are, the more that will happen. And that has been demonstrated through a couple of different drought periods now where the Mouth has closed entirely and been maintained through dredging artificially.

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MR BEASLEY: Yes.

ASSOC PROF LESTER: So that's one mechanism. The second mechanism is that fresh water flows raise the overall water levels within the Coorong. And that is important because the south lagoon is connected to the north lagoon by quite a narrow channel. And when water levels drop, you get effective hydrologic disconnection between the north and south lagoon and then there is no water to replace evaporation in the south lagoon. And that's when you get very low water levels and extreme salinities, which we saw to about seven times the salinity of seawater during the millennium drought. Having higher water levels maintains that connection for longer into the year. Again, it's a natural seasonal process for there to be variation in water level. You get changes in the weather systems that come through.

20 So in spring and summertime, you tend to get more high-pressure systems that depress the sea level. And so you do get a drop in sea levels in Encounter Bay. And that will tend to mean that you get that disconnection with the south lagoon naturally. But having low barrage flows means that that disconnection occurs earlier in season and lasts for longer which means that you then have that evaporative process
25 happening and you get more severe extremes in water level and in salinity. And the last mechanism by which fresh water flows from the barrages are important is that actually freshen the water within the north lagoon so that while you do have that connection persisting, the water that is replacing evaporative losses through affection is actually much pressure than it would be if it was just sea water or just north lagoon
30 water that had been sitting there for a while. So that is, effectively, how barrage flows influence that system.

The question about allowing it to close up and to silt up is one that was, I think, tendered quite freely during the millennium drought as to whether it was even going
35 to be possible to have a fresh water future for that part of the system. My group at Flinders University at that time were involved in collaborating with DEWNR here in South Australia, so the Department for Environment, Water and Natural Resources. And we actively assessed the likelihood that there would be a fresh water future for the system and found that even under severe climate change, the millennium drought
40 is an anomaly in terms of the likely length and severity of the drought. And so in our assessment, there should usually be no problem within the basin for there to be sufficient water for it to be possible to fill the lakes and to fill the Coorong. We were also involved in some work that was done to assess the likely impact of opening the barrages, as to whether that could ameliorate acid sulphate soils. That - - -

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MR BEASLEY: Now, that's where the water level drops in - - -

ASSOC PROF LESTER: That's right.

MR BEASLEY: Is that in the Lower Lakes?

5 ASSOC PROF LESTER: That's in the Lower Lakes.

MR BEASLEY: The Coorong as well?

10 ASSOC PROF LESTER: No, it's predominantly the Lakes.

MR BEASLEY: And soil that hasn't been exposed to air for a long time basically turns the water into sulphuric acid.

15 ASSOC PROF LESTER: Yes. So the poor water within the sediment turns into sulphuric acid. Yes. And then that runs into the lake that's connected to

THE COMMISSIONER: Is that partly, also, a function of bank collapse?

20 ASSOC PROF LESTER: It's not. Bank collapse is further up within the river.

THE COMMISSIONER: Does that lead to acid sulphate soils?

25 ASSOC PROF LESTER: I couldn't comment. It depends on whether the banks were sulfidic in their soil nature and I'm not sure as to that. Within the lakes, there is naturally large amounts of sulfidic soil and what would naturally happen in an unregulated system is that the water levels would fluctuate inter-annually and inter-seasonally and so you would get little pulses of sulphuric acid entering the system. During the millennium drought, of course, the lake was far below sea level at historically low water levels and there were thousands of hectares of, I think, tens of
30 thousands of hectares of exposed acid sulphate soils. And so that was far beyond the likely capacity of the system to cope naturally.

35 And there was a significant risk that flows to refill the lakes would actually wash all of that sulphuric acid into the water and that the whole lake would go acidic. Sea water was proposed as one potential solution to that but the analyses that were done by people that are far more qualified than me to speak about acid sulphate soils suggested that actually sea water may exacerbate that process and make it more likely for the lake to turn acidic and that once you had salt water in Lake Albert, because that's terminal, there would be nearly no possibility of flushing that back
40 out of that system. So you would, effectively, be resigning the Lower Lakes as a fresh water system then and there.

MR BEASLEY: And I - thank you. Because I asked you more than one question at once, you've understandably - - -

45 ASSOC PROF LESTER: I have forgotten them.

MR BEASLEY: No, and I wanted you to tell the Commissioner about the importance of the Coorong ecosystem.

5 ASSOC PROF LESTER: Yes. So the – the Coorong is the estuary within the Murray-Darling, and it's necessary there is only one estuary per river system. It is defined as the mixing of fresh water and marine water, and that is the – the environment in which the organisms that live in it reside, and there are – the – the reason that I believe the Coorong is such a – an important bird refuge, along with all of the other values that go with it, is because of that estuarine nature. If the Murray is – if the Murray Mouth is allowed to close and the Lower Lakes are allowed to basically – left to their own devices, that will completely remove that aspect of the ecosystem, so that will no longer exist within the system.

15 We again did a lot of work during the millennium drought, modelling the different impacts of proposed engineering solutions, including dredging, including pumping sea water from the south lagoon out into Encounter Bay. We did a little bit of informal looking at developing a channel between Lake Albert and the south lagoon, and none of those interventions had any ability to do anything other than maybe cut off – for some of them, cut off some of the worst impacts of the drought. None of them returned the system to anything that could be considered to be a healthy estuarine system. For that, fresh water flow is required. And so that – that would mean again that the international obligations that you referred to earlier would not be met and that all of the – the ecology, as has been described, within that system would be very unlikely to persist.

25 THE COMMISSIONER: You refer to birds.

ASSOC PROF LESTER: Yes.

30 THE COMMISSIONER: They

MR BEASLEY: That – sorry. That last word was persist.

35 ASSOC PROF LESTER: Persist, yes.

THE COMMISSIONER: Those birds include the migratory birds which are the object of Ramsar's protection.

40 ASSOC PROF LESTER: Yes, indeed.

MR BEASLEY: And please provide a better explanation than I would in my question, but the Coorong becoming, whether it's in the south lagoon or the north lagoon, too saline puts doubts on the viability of Ruppia as an example.

45 ASSOC PROF LESTER: So Ruppia – there used to be two species of Ruppia within the system, Ruppia megacarpa, as well as Ruppia tuberosa, which will be the

– the extant species that you’ll have heard about. *Ruppia megacarpa* went extinct within the system in the 1980s.

5 MR BEASLEY: Because of salinity or - - -

ASSOC PROF LESTER: Possibly. The exact mechanisms are not known. If I had to guess, I would suggest it was a combination of salinity and changes in how – how stable the sediments were around the Murray Mouth.

10 MR BEASLEY: Right.

ASSOC PROF LESTER: There were also some seagrasses, *Zostera* and others, that also went extinct around the same time which won’t be a result of salinity.

15 MR BEASLEY: Right.

ASSOC PROF LESTER: But certainly for *Ruppia megacarpa*, salinity is a possibility.

20 MR BEASLEY: Yes.

ASSOC PROF LESTER: For *Ruppia tuberosa*, there was a dramatic decline during the drought that has not recovered for a range of reasons that I think are still being investigated, but that going locally extinct within the Coorong is a possibility.

25 THE COMMISSIONER: So *Ruppia tuberosa* is the species that is being artificially planted.

30 ASSOC PROF LESTER: That’s right.

THE COMMISSIONER: And can you put in summary terms the significance of the two species of *Ruppia* in the ecosystem?

35 ASSOC PROF LESTER: *Ruppia* provides an important bird food resource, for example. It creates both seeds and something that’s called a turion, which – I guess the – the best analogy for that is like a little potato. It’s a little starchy, much smaller than a potato. A little starchy growth that enables it to die back over the hot summer months and then re-sprout from its seed base in - - -

40 THE COMMISSIONER: Like a tuber.

45 ASSOC PROF LESTER: It is – it is like a tuber, yes. A little more self-contained. But both – both the seeds and the turions are an important food resource for birds. The plant itself also gets, like, the – the leaves of the plant get eaten by swans in particular, and the – the – it’s also important habitat-creating element of the system. So it’s used as a habitat for small bodied fish. There are also invertebrates living within that system.

THE COMMISSIONER: So that if – has there been any study of the effects of losing the other *Ruppia*, the megacarpa?

ASSOC PROF LESTER: The megacarpa?

5

THE COMMISSIONER: Megacarpa.

ASSOC PROF LESTER: Not from the perspective of what's gone missing from system, I don't think. I don't think there is sufficient data from the four – from when
10 *Ruppia* megacarpa was extant within the system. The – the ecological data that we have go back to the eighties, but not much before that. And so there are a few patchy more natural history-type assessments about what is in those systems. So it's difficult to comment on that.

15 THE COMMISSIONER: So are there any other large species, birds, etcetera, that were obligate megacarpa feeders rather than - - -

ASSOC PROF LESTER: To the megacarpa? Not that I'm aware. It – I – I suspect – and I – I don't know whether megacarpa produces turions. I'm not aware that it
20 does, but I'm not a botanist so I – I certainly wouldn't – wouldn't rest on that advice. I – I suspect that most birds would be happy to eat the seeds or the plant material from either, but that is a guess.

25 THE COMMISSIONER: And if all the *Ruppia* went - - -

ASSOC PROF LESTER: Yes.

30 THE COMMISSIONER: - - - how would you explain the likely – what would you expect to be the knock-on effects of that?

ASSOC PROF LESTER: Again, it's a little difficult to comment on precisely what happens. We did a small study a number of years ago to try and identify a different assemblage of organisms that live within *Ruppia tuberosa* compared to *Ruppia*
35 megacarpa compared to elsewhere and we weren't able to identify specific organisms that only lived within the *Ruppia*, but we know that it is going to be an important habitat. There aren't any other macrophytes within the system so there are no other plants that could be used as a surrogate. The – that means that the fish would have no habitat, the birds would have no food source, so they would have to go elsewhere to look for those, which is a real possibility.

40

THE COMMISSIONER: Is there an elsewhere in this part of the globe for the international migratory birds?

45 ASSOC PROF LESTER: Not on the same scale as the Coorong. There are certainly other small wetlands within the south-east of the state. Most of them are much more ephemeral than the Coorong and so would be a much less reliable food

resource. And they certainly wouldn't support the same numbers of birds that the Coorong

5 MR BEASLEY: It's I think one per cent of the world's population of migratory birds, isn't it? Coorong.

ASSOC PROF LESTER: I – for specific species.

10 MR BEASLEY: Yes.

ASSOC PROF LESTER: There are a number of species but yes. And it's certainly those - - -

15 MR BEASLEY: Which might be a Ramsar criteria, is it?

ASSOC PROF LESTER: It is a Ramsar criteria.

MR BEASLEY: Yes, yes.

20 ASSOC PROF LESTER: And there are the fish that live within the system – they don't have the ability to move to any of these ephemeral systems. They're not connected.

25 MR BEASLEY: Can you hold that thought, Professor Lester.

ASSOC PROF LESTER: Yes.

30 MR BEASLEY: On – if anything occurs to you over the break we're about to have before I faint, you can add to that, but after the break I will take to you multiple benefits report and those two Goyder reports were involved in. It's even legal in this building to get a coffee, Commissioner, so - - -

THE COMMISSIONER: Is it too demanding to suggest we resume at 10 to?

35 MR BEASLEY: Too demanding?

THE COMMISSIONER: Yes. Do you need

40 MR BEASLEY: I would rather it was five to, but - - -

THE COMMISSIONER: Five to. We will adjourn to

ASSOC PROF LESTER: I guess the answer is yes, it is too demanding, thank you.

45 THE COMMISSIONER: That's why I asked. We will adjourn till five to 12.

MR BEASLEY: Thank you.

ADJOURNED

[11.38 am]

RESUMED

[11.55 am]

5

THE COMMISSIONER: Yes.

10 MR BEASLEY: In the comments I was making before you gave evidence, you would have heard me make references to Dr Colloff and his state of dissatisfaction in relation to certain changes made to the Multiple Benefits Report.

ASSOC PROF LESTER: Yes.

15 MR BEASLEY: One of the things I didn't mention, I'm just wondering whether you took part in this process, but as a result of – Dr Colloff's evidence was that as a result of the high level of unhappiness amongst his team and other members of CSIRO staff that worked on the Multiple Benefits Report in relation to what they perceived is interference and pressure by the Basin Authority, and concessions made
20 by senior people at the CSIRO, a mediator had to be brought in to allow people to vent and have some release from that level of unhappiness. Were you aware of that process?

25 ASSOC PROF LESTER: I knew it had happened. I wasn't aware of it.

MR BEASLEY: Right did. You go to any of the - - -

ASSOC PROF LESTER: No, I wasn't part of it.

30 MR BEASLEY: I think we've already – you've already given evidence that you were part of the chapter 3 team for the Multiple Benefits Report.

ASSOC PROF LESTER: That's right.

35 MR BEASLEY: And am I right that you have read, again, the final version of that report – sorry, I should say, you were given responsibility for the part of the report dealing with the Coorong – part of the chapter, chapter 3 dealing with the Coorong.

40 ASSOC PROF LESTER: And also some of the fish modelling.

MR BEASLEY: And also some of the fish modelling.

ASSOC PROF LESTER: Yes.

45 MR BEASLEY: And I am right that you've been given an opportunity to read the final version of the report?

ASSOC PROF LESTER: Yes.

MR BEASLEY: Which is exhibit RCE16. And you've also considered, recently, the draft that has been provided to the Commission that Dr Colloff spoke to.

5

ASSOC PROF LESTER: Yes, that's right.

MR BEASLEY: And you've also seen your work as it appeared in the draft.

10 ASSOC PROF LESTER: Yes.

MR BEASLEY: And that's exhibit RCE17. Am I right that the drafting in the draft of the part of the report that you had responsibility for was your work, your writing?

15 ASSOC PROF LESTER: It was my work – work in collaboration with others.

MR BEASLEY: Yes.

ASSOC PROF LESTER: So it wasn't exclusively my writing.

20

MR BEASLEY: Yes. And you did not personally, in relation to the parts of the report where you had responsibility, make the changes to your parts of the report that appeared in the final report.

25 ASSOC PROF LESTER: No, I didn't personally do that.

MR BEASLEY: But having considered both the final version of the report and the draft, at least from your point of view, am I right that you considered that your conclusions that are expressed in the draft have been adequately or satisfactorily covered in the final version?

30

ASSOC PROF LESTER: Yes, I think that's right.

MR BEASLEY: And you don't have any particular complaint in relation to any of the changes that were made?

35

ASSOC PROF LESTER: No, I don't.

MR BEASLEY: All right. Thank you. You did some work analysing whether the Basin Authority's environmental water requirements could be met under various scenarios for water recovery in the Coorong Lower Lakes Murray Mouth.

40

ASSOC PROF LESTER: Yes, we did.

45 MR BEASLEY: You were also involved in work in establishing South Australia's own environmental water requirements for that region.

ASSOC PROF LESTER: Yes, that's correct.

MR BEASLEY: Can you just explain to the Commissioner what that work involved?

5

ASSOC PROF LESTER: So that work was a little bit of a moving feast. Initially, we were asked, so the team that I led at Flinders University were asked to justify a specific volume as the environmental water requirement for the Coorong. In attempting to do that, we worked out quite quickly that that wasn't really – that
10 wasn't going to be the most scientifically robust way to go about that. And so in collaboration with the Department, we then undertook what ended up being, approximately, a two-year project to develop the environmental water requirements as they have been adopted by South Australia. And so we started from ecological first principles. We had the statement of vision that the Department had set for the
15 region, and in collaboration with the Department, broke down what that would look like. And so, off the top of my head, I think the statement is something along the lines of that the Coorong Lower Lakes and Murray Mouth region will maintain the ecological character that has a healthy resilient wetland of national importance. And so we – from a scientific perspective, we said that's lovely, but what does it actually
20 mean? And - - -

MR BEASLEY: Was that as at the time it was first listed as a Ramsar site?

ASSOC PROF LESTER: No, it wasn't. That happened in the 1980s. This was
25 during the millennium drought and because some of the staff at the Department could see that environmental water requirements were going to be needed in the near future for what has turned into the Basin Plan. So we got a head start, effectively. We broke that down into what we understood a healthy resilient wetland would look like from an ecological perspective. And so that include things like having self-
30 sustaining populations of different organisms, having the correct proportional functions that a wetland should undertake, that it had a persistent salinity gradient, among other things.

And we then went through a series of indicators which included birds – sorry, not
35 birds, fish, vegetation, macroinvertebrates, and ecological processes within the Basin to identify what the salinity requirements, flow requirements, any flooding requirements, any PH requirements, any connectivity requirements that we could identify, and so there is a very large document that lists all of those. We then combined those together to try and set some salinity targets for Lake Alexandrina
40 because that was the variable for which we had most information about tolerances. But it was - - -

MR BEASLEY: Now, just stopping there. That was an additional environmental water requirement to the Basin Authority, Lake Alexandrina.

45

ASSOC PROF LESTER: This is separate to that process. So it pre-dated that process. And so we ended up setting three different salinity targets, one of which

was a long-term average of 700 microsiemens per centimetre which is an electrical connectivity which is a surrogate for salinity. So that was the long-term average. We then also said we didn't want to exceed 1,000 microsiemens per centimetre in the 95 per cent of years and 1,500 in 100 per cent of years was an absolute maximum.

5 And part of the reason for setting those was that the system is naturally really variable and so it isn't of benefit to the system to artificially constrain it to limit that variability. You actually want that variability. And part of that is what has driven the diversity and the productivity of the region that is there now.

10 We then – Theresa Heneker from the Department undertook modelling within the Lower Lakes to understand how much flow was required to meet those salinity targets. And then my team at Flinders assessed those volumes as to whether they would or would not be sufficient for the Coorong as well. And we added in some high-flow targets into the Coorong because those were also shown to be important
15 out of some of the work that we had done previously. So, as a result, we ended up with sets of three year – sorry, three minimum flow requirements, which includes an absolute minimum, an average for – a long-term average and then a sort of a middle ground in which you choose the highest value as being the requirement for that part of the system. So it's a little bit complex, but reflects that fact - - -

20

MR BEASLEY: A little bit?

ASSOC PROF LESTER: It took us two years to do.

25 MR BEASLEY: Yes.

ASSOC PROF LESTER: So it reflects the fact that it is variable and that the hydrodynamics in that system complex and so we were trying to accommodate that in setting the target.

30

MR BEASLEY: So can I summarise it in this way: that the Basin Authority – and this is reflected in the Guide, had identified over 2,000 key environmental assets and then set their over 100 indicator sites.

35 ASSOC PROF LESTER: Yes.

MR BEASLEY: And then they had established environmental watering requirements in relation to flows needed at various sites, which include volume of flow, length of flow, duration, time of year, etcetera.

40

ASSOC PROF LESTER: Yes.

MR BEASLEY: Sorry. Number of years, percentage and number of years, all of those sorts of matters. And they had then published those environmental water requirements in the Guide.

45

ASSOC PROF LESTER: Yes.

MR BEASLEY: You did the separate work to – and published in the Guide included the Basin Authority’s environmental water requirements for the Coorong, Lower Lakes, Murray Mouth.

5 ASSOC PROF LESTER: Yes.

MR BEASLEY: And you, through 2009 – was it the start of 2009 to 2011, something like that?

10 ASSOC PROF LESTER: Something like that.

MR BEASLEY: Did your own work with others setting South Australia’s environmental water requirements, particularly for the Coorong, Lower Lakes, Murray Mouth.

15

ASSOC PROF LESTER: That’s right.

MR BEASLEY: Right. Okay. And then you were involved in, as a co-author of two reports for Goyder, one looking at the scenarios in the Guide which were for a recovery of 3,000 gigalitres for environment and 3,500 to 4,000.

20

ASSOC PROF LESTER: Yes.

MR BEASLEY: And seeing what was meant in terms of the Basin Authority’s environmental requirement and South Australia’s environmental water requirements.

25

ASSOC PROF LESTER: Yes.

MR BEASLEY: And then after the Plan came out, at least in draft, you did a 2013 report for Goyder which analysed the – what was in the ESLT report as the three scenarios, being 2,400, 2,800 and 3,200.

30

ASSOC PROF LESTER: That’s right.

MR BEASLEY: Again, looking at whether targets were met in terms of environmental water requirements based on the Basin Authority’s water requirements and the South Australian ones you worked off.

35

ASSOC PROF LESTER: That’s right.

40

MR BEASLEY: Okay. So the first report, if you could help us with, is a report entitled ‘Analysis of South Australia’s Environmental Water and Water Quality Requirements and their Delivery under the Guide to the Proposed Basin Plan’.

45 ASSOC PROF LESTER: Yes.

MR BEASLEY: Authors Pollino, Lester, Podger, Black and Overton, Goyder Institute for Water Research. I'm not sure we've got on record, what is the Goyder Institute for Water Research, it's a collaboration between the government, CSIRO and the universities mentioned, is it?

5

ASSOC PROF LESTER: The universities within South Australia. Yes.

MR BEASLEY: Yes. So University of Adelaide, University of South Australia, Flinders University.

10

ASSOC PROF LESTER: That's correct.

MR BEASLEY: And were you responsible for any particular part of the report?

15

ASSOC PROF LESTER: I, again, was responsible for the assessment of the water requirements for the Coorong.

MR BEASLEY: Right. Okay. And by the fact you're looking at your computer, I assume you have this report on your computer.

20

ASSOC PROF LESTER: Indeed.

MR BEASLEY: I'm going to tender this report. I don't think it has been tendered yet. No. So that report will go into evidence. The terms of reference for this report are in the preface on page (i). And, in particular:

25

Independently review and assess the modelling underpinning the proposed SDLs and environmental water requirements.

THE COMMISSIONER: I take it these technical reports are numbered in a series by the year and the series within the year. This is called number 11/2.

30

ASSOC PROF LESTER: I imagine so. I must admit, I haven't paid particular attention.

35

THE COMMISSIONER: It's just a convenient way to – and I see the copyright is given to the CSIRO or claimed by the CSIRO?

40

ASSOC PROF LESTER: Yes. The bulk of the work that this was done by the CSIRO so I'm not surprised by that.

THE COMMISSIONER: Thank you.

ASSOC PROF LESTER: All of the other co-authors are from the CSIRO.

45

THE COMMISSIONER: Thanks.

MR BEASLEY: On page 2 of the report, there's a table. I'm just wondering if you could help me with that:

5 *Table 1.1 Assessment of meeting the volume requirements of environmental water requirements for Riverland-Chowilla and CLLMM under the Guide scenarios, showing the number of environmental water requirements that are met under different models.*

ASSOC PROF LESTER: Yes.

10

MR BEASLEY: Is that a summary table of what's contained in rest of the report?

ASSOC PROF LESTER: Yes, that's right.

15 MR BEASLEY: So can you just explain to me – so we've got the three scenarios, 3,000, 3,500 and 4,000 for MDBA's environmental water requirements and the same for South Australia's environmental water requirements.

ASSOC PROF LESTER: Yes.

20

MR BEASLEY: What does Guide annual and big mod annual mean?

ASSOC PROF LESTER: Those are for the Riverland-Chowilla environmental water requirements, and so I would not be the best comment on those

25

MR BEASLEY: Is Guide annual a reference to the Guide to the Basin Plan or - - -

ASSOC PROF LESTER: Yes.

30 MR BEASLEY: Yes. And what's big mod annual?

ASSOC PROF LESTER: Big mod is – so again, I'm – I'm not 100 per cent across this, but - - -

35 MR BEASLEY: Yes.

ASSOC PROF LESTER: - - - my understanding is that the scenarios that were provided under the Guide to the Basin Plan were at an annual time stamp.

40 MR BEASLEY: Right.

ASSOC PROF LESTER: Whereas big mod is the – the hydrologic model that – that models water flow through the Basin.

45 MR BEASLEY: Right.

ASSOC PROF LESTER: And so that's at a daily time stamp.

MR BEASLEY: Okay.

ASSOC PROF LESTER: I understand in order to assess the Riverland-Chowilla environmental water requirements accurately, the preference was to use the daily time stamp, but that wasn't – wasn't how the – they were set, so both were used, but I wasn't personally involved in that analysis.

MR BEASLEY: All right. But looking at the table, it indicates that, in relation to what the Guide provided, under the MDBA's environmental watering requirements, we've got the two of four targets met for 3,000, two of four targets met for 3,500 and three of the four for 4,000.

ASSOC PROF LESTER: That's right.

MR BEASLEY: And in relation to the South Australian water requirements, three of nine, five of nine and six of nine, depending on the scenario.

ASSOC PROF LESTER: That's right.

MR BEASLEY: All right. I think page 3 is then just a summary of what's in the Guide and how the ESLT was defined and determined and talking about the hydrological indicator sites and the 2,444 key environmental assets determined.

ASSOC PROF LESTER: Yes.

MR BEASLEY: And what I then wanted to take you to was – can you explain to me, on page 12 of this report, the Department of Environment and Heritage has a plan – has a focus on maintaining character of Ramsar areas and the boundaries limited to Ramsar wetlands, etcetera, etcetera. The SA report DWLBC 2010 states that:

The preferred approach to setting EWRs is to use a functional rather than a site-based approach.

What does that mean?

ASSOC PROF LESTER: Again, this is with reference to Riverland and Chowilla.

MR BEASLEY: Yes.

ASSOC PROF LESTER: I suspect that what they're referring to is that a lot of the time the boundaries that we draw around particular ecological assets are not particularly relevant from how the site actually works.

MR BEASLEY: Yes.

ASSOC PROF LESTER: And so that may mean that there are parts of the – often parts of the sites that are not included within the boundaries that are specified but are actually quite important to maintaining the character.

5 MR BEASLEY: Right. All right.

ASSOC PROF LESTER: That would be my interpretation.

10 THE COMMISSIONER: Could I just ask you about – there's a reference on page 3
- - -

ASSOC PROF LESTER: Yes.

15 THE COMMISSIONER: - - - supported by figure 2.1, which is on page 4... the end of text on page 3, there's a suggestion of the MDBA that the flow regimes required to sustain key ecosystem functions are typically the base and freshes flow components, while the overbank flows typically sustained key environmental assets. Now, those are expressions that seem to have a technical meaning, do they?

20 ASSOC PROF LESTER: Yes, they do.

THE COMMISSIONER: And can you explain your understanding of that technical meaning?

25 ASSOC PROF LESTER: So the – flows are often, I think, from, I guess, a convenience perspective – are often described by their total volume, but ecology – ecosystems rarely respond to a total annual volume. They actually respond to the manner in which flow is delivered, so - - -

30 THE COMMISSIONER: To use a silly example, if it all came down in one month and nothing else for the rest of the year, that would be very different from some other distribution.

35 ASSOC PROF LESTER: Precisely. So you could have the same volume delivered equally every day over the year or you could have the scenario that you just posed or any number of other ways - - -

THE COMMISSIONER: Right.

40 ASSOC PROF LESTER: - - - of delivering the same thing. For the ecosystem, that manner of delivery is actually critical.

THE COMMISSIONER: Yes.

45 ASSOC PROF LESTER: And so throughout the reports that you've been reading, I'm sure you have seen reference to the fact that the scenarios that we're modelling are often one potential way in which that flow could be delivered, and so if you

altered that flow distribution, you would actually get very different outcomes. And one of the ways that is commonly used to divide up parts of that flow distribution are illustrated in – on page 4 in that diagram - - -

5 THE COMMISSIONER: Yes.

ASSOC PROF LESTER: - - - where you have a cease-to-flow event where there is no flowing water through the system, although there might be standing water. You then have a low season – low flow baseflow, which is usually groundwater that is seeping into the system and maintains a flowing water system when there's not rainfall. You can then have a high flow season base fall which would be the winter equivalent of that low flow baseflow, which in – in our part of the world would typically be in summer time. A low flow - - -

15 THE COMMISSIONER: ...

ASSOC PROF LESTER: Sorry. In – so the low flow season, in our part of the world, would typically be summer - - -

20 THE COMMISSIONER: Yes.

ASSOC PROF LESTER: - - - when there's less rainfall.

25 THE COMMISSIONER: Yes.

ASSOC PROF LESTER: And so low flow season is usually a summer/autumn until you start to get more flow into the system, whereas your high flow is likely to be winter and spring.

30 THE COMMISSIONER: Thank you.

ASSOC PROF LESTER: And so that's where you've got those divisions there.

35 THE COMMISSIONER: Yes.

ASSOC PROF LESTER: Your baseflow is predominantly the groundwater feeding back into the system. The freshes that you get on top of those are – are shorter, higher flows that are usually derived from rainfall. So it will rain - - -

40 THE COMMISSIONER: So the freshes normally come from rain.

ASSOC PROF LESTER: That's right.

45 THE COMMISSIONER: And what about in this country... snow?

ASSOC PROF LESTER: We have very little.

THE COMMISSIONER: Right. So that would just be monthly with the freshes?

ASSOC PROF LESTER: It would probably be lumped in with the baseflow.

5 THE COMMISSIONER: So high flow season, baseflow - - -

ASSOC PROF LESTER: High flow season baseflow I think - - -

10 THE COMMISSIONER: - - - is where you get your - - -

ASSOC PROF LESTER: Would include snow melt, but that is not something that is particularly common within South Australia, so let's just take that as a "maybe". Bankfull flows are when the water reaches the top of the channel and effectively fills the whole channel, and then overbank is flooding that extends beyond the channel.
15 So those are the different flow components. These are particularly relevant for floodplain systems like the Riverland and Chowilla but are much less relevant for the Lakes and Coorong because they're – they're effectively basins that fill up, and so it's rare for there to be substantial overbank flooding. You do get flooding across some of the barrier islands like Hindmarsh Island which is important for fish
20 connectivity, but we don't tend to separate the flow distribution up into the same components because they – they're less relevant.

THE COMMISSIONER: Now, again, at the foot of page 3 - - -

25 ASSOC PROF LESTER: Yes.

THE COMMISSIONER: - - - there's a distinction the reader is evidently expected to understand between key ecosystem functions and key environmental assets.

30 ASSOC PROF LESTER: Yes.

THE COMMISSIONER: And that's of importance to me, because those are the expressions you find in items A and B of the definition of environmentally sustainable level of take in - - -

35 ASSOC PROF LESTER: Yes.

THE COMMISSIONER: - - - in the Water Act.

40 ASSOC PROF LESTER: Yes.

THE COMMISSIONER: Now, environmental assets is not so helpfully defined to include:

45 *Water dependent ecosystems, ecosystem services and sites with ecological significance.*

And I don't think – I may be wrong – I don't think ecosystem function is itself defined.

5 ASSOC PROF LESTER: I couldn't comment on whether it is or isn't defined.

THE COMMISSIONER: Well, sorry. It's not in the Act.

ASSOC PROF LESTER: It's not in the Act.

10 THE COMMISSIONER: But it's used repeatedly.

ASSOC PROF LESTER: Yes.

15 THE COMMISSIONER: And it's used, for example, as the first of the examples of environmental outcomes which are said to include ecosystem function.

ASSOC PROF LESTER: That's right.

20 THE COMMISSIONER: Which is, I think, a bit different from ecosystem functions, but one describes, I think, the operating of functions and the other is functions...

ASSOC PROF LESTER: I – I think one would encompass – yes, the - - -

25 THE COMMISSIONER: ...

ASSOC PROF LESTER: Function in general, I think, would include the various individual functions.

30 THE COMMISSIONER: Can you just explain, and this may not matter – but could you just explain why the statement is made that key ecosystem functions are typically – typically need based and freshes flow components, and key environmental assets typically require overbank flows.

35 ASSOC PROF LESTER: I'm not sure I would have made that statement, but the – well, I mean - - -

THE COMMISSIONER: Why I ask is just as a matter of English.

40 ASSOC PROF LESTER: No, no, absolutely.

THE COMMISSIONER: Not being a scientist - - -

45 ASSOC PROF LESTER: So - - -

THE COMMISSIONER: Each phrase seems to be interchangeably possible to apply to all of the observable aspects of the natural world affected by this water.

ASSOC PROF LESTER: That's right. So the way I would read this, is that the environmental assets are usually – could potentially be interchangeable with the hydrological indicator sites. So they would be examples of assets where you would usually – I would usually think of an asset as being a specific location that had some ecological value that had been ascribed to it.

THE COMMISSIONER: Well, just to confuse things, this very next paragraph of this very same document gives as the second example of an asset site, asset site, being the Coorong, Lower Lakes, the Murray Mouth.

ASSOC PROF LESTER: That's right.

THE COMMISSIONER: Which I think you've just told us is not typically sustained by overbank flows.

ASSOC PROF LESTER: No, it is not typically sustained by overbank flows but it's probably the exception for a lot of the – the system.

THE COMMISSIONER: Okay. The Chowilla - - -

ASSOC PROF LESTER: Chowilla certainly would be - - -

THE COMMISSIONER: ...

ASSOC PROF LESTER: - - - sustained by overbank flows, and other – other assets such as Barmah-Millewa, Macquarie Marshes and – and others further up in the system would be sustained by overbank flows, but I - - -

THE COMMISSIONER: Without overbank flows they disappear, don't they?

ASSOC PROF LESTER: Well, they have – they have floodplain tree species in particular that support ecosystems, and those are the – particularly for things like River Red Gum are reliant on flooding for regeneration, so yes, they do disappear without flooding.

THE COMMISSIONER: And flooding is overbank flowing.

ASSOC PROF LESTER: Overbank flood, yes.

THE COMMISSIONER: Thank you. Sorry.

MR BEASLEY: And then I think it - - -

ASSOC PROF LESTER: Did you – I can define function, if that's - - -

THE COMMISSIONER: Yes, please.

MR BEASLEY: Go ahead. Yes.

ASSOC PROF LESTER: So ecosystem functions are the – I guess the activities that an ecosystem performs that sustain the biota that live there. So functions would be things like connectivity. Decomposition, for example, is another function. Nutrient cycling is a function. I think the only function that is listed within the – within the Basin Plan is connectivity. I think they have limited it to that, and so that's the flow of not just water, but also organisms and carbon and other nutrients and salt, for example, through the system to be able to link the system as a whole, so that you don't think about it as individual sites that are not connected. So a fundamental property of a river system is that it has uni-directional flow from upstream to downstream but also lateral connectivity with those overbank flows and other sorts of connectivity as well.

THE COMMISSIONER: Thanks.

ASSOC PROF LESTER: So that's what I would understand by that sentence.

MR BEASLEY: What do you understand by the term productive base ecosystem water resource.

ASSOC PROF LESTER: I would suggest that that is the – the minimum requirements to maintain the land. So I would suggest that that would include the basic functions that you would expect a system to work. It would probably - - -

MR BEASLEY: Such as?

ASSOC PROF LESTER: Such as primary production within the system, reproduction - - -

MR BEASLEY: Is that reproduction? Right.

ASSOC PROF LESTER: No, that – that's not reproduction.

MR BEASLEY: What's primary production, then?

ASSOC PROF LESTER: Primary production is the – the growth of plants and algae and other – other things that use sunlight predominantly - - -

MR BEASLEY: Right.

ASSOC PROF LESTER: - - - to create their own carbon.

THE COMMISSIONER: But called primary because they might be regarded as the beginning of dynamic processes affecting other life forms.

ASSOC PROF LESTER: I think called primary because they're the first step in a food chain, so they take - - -

THE COMMISSIONER: Thank you.

5

ASSOC PROF LESTER: - - - sun or chemical – chemical energy and turn it into biological energy, effectively.

THE COMMISSIONER: Thanks.

10

MR BEASLEY: Whereas reproduction is - - -

ASSOC PROF LESTER: Reproduction is the - - -

15

MR BEASLEY: - - - a species reproducing itself.

ASSOC PROF LESTER: Yes, or the next generation of a species, so they're a little separate.

20

MR BEASLEY: Right. Did that complete your answer to that question?

ASSOC PROF LESTER: Yes.

25

MR BEASLEY: Okay. Great. Page 9 – there's a – I think a summary of what is contained in the Guide. I think this is direct from the Guide about the range of surface water required to meet the requirements of the Water Act, and I assume that's – from the definition of the ESLT is 22,100 gegalitres a year and 26,700 which is between 67 per cent and 81 per cent of historical flows.

30

ASSOC PROF LESTER: Yes.

MR BEASLEY: And hence, there's then that reference to 3,658 and 69. That 3,658 might be a typo.

35

THE COMMISSIONER: Sorry. Could you just - - -

MR BEASLEY: Top of page 9.

THE COMMISSIONER: Thanks.

40

MR BEASLEY: Someone can check that from the Guide. I'm not sure that the figure 3,658 gegalitres a year is right.

THE COMMISSIONER: no

45

MR BEASLEY: I think it's higher than that. And 6,900 gegalitres, long-term average, etcetera, etcetera, and then down the bottom:

It is stated in the Guide that the environmental watering requirements for key environmental assets and key ecosystem functions can be achieved with a high level of uncertainty with a Basin-wide reduction in diversions of 3,000 gicalitres a year.

5

That term, “high level of uncertainty”, what does that mean to you as an ecologist?

10 ASSOC PROF LESTER: I think that this comes about by the fact that – just what I was explaining just before, that ecosystems don’t respond to overall levels of flow within the system. So it’s really difficult to answer the question, can a specific volume of flow meet the environmental water requirements for a system, because that’s not how the ecosystem functions. I would read that to be that it’s possible that 15 diversions of 3,000 gicalitres per year could meet the – could meet the environmental water requirements, but that, that would require a number of circumstances to be met. It would require the flows to be delivered in a way that was optimal, it would require that the local weather conditions were likely to be optimal. And so, therefore, it’s – the high level of uncertainty suggests to me that in many years you would not meet those targets.

20 MR BEASLEY: All right. Then I wanted to take you to, so that I understand and make sure we understand, two of the tables in this report. Page 43, in the section dealing with flow regime requirements, we have table 4.6 which is:

25 *Number of times MDBA and SA Riverland-Chowilla environmental requirements are met under the Guide scenario relative to without development baseline –*

and the 3,000, 3,500 and 4,000 scenarios.

30 ASSOC PROF LESTER: Mmm.

MR BEASLEY: Now, for the MDBA’s environmental watering requirements, they seem to be all met under all scenarios, until you get to the requirement of 100 gicalitres for 21 days one-in-seven years, and 125 gicalitres for seven days one-in- 35 nine years, where the result is, in fact, worse than under the baseline.

ASSOC PROF LESTER: Yes.

MR BEASLEY: For the South Australian water requirements, each scenario meets 40 those requirements up to and including 80 gicalitres for 30 days one-in-four years, but then there starts to be the same result as baseline or worse than baseline once the requirement is 85 gicalitres a year for 13 days one-in-five years, 90 for 30 days one-in-five years, 100 for 20 days, one-in-five years.

45 ASSOC PROF LESTER: That’s right.

MR BEASLEY: All right. And that's a summary of all the flow regime requirements.

5 ASSOC PROF LESTER: Again, this is not part of the report that I did personally.

MR BEASLEY: Okay.

ASSOC PROF LESTER: So that's certainly how I would read it.

10 MR BEASLEY: All right.

THE COMMISSIONER: I should ask there, baseline, as amongst other things, referring to that state of affairs in relation to consumptive use of the Basin water which had politically been decided should be reduced.

15

ASSOC PROF LESTER: Yes, that's right. So baseline – different reports also have slightly different definitions of baseline but, in general, it will include all of the pre-Basin Plan infrastructure within the Basin and the pre-Basin Plan level of take within the system.

20

MR BEASLEY: Up to 2009. Is that - - -

ASSOC PROF LESTER: That would be right. Even following 2009, a lot of the modelling still uses that as a baseline.

25

MR BEASLEY: Yes.

THE COMMISSIONER: But in other words, it's the state of affairs which is addressed by the Water Act and the Basin Plan as being something that has to be reduced as to consumptive use.

30

ASSOC PROF LESTER: Yes, that's right.

THE COMMISSIONER: Or to put it another way, socially and politically, we had said together that we have been taking too much water from the Basin.

35

ASSOC PROF LESTER: Yes, that's right.

THE COMMISSIONER: And we need to work out a way of taking less so as to protect and recover environmental factors.

40

ASSOC PROF LESTER: That's right. So the two references that are usually within these reports are that baseline, which is usually assessed as insufficient to support the ecology within the systems that we're looking at, and as a result, the Basin Plan was developed, and the without-developments scenario, which is an artificial removal of all of the – the impact of the infrastructure and the take that happens within the Basin to, effectively, almost provide a natural – it's not quite the same as natural, but a

45

baseline against which you can assess whether something would even be possible in an ideal world.

5 THE COMMISSIONER: Right. So its only real function, surely, is to apply the sanity check that will prevent any serious entertaining of what I will call environmental outcomes that have no relation to a natural possibility.

ASSOC PROF LESTER: That's right.

10 MR BEASLEY: And can I now ask you to help me to make sure I'm reading table 4.12 on page 55 correctly, which is the flow – the water requirements – flow requirements for the Coorong, Lower Lakes and Murray Mouth.

ASSOC PROF LESTER: Yes.

15

MR BEASLEY: So in relation to the MDBA targets for flow, for 5,100 gigalitres a year as a long-term average, each of the three scenarios achieves that.

ASSOC PROF LESTER: That's right.

20

MR BEASLEY: For 2,000 gigalitres a year rolling average over three years in 95 per cent of the years, each scenario achieves that.

ASSOC PROF LESTER: Except the baseline.

25

MR BEASLEY: Except the baseline. I'm only asking you about the 3,000, 3,500 and 4,000. For the requirement of 1,000 gigalitres a year rolling average over three years, scenario 3,000, scenario 3,500 and scenario 4,000 does not achieve that requirement.

30

ASSOC PROF LESTER: That's right.

35 MR BEASLEY: And for 3,200 gigalitres, as a 10-year rolling average for salt export, 3,000 gigalitres and 3,500 gigalitres does not achieve that target but 4,000 does.

ASSOC PROF LESTER: That's right.

40 MR BEASLEY: And then when we look at the South Australian Government targets, they are – was this your work?

ASSOC PROF LESTER: Yes.

45 MR BEASLEY: In some instances, significantly – well, is it – it is different to the MDBA targets.

ASSOC PROF LESTER: Yes.

MR BEASLEY: Can you just explain that?

ASSOC PROF LESTER: So the – in setting targets, the MDBA decided not to adopt the targets that the South Australian Government had produced. And so they
5 set their own targets. We did do an assessment about how similar those were. And we concluded that, more or less, they kind of came to the same place. The targets that we set were based on that setting of salinity targets for Lake Alexandrina and that and that was not something that the MDBA thought they could adopt. So they set their targets based on salinity targets within the Coorong, in particular, for things
10 like *Ruppia tuberosa*.

MR BEASLEY: Can I just ask, sorry to interrupt but just so I don't forget, is 2,000 gegalitres a year flow, is that considered the minimum amount to keep the Mouth open?
15

ASSOC PROF LESTER: There is no minimum amount to keep the Mouth open.

MR BEASLEY: Right. No, but - - -

ASSOC PROF LESTER: Mouth open in that context sounds binary. It sounds like
20 it's open or it's closed and that's not true. It's almost linear. And so a colleague of mine at CSIRO, Ian Webster, who has subsequently retired, did an analysis of about how much water was required to keep the Mouth open. And he concluded that there was no threshold. The more water you put through, the more the Mouth is open. I
25 would have personally adopted a target about the extent of the tidal prism into the Coorong, because the reason you want to keep the Mouth open - - -

MR BEASLEY: You're going to have to explain the term tidal prism to me

ASSOC PROF LESTER: Okay. So when the Mouth is open, what happens is that
30 the tides that you always experience within the ocean will penetrate into the Coorong. And the further you go down the Coorong the less likely it is that the tide will make it that far.

MR BEASLEY: Yes.
35

ASSOC PROF LESTER: So the tidal prism is just the extent to which you can detect the impact of tides within the system.

MR BEASLEY: Right. Okay. Sorry, now I interrupted you. It's always
40 dangerous.

ASSOC PROF LESTER: So there is no one value of water that will keep the Mouth open.
45

MR BEASLEY: Yes.

ASSOC PROF LESTER: The other reason I don't like that as a target is because it implies that it is always desirable to have the Mouth open at the same extent. And, as I mentioned earlier, it's actually natural for there to be seasonal variability and inter-annual variability within that.

5

THE COMMISSIONER: Historically, do we know – is there any pattern of how often the Mouth closes?

ASSOC PROF LESTER: Nearly never. As in, closed entirely, nearly never.

10

MR BEASLEY: Since Australian settlement, wasn't 1981 the first year that - - -

ASSOC PROF LESTER: As far as I know, yes.

15

MR BEASLEY: That it had been detected that it actually closed.

ASSOC PROF LESTER: That's right. And the modelling we've done of without-development flows suggests that wouldn't occur, certainly for any length of time. There is seasonal variability of how open it is but it shouldn't close entirely and certainly not for weeks or months at a time.

20

THE COMMISSIONER: And should I think of salt transport as an aspect of the consequence of the flow continuing through the Mouth?

25

ASSOC PROF LESTER: Yes.

THE COMMISSIONER: I'm sorry, I have forgotten. The barrage, in its present form and extent, when does that date from?

30

ASSOC PROF LESTER: The 30s. So it was constructed in, I think, between about '35 into the 40s. It was constructed over a number of years and so there's five barrages.

MR BEASLEY: Would I be right in saying that tends to indicate that extraction....

35

ASSOC PROF LESTER: Yes.

MR BEASLEY: That long ago.

40

ASSOC PROF LESTER: Yes, that's right. So there's a reason for construction that I have read is that seawater was starting to intrude into Lake Alexandrina and to make that water unsuitable for stock in that region. And so the barrages were built to prevent that saltwater intrusion back upstream into the system. So that would only happen because there was less fresh water.

45

THE COMMISSIONER: Without development, of course, is to be understood as, roughly speaking, none of the consumptive use and no artificial regulation by the barrages.

5 ASSOC PROF LESTER: The barrages are one of the exceptions within the without-development. So they - - -

THE COMMISSIONER: Why is that?

10 ASSOC PROF LESTER: Because of the complexity of trying to model the saltwater moving back up into the system. That isn't something that the existing models, as I understand, are able to do. So the barrages remain in place, but they remain open throughout the without-development scenario. So that's why it's not quite the same as the natural - - -

15 THE COMMISSIONER: Remaining open, at least in theory, means that depending upon high water conditions, the ocean water can come back up the river system.

ASSOC PROF LESTER: That's right, yes.

20 THE COMMISSIONER: Which obviously happens in nature.

ASSOC PROF LESTER: Not usually.

25 THE COMMISSIONER: Well, it must happen from time to time?

ASSOC PROF LESTER: Well, I think very rarely. The without-developments modelling that we've done for the Coorong suggests that sufficient water flows through to actually keep the south lagoon estuarine. So that's lower than the salinity
30 of seawater. And so if the south lagoon is it estuarine, there wouldn't be any seawater flowing back into the lakes. There would be sufficient fresh water that that would push the - - -

35 THE COMMISSIONER: Seawater comes in but only to a very limited extent.

ASSOC PROF LESTER: It would be very rare.

40 THE COMMISSIONER: Yes. Water is estuarine because there's a mixing of seawater and river water.

ASSOC PROF LESTER: But what happens naturally in an estuary is the location of that mixing zone will move up and down the system.

45 THE COMMISSIONER: Yes.

ASSOC PROF LESTER: So the modelling that we have done suggests that it's rare for that to occur in the lakes. It's much more common for it to be in the Coorong.

And, occasionally, into Encounter Bay because you've got sufficient volumes of fresh water that they're actually making Encounter Bay around the Mouth estuarine rather than this moving back up into the system.

5 THE COMMISSIONER: Thank you very much.

MR BEASLEY: I think I understand the rest of that table because I think I understand the significance of a tick and a cross.

10 ASSOC PROF LESTER: Yes.

MR BEASLEY: But can I just ask: for the South Australian Government targets here for flows and also for the table I took you to before regarding environmental watering requirements for Riverland-Chowilla and particularly in relation to the
15 South Australian targets, is there a report where those targets are set out based on the work you did for those?

ASSOC PROF LESTER: Yes, there is.

20 MR BEASLEY: There is? Would you be able to identify that report for us?

ASSOC PROF LESTER: That is the – that is the document that had myself, Peter Fairweather and Jason Higham and there's also a summary document?

25 MR BEASLEY: Has it got a title?

ASSOC PROF LESTER: It does. I'm just trying to find that.

MR BEASLEY: It's not – no, it won't be that.
30

ASSOC PROF LESTER: 'Determining the Environmental Water Requirements for the Coorong, Lower Lakes and Murray Region, Methods and Findings to Date'.

MR BEASLEY: ... I'll just - - -
35

ASSOC PROF LESTER: So it's 2011.

MR BEASLEY: Let me just see if I can – I may not have that one.

40 MR O'FLAHERTY: It might be the 500-page one ...

ASSOC PROF LESTER: Yes, it's a 500-page report. You should – you would know if you had it.

45 MR BEASLEY: Yes.

ASSOC PROF LESTER: ...

MR BEASLEY: ... how many pages?

ASSOC PROF LESTER: 500.

5 MR BEASLEY: All right. Thanks for that.

ASSOC PROF LESTER: We wrote an eight-page summary for you.

MR O'FLAHERTY: Yeah ...

10

MR BEASLEY: Really? I wish everyone would do that. Sorry, tab 4, is it?

MR O'FLAHERTY: 4 is the summary.

15 MR BEASLEY: Right. Is it? I've got a – are you sure? I've got a document here, 'Murray Futures Lower Lakes and Coorong Recovery – Specifying an Environmental Water Requirement for the Coorong and Lakes Alexandrina and Albert – a First Iteration Summary of Methods and Findings to Date'.

20 ASSOC PROF LESTER: Yes.

MR BEASLEY: Is that the summary you're talking about?

ASSOC PROF LESTER: That is the summary I'm talking about.

25

MR BEASLEY: Very good. Okay. All right. Thank you for that. I'll read that and I'll get Mr O'Flaherty to read the 500-page report and mark that up.

ASSOC PROF LESTER: My apologies in advance.

30

MR BEASLEY: Then you were part of a report with Fairweather and Hamilton where – for Goyder where you assessed the 2,400, 2,800 and 3,200 scenarios.

ASSOC PROF LESTER: That's right.

35

MR BEASLEY: That report is called 'Assessing the Impact of Volumes Proposed Under the Draft Basin Plan on the Coorong and Murray Mouth Region', Goyder Institute for Water Research, Technical Report Series Number 13/2.

40 ASSOC PROF LESTER: That's right.

MR BEASLEY: You have a copy of that report?

ASSOC PROF LESTER: I do.

45

MR BEASLEY: All right. And can I just make sure I have read this report correctly. Starting at the analysis of the water levels – what part of this – sorry, I should ask, what part of the report did you - - -

5 ASSOC PROF LESTER: All of it.

MR BEASLEY: All of it. All of this one. Good. So the results in relation to water level ranges commence – the discussion commences at page 12 of the report, and there's some tables on page 13.

10 ASSOC PROF LESTER: Yes.

MR BEASLEY: But I think the results show that there's very little difference in relation to water levels between the three scenarios; is that right?

15 ASSOC PROF LESTER: Yes, that's right.

MR BEASLEY: And certainly looking at the graphic representations it's very hard to see a distinction between the water levels - - -

20 ASSOC PROF LESTER: Yes. What's probably most relevant are the dots at the bottom, so if you look at - - -

MR BEASLEY: Explain that to me.

25 ASSOC PROF LESTER: So these are box plots, and effectively they give you the distribution of the – the values - - -

MR BEASLEY: Right.

30 ASSOC PROF LESTER: - - - that are there for each of the variables that are being graphed.

MR BEASLEY: Yes.

35 ASSOC PROF LESTER: So for the bottom right-hand corner – is probably the – the easiest to see – that was average water levels for the five different scenarios.

MR BEASLEY: Yes, is it that box D you want me to look at?

40 ASSOC PROF LESTER: The – box C.

MR BEASLEY: Box C.

45 ASSOC PROF LESTER: Sorry, that was – I didn't ... left.

MR BEASLEY: You should bottom right.

ASSOC PROF LESTER: I did.

MR BEASLEY: You want bottom left.

5 ASSOC PROF LESTER: I did say bottom right.

MR BEASLEY: Yes, right.

ASSOC PROF LESTER: I meant bottom left.

10

MR BEASLEY: Bottom left.

ASSOC PROF LESTER: Bottom left.

15 MR BEASLEY: Yes.

ASSOC PROF LESTER: You can see that the baseline has a whole series of little dots that sit below the green line.

20 MR BEASLEY: I can see that, yes.

ASSOC PROF LESTER: And so those are instances where the water level is very low because - - -

25 MR BEASLEY: I see.

ASSOC PROF LESTER: And you can see that for the 2,400 scenario - - -

MR BEASLEY: Yes.

30

ASSOC PROF LESTER: - - - there are a number of dots there that are similarly low.

MR BEASLEY: Yes.

35

ASSOC PROF LESTER: Whereas for the 2,800 and the 3,200, you don't see those dots.

MR BEASLEY: Are some of these circles and some of these dots?

40

ASSOC PROF LESTER: They're all circles.

MR BEASLEY: They're all circles.

45 ASSOC PROF LESTER: It would be – a number of them overlapping..

MR BEASLEY: It's just a blurring of the ink, is it?

ASSOC PROF LESTER: It's not.

MR BEASLEY: No?

5 ASSOC PROF LESTER: It's actually circles that are overlapping.

MR BEASLEY: Right. Okay. But there's no – there's not – they are just circles.

ASSOC PROF LESTER: They are circles.

10

MR BEASLEY: Right. Okay. And at least in relation to water levels, very little difference between the 2,800 and 3,200 gigalitre scenarios.

15 ASSOC PROF LESTER: Except that I suspect given the colour of the – the dots at the top - - -

MR BEASLEY: More frequently.

ASSOC PROF LESTER: - - - there are more frequently - - -

20

MR BEASLEY: Yes.

ASSOC PROF LESTER: - - - higher water levels. I guess the – the relevance of that is - - -

25

MR BEASLEY: Yes.

ASSOC PROF LESTER: - - - that those are the instances in which ecological degradation is most likely when you have the very low water levels or the very high salinities. That's when organisms are less likely to be able to persist within the system.

30

MR BEASLEY: What does the – the green lines in box C, what do they represent?

35 ASSOC PROF LESTER: Those are thresholds that we have determined for the system, and - - -

MR BEASLEY: Right. So the bottom green is - - -

40 ASSOC PROF LESTER: The bottom green is a threshold at which we start to see what we've termed degraded ecosystem states within the system.

MR BEASLEY: Right. Is there somewhere in the report that tells me that, that I've missed or - - -

45

ASSOC PROF LESTER: Yes. It will be in appendix B1.

MR BEASLEY: Appendix B1. Okay.

THE COMMISSIONER: Is page 31 ... that I went to, somewhat hopefully, I suspect, to try to get my head round these box plots.

5

ASSOC PROF LESTER: Yes.

THE COMMISSIONER: I'm so sorry.

10 ASSOC PROF LESTER: No, no.

THE COMMISSIONER: I have tried, but can you just see whether you can explain to me what the purpose of a so-called box plot is?

15 ASSOC PROF LESTER: So it – it is to illustrate the distribution of the variable. So it is – again, I'm just sort of coming back to the same point that ecosystems don't respond to a mean. So to plot a mean and say these are all the same is completely unhelpful, I feel, because of that problem

20 THE COMMISSIONER: You're trying to avoid saying our mean would be meaningless.

ASSOC PROF LESTER: I am avoiding saying that, but it comes back to the illustration that we gave earlier, that if you have the same water level or the same
25 salinity that could be all in one day or it could be even across time and so there's no indication about the variability which is so critical to supporting the ecology...

THE COMMISSIONER: Yes. So graphically, this box plot - - -

30 ASSOC PROF LESTER: Yes.

THE COMMISSIONER: - - - when the rectangle with the bold horizontal midpoint
- - -

35 ASSOC PROF LESTER: Yes. So that's the median.

THE COMMISSIONER: What - - -

ASSOC PROF LESTER: Is the bold horizontal midpoint.

40

THE COMMISSIONER: Is the median?

ASSOC PROF LESTER: Median. And the box itself will be the 25th and 75th percentile.

45

THE COMMISSIONER: Thank you. Right. Thanks.

ASSOC PROF LESTER: And then the – the whiskers give you the 90 - - -

THE COMMISSIONER: So this might've been done on a bell curve, as it were.

5 ASSOC PROF LESTER: It doesn't have to be, but if it's a normal distribution, then yes, it will be on a bell curve.

THE COMMISSIONER: Yes.

10 MR BEASLEY: And in box C on page 13, the top green line signifies what?

ASSOC PROF LESTER: So the green lines all come from our ecosystem states model which give the – the points at which we've identified that there are differences in the environmental conditions that lead – that are associated with different
15 ecosystem conditions.

MR BEASLEY: Yes. So - - -

ASSOC PROF LESTER: So different mixes of birds, vegetation, fish, invertebrates
20 within the system.

MR BEASLEY: All right. And the top green line means - - -

ASSOC PROF LESTER: The top – sorry, this is for the bottom - - -
25

MR BEASLEY: Yes, for C.

ASSOC PROF LESTER: So the – the top green line will be a threshold that's associated with some of the states that are associated with high water levels. So we
30 term them some of the healthy ecosystem states.

MR BEASLEY: Right. Okay.

ASSOC PROF LESTER: That one will be associated with the healthy hypersaline
35 state.

MR BEASLEY: Right. All right. Okay. And then – I see. And is there another graphic representation of that on page 17?

40 ASSOC PROF LESTER: So page 17 gives – so the – the box plots are derived from the hydrodynamic models.

MR BEASLEY: Yes.

45 ASSOC PROF LESTER: So that is water levels and salinities within the Coorong. Page 17 is the output from our ecosystem states model.

MR BEASLEY: Right.

ASSOC PROF LESTER: And so the thresholds in salinities and water levels - - -

5 THE COMMISSIONER: Inform.

ASSOC PROF LESTER: They inform - - -

MR BEASLEY: Yes.

10 THE COMMISSIONER: An assessment.

ASSOC PROF LESTER: That's right.

15 THE COMMISSIONER: And we're talking about figure 5 now, are we?

ASSOC PROF LESTER: We are talking about figure 5.

MR BEASLEY: Yes.

20 ASSOC PROF LESTER: And so here, this is a graphical representation of the mix of ecosystem states that you would expect to get under each of those flow scenarios, and the green, red and purple ecosystem states are the ones that are – have only occurred in our data when the system has been in severe drought. So they're

25 undesirable states that are depauperate compared to the blue, yellow and orange.

THE COMMISSIONER: Now, without-development shows - - -

ASSOC PROF LESTER: Red.

30 THE COMMISSIONER: - - - what appears to be the highest of all these scenarios for the - - -

ASSOC PROF LESTER: For the red.

35 THE COMMISSIONER: The red, which I think is unhealthy hypersaline; is that right?

ASSOC PROF LESTER: Yes, that's a – an artefact in this particular model.

40 THE COMMISSIONER: That's ...

ASSOC PROF LESTER: And so that should be ignored ...

45 THE COMMISSIONER: Could you as briefly as you may just explain what - - -

ASSOC PROF LESTER: What, the artefact?

THE COMMISSIONER: And how ...

ASSOC PROF LESTER: When we originally created the model, one of the key variables that was driving the system was the number of delays with zero flow over the barrages, and so when we developed it, we named and characterised all of the ecosystem states around the conditions under which they occurred, including that as a variable.

10 THE COMMISSIONER: Yes.

ASSOC PROF LESTER: When we started to use the model to assess different environmental flow regimes, the – the cynic in me said, “You could put one gigalitre or one megalitre over the barrages every one year and thereby artificially limit the number of zero-flow barrage days that there were but not actually have any real impact on the ecology within the Coorong.” So we actually created an alternative model that attempted to remove barrage flows as one of the things that was driving the ecosystem states. And in creating that second model, the – this artefact has arisen whereby, under particular circumstances, you get what I consider to be abnormally high level of unhealthy hypersaline states.

20 THE COMMISSIONER: So it - - -

ASSOC PROF LESTER: So I am ignoring that.

25 THE COMMISSIONER: So it being an artefact, and notwithstanding that it has been presented in figure 5 - - -

ASSOC PROF LESTER: Yes.

30 THE COMMISSIONER: - - - I should not draw the conclusion, say, that baseline conditions will produce less unhealthy hypersaline than what would occur without development.

ASSOC PROF LESTER: No. I would completely ignore that particular state.

35 THE COMMISSIONER: All right.

ASSOC PROF LESTER: And concentrate on the purple and the green.

40 THE COMMISSIONER: Sure. So, instead, I can say of baseline, the combination of purple and red, that is, unhealthy hypersaline and degraded hypersaline - - -

ASSOC PROF LESTER: Yes.

45 THE COMMISSIONER: The latter is worse than the former, I take it.

ASSOC PROF LESTER: Yes.

THE COMMISSIONER: That is materially greater in baseline conditions than it would be with any of the three scenarios, 2,400, 2,800 and 3,200.

5 ASSOC PROF LESTER: That's right.

THE COMMISSIONER: Now - - -

ASSOC PROF LESTER:

10 THE COMMISSIONER: - - - you've encouraged us to focus on red, green and what's called purple.

ASSOC PROF LESTER: Yes, I should have ignored red. Sorry. Yes.

15 THE COMMISSIONER: So - - -

ASSOC PROF LESTER: If you have a look at figure 6, this actually provides the – the change in the distribution of states relative to the baseline for each of the other scenarios.

20 MR BEASLEY: Just before we get there, though, could you explain, what is meant by, for example, unhealthy hypersaline?

25 ASSOC PROF LESTER: Would you like another 500 page report? I'm sorry. That was very facetious.

THE COMMISSIONER: It would be destructive to the ecosystem.

30 ASSOC PROF LESTER: So the - - -

THE COMMISSIONER: ...

35 ASSOC PROF LESTER: The work I started doing at Flinders when I was there as a research fellow was to develop this model. And so this model attempts to assess the biota of the Coorong in its entirety and identify groups of organisms that occur together in space and time, and it then considers what the environmental conditions that are associated with each of those groups are.

40 MR BEASLEY: Right.

ASSOC PROF LESTER: And when we constructed that, we came up with these eight groups of organisms.

45 MR BEASLEY: Yes.

ASSOC PROF LESTER: And for the – for simplicity, we have given them names
- - -

MR BEASLEY: Yes.

ASSOC PROF LESTER: - - - that reflect the – the conditions that we have observed. So, for example, the healthy hypersaline state is a – usually a south lagoon state. So it has migratory birds, it's got Smallmouth Hardyhead, which is a small-bodied fish within the system, it has Ruppia tuberosa, and it has a mix of different invertebrates that also provide good food for

MR BEASLEY: It's naturally hypersaline, the south lagoon; correct?

ASSOC PROF LESTER: Depends how you define naturally.

MR BEASLEY: Okay.

ASSOC PROF LESTER: Under without-development conditions - - -

MR BEASLEY: Yes.

ASSOC PROF LESTER: - - - not necessarily.

MR BEASLEY: All right.

ASSOC PROF LESTER: Under baseline, yes.

MR BEASLEY: Yes. Right.

THE COMMISSIONER: Figure 5 suggests that under without-development conditions, it certainly will display a degree of healthy hypersaline.

ASSOC PROF LESTER: Yes, that's – that particular state is associated with quite high water levels within the south lagoon that are rarely there with the current extraction that we have, and so that's what's driving that big difference in the healthy hypersaline state, and that's part of the reason that we included high flow targets - - -

THE COMMISSIONER: Yes.

ASSOC PROF LESTER: - - - in the environmental water requirements – was to try and trigger that state, which seems to rely on those higher flows based on our analysis.

THE COMMISSIONER: Now, you were taking us to figure 6.

ASSOC PROF LESTER: I was. Figure 6.

THE COMMISSIONER: It shows touching faith in our capacity to - - -

ASSOC PROF LESTER: So figure 6 - - -

THE COMMISSIONER: - - - understand one table by reference to another.

ASSOC PROF LESTER: Figure 6 takes the – the baseline and plots the difference
- - -

5

THE COMMISSIONER: Yes.

ASSOC PROF LESTER: - - - that occurs under each of those. So you can see that
there is a much higher proportion of that light yellow colour, which is the healthy
hypersaline, so that's what we were just discussing.

10

MR BEASLEY: Yes.

ASSOC PROF LESTER: There's a much lower percentage of the average
hypersaline state in the without-development compared to the baseline, and you can
see that there are much smaller differences across the three other – the other
scenarios that are there, but the relevant differences are probably in that light yellow
that you get a little bit of that under each of the 2,800 and 3,200 - - -

15

THE COMMISSIONER: A little bit of a - - -

20

ASSOC PROF LESTER: A little bit of an increase.

25

THE COMMISSIONER: Increase.

ASSOC PROF LESTER: Whereas, you don't see that increase for 2,400 and you
get a slight decrease in the degraded hypersaline as you go through. Not much
change in the others.

30

THE COMMISSIONER: But what's the significance of any of the – the without-
development scenario producing what appears to be the same decrease in unhealthy
marine as all the others?

35

ASSOC PROF LESTER: I think under without-development conditions, you would
not expect to see the marine, the degraded marine or the degraded hypersaline.

THE COMMISSIONER: That goes back to what you were saying earlier in relation
to the rarity of truly marine conditions.

40

ASSOC PROF LESTER: Yes.

THE COMMISSIONER: So it's not – the green is not very significant, then, to me,
is it?

45

ASSOC PROF LESTER: The green is - - -

THE COMMISSIONER: Because it appears to not much alter.

ASSOC PROF LESTER: It – it is there – it doesn't alter by a lot, no. This model is – for the magnitude of difference among these scenarios it's not particularly sensitive.

5 THE COMMISSIONER: So what do I get from figure 6?

ASSOC PROF LESTER: From figure 6, you should take that you get a slight increase in the more desirable states, particularly the healthy hypersaline with increasing volumes of what are recovered for the environment.

10

THE COMMISSIONER: Although, again, we see barely any difference - - -

ASSOC PROF LESTER: Yes.

15 THE COMMISSIONER: - - - between 2,800 and 3,200 with respect to it.

ASSOC PROF LESTER: That's right.

20 THE COMMISSIONER: And in respect of average hypersaline, which is on the way between healthy to unhealthy - - -

ASSOC PROF LESTER: That's right.

25 THE COMMISSIONER: - - - you get not much of a difference between 2,400 to 3,200.

30 ASSOC PROF LESTER: That's right. And I think the other thing I would take from this is that 3,200 does not return you to anything that looks like the without-development scenario.

MR BEASLEY: Understood, yes. So, in other words, 3,200, whilst that's the highest scenario modelled - - -

ASSOC PROF LESTER: In this report.

35

MR BEASLEY: - - - in this report, doesn't achieve anything remotely approaching without-development.

ASSOC PROF LESTER: No.

40

MR BEASLEY: That's not a criticism of choosing 3,200. It's just an observation.

45 ASSOC PROF LESTER: It is an observation and I think as you rightly pointed out, without-developments is there as more after sanity check and some assessment of what might be there naturally. But we would never advocate attempting to - - -

MR BEASLEY: What should we understand by the difference between average and healthy?

5 ASSOC PROF LESTER: I think that the healthy one – for that particular – I’m not
sure that I would rename the same way again. The healthy state for the hypersaline
condition seems to be associated with those high water levels. So even under the
without-development situation, both the average and the healthy are there, and
present, and probably desirable. So you would want both of them to be occurring,
10 but you would not just want the average hypersaline state. Would you still want to
be wanting to have some instances of all the higher saline.

MR BEASLEY: Does the witness have this? Could you give it to her, please?

15 ASSOC PROF LESTER: I have that.

MR BEASLEY: Sorry. There is a report behind tab 2 that you were one of many
contributors, an ‘Ecosystem Assessment to Guide Management of the Coorong’.

20 ASSOC PROF LESTER: Yes. You’ve got the diagrams, excellent.

MR BEASLEY: I was just wondering whether there’s any assistance at all –
starting from page 36, we’re looking at marine, marine unhealthy marine, degraded
marine on page 36. And on page 37 we’ve got healthy higher saline, average
hypersaline and going back to 36, I’ve got ducks on the bank and ducks in the
25 water and swans in the water and there’s a shark in one.

THE COMMISSIONER: They’re not all ducks.

30 MR BEASLEY: Well - - -

ASSOC PROF LESTER: They are not all ducks, no, that’s true.

MR O’FLAHERTY: There’s a cormorant.

35 ASSOC PROF LESTER: There’s all sorts of things.

MR BEASLEY: Is there any way these diagrams assist in understanding - - -

40 ASSOC PROF LESTER: Absolutely.

MR BEASLEY: Can you explain that?

ASSOC PROF LESTER: Yes. And these are the diagrams that we put together
before we gave them the names.
45

MR BEASLEY: Right.

ASSOC PROF LESTER: So we went through – these are the groups of organisms that are representative of each of these states. So these are the ones that co-occur in space and time. And when we looked at what was happening across the different – across all the states in each of the hypersaline and the marine are the part of the system, we noticed that the first in the list has a lot higher diversity.

MR BEASLEY: Right.

ASSOC PROF LESTER: And in instances higher abundance then as you work your way through that sequence. So that was what prompted them to give them the names that we have.

MR BEASLEY: I see.

ASSOC PROF LESTER: You can see that the estuarine marine state which is A on page 36 has a range of different fish species, it has got a range of different piscivorous birds so fish eating birds and also some ducks. And you can see within the banks there are a range of different invertebrates that also occur there. And then as you work your way through that system, you lose some organisms.

MR BEASLEY: Right.

ASSOC PROF LESTER: New ones appear and then by the time you get to the end it actually looks quite different than what it did at the beginning.

MR BEASLEY: Right.

ASSOC PROF LESTER: And it's more stark on page 37, where because it's a hypersaline system you actually have fewer things that can persist within that system naturally.

MR BEASLEY: Is there any guide to what these birds and fish are or - - -

ASSOC PROF LESTER: Yes. There will be a big long list.

THE COMMISSIONER: There is a species list in Lester and Fairweather 2009 according to the key.

MR BEASLEY: I see. Yes. You're right. Right at the bottom.

ASSOC PROF LESTER: Is there anything in particular that you're looking at?

MR BEASLEY: Yes. Well, I can see - - -

THE COMMISSIONER: In my case, it's my watch.

ASSOC PROF LESTER: You're going to be testing.

MR BEASLEY: I don't have long to go. Should we complete it? Or - - -

THE COMMISSIONER: You've said that before.

5 MR BEASLEY: Well, I mean it this time.

THE COMMISSIONER: Professor, are you happy - - -

ASSOC PROF LESTER: I'm happy to continue.

10

MR BEASLEY: I don't care. We can come back at a later time.

THE COMMISSIONER: I would like the advice of the professor.

15 MR BEASLEY: Would you like a break?

ASSOC PROF LESTER: I'm fine either way.

THE COMMISSIONER: How long do you reckon?

20

MR BEASLEY: I do actually think only 10 minutes.

THE COMMISSIONER: Very well. I have scars from a recent experience, that's all.

25

ASSOC PROF LESTER: I will attempt to be brief.

THE COMMISSIONER: No, no, no. I absolutely don't want you to feel constrained.

30

ASSOC PROF LESTER: Okay.

MR BEASLEY: Then can we go to that – back to this report and we're looking at page 19, immediately under figure 6, we start the discussion about environmental water requirements.

35

ASSOC PROF LESTER: Yes.

MR BEASLEY: So what the reports – can you just tell me what – there's a minus 1 after the reference to 3,200 gigalitres a year. What does that symbolise?

40

ASSOC PROF LESTER: Per year.

MR BEASLEY: Per year. Okay. Without development one Basin Plan scenario with the additional flow of 3,200 gigalitres met all eight relevant MDBA and SA government water requirements.

45

ASSOC PROF LESTER: Yes.

MR BEASLEY: But 2,400 and 2,800 met only three and four respectively.

5 ASSOC PROF LESTER: Yes.

MR BEASLEY: And so 2,400, three out of eight.

ASSOC PROF LESTER: Mmm.

10

MR BEASLEY: And then over the page, whilst the addition of the – last paragraph, an addition of 400 gegalitres a year between 24 and 48 resulted in only one additional environmental water requirement being met, an increase of 400 to the 3,200 meant that all eight were met. So in relation to these environmental water requirements, there is a significant difference, at least in achieving targets between 2,800 and 3,200.

15

ASSOC PROF LESTER: At least for this particular flow degree scenario. Yes.

20

MR BEASLEY: Yes.

THE COMMISSIONER: So table 3 gives us a bit more detail on that, including what I might call margins by which

25

ASSOC PROF LESTER: Yes. That's right.

THE COMMISSIONER: Figure 7, on page 23 - - -

30

ASSOC PROF LESTER: Yes.

THE COMMISSIONER: Is an attempt to synthesise or compare or combine, in a detectable fashion, assessment of baseline 2,400, 2,800, 3,200 and, for what it's worth, without-development.

35

ASSOC PROF LESTER: Yes.

THE COMMISSIONER: By reference to what is called the percentage success of the meeting the targets that comprise the EWR. Is that right?

40

ASSOC PROF LESTER: Yes. So that would be a proportion out of eight.

THE COMMISSIONER: Yes. And without-development and 3,200 as the text Mr Beasley has just taken you to, are combined in the coloured fashion they are on figure 7 so indicate that there's 100 per cent success in both of them beating those targets.

45

ASSOC PROF LESTER: That's right.

THE COMMISSIONER: Now, if I read this, however, the dotted line is 50 per cent. Is that correct?

5 ASSOC PROF LESTER: Yes, it is.

THE COMMISSIONER: Or the dashed line. So that at 2,800, in relation to the MDBA targets, there's a 50 per cent success in meeting targets.

10 ASSOC PROF LESTER: Yes.

THE COMMISSIONER: Now, if those targets were to be treated by me as signifiers of the ecosystem functions and the environmental assets - - -

15 ASSOC PROF LESTER: Yes.

THE COMMISSIONER: - - - being affected, figure 7 tells me that, according to this analysis of the targets and the scenarios, 2,800 would compromise those ecosystem functions and environmental assets.

20 ASSOC PROF LESTER: Certainly, that's true for this particular delivery scenario. And so that comes back to the point around it depends how you deliver the water.

THE COMMISSIONER: Of course.

25 MR BEASLEY: That's explained, I think, further on page 20 which I wanted you to explain to – sorry, have I interrupted your question.

THE COMMISSIONER: So methods of delivery.

30 ASSOC PROF LESTER: Yes.

THE COMMISSIONER: Which includes timing and duration.

35 ASSOC PROF LESTER: That's right.

THE COMMISSIONER: Which, of course, will affect what I might call location.

ASSOC PROF LESTER: What do you mean by that?

40 THE COMMISSIONER: Well, where the water will go is partly affected by how much is coming down at what rate and when.

45 ASSOC PROF LESTER: It's not so much about location for the Coorong. That would certainly be true for a floodplain system. But for the Coorong, it's more around that connection between the two lagoons and so - - -

THE COMMISSIONER: That is what I meant by location for the Coorong. Different water flows will be observed according to when it happens.

5 ASSOC PROF LESTER: Certainly, different water levels and different salinities will be observed depending on how the water is delivered.

MR BEASLEY: What does it mean – on page 20, I read part of that last paragraph, but then it goes on to say:

10 *While the volume of additional water is instrumental to increasing the number of environmental water requirements that are met, reference to figure 7, the method of flow delivery is also a driver of the number of environmental water requirements that are met.*

15 I understand that.

ASSOC PROF LESTER: Yes.

MR BEASLEY: But then it says:

20 *With the pattern of flow delivery modelled by the 3,200 scenario optimised to meet each target.*

What does that mean?

25

ASSOC PROF LESTER: So the scenario that we received from MDBA had been specifically designed to try and meet low targets. So they attempted to deliver the environmental water, virtual environmental water, within that scenario in a way that was most likely to meet the targets. Which is how they would deliver environmental water in reality. So I don't think that's an unfair thing for them to have done.

30

THE COMMISSIONER: No.

MR BEASLEY: No, right.

35

ASSOC PROF LESTER: But what that means is that this assessment is likely to be a best-case scenario.

MR BEASLEY: Right. Yes.

40

THE COMMISSIONER: So 3,200 had that special attention.

ASSOC PROF LESTER: No. All of them had that special attention.

45 THE COMMISSIONER: Well, that pretty clearly indicates, then, via figure 7 that so far as this work is concerned, 2,800 would compromise the environmental outcomes.

ASSOC PROF LESTER: Certainly, as defined by the environmental water requirements. I think the other point - - -

5 THE COMMISSIONER: Yes. That's what I mean. Just within the universe of intellectual inquiry reported here.

ASSOC PROF LESTER: Yes. But I think it is important to also note that all of those scenarios represent an improvement on the baseline.

10 MR BEASLEY: Of course

ASSOC PROF LESTER: And so the - - -

15 THE COMMISSIONER: As figure 7 graphically illustrates.

ASSOC PROF LESTER: As figure 7 graphically illustrates. So I think the approach that we have taken to a lot of this modelling has been that you – you don't want to throw the baby out with the bathwater, effectively. The 2,400 may not completely redress the issues that we would seek to redress, but it is certainly better than not having the 2,400.

THE COMMISSIONER: I'm asking about compromise.

25 ASSOC PROF LESTER: No.

THE COMMISSIONER: Because the Water Act doesn't say something is better than nothing

30 ASSOC PROF LESTER: No. I understand that. I understand that. I understand that that's the position but, certainly, when we've been doing this we haven't approached it from the perspective that we like to see an improvement against the baseline. Which is not the task - - -

35 MR BEASLEY: You've certainly heard the phrase don't let perfect get in the way of good in relation to this, but that sort of ignores the Water Act. Can I just – you are footnoting a warning, are you not, at the bottom of page 20, that 3,200 modelling being optimised by the MDBA, you're pointing out that it won't take much change to the pattern of flow delivery to, as you say in this report, risk ecological degradation.

40 ASSOC PROF LESTER: That's right and I try and think about it from a risk perspective. So we have done separate analysis that looks at the impact of local weather conditions.

45 MR BEASLEY: Right.

ASSOC PROF LESTER: And, in particular, the timing of those high pressure systems that I mentioned earlier.

MR BEASLEY: Yes.

ASSOC PROF LESTER: And that change in water level through the system have a very large impact on the hydrodynamics. And so in a year where the timing of that is
5 very early in the season, you would expect that disconnection to be proportionally earlier and so, therefore, you would expect more severe water level – so low water levels and high salinities. And you would – in years like that, you would need more environmental water to prevent degradation than you would in other years.

10 THE COMMISSIONER: That is how – I think that’s how I’ve understood a couple of references I wanted to ask you about. On page 24 - - -

MR BEASLEY: You’re on the clock now, Commissioner.

15 THE COMMISSIONER: Yes, yes. It’s my account. Page 24, just above the heading for table 4, that last sentence, the delivery of additional volumes. Do you see that?

ASSOC PROF LESTER: Yes.

20

THE COMMISSIONER: The parentheses there refers to some damage being still likely as a result of failing to meet the EWRs. So this is part of the continuum effect that something is better than nothing.

25 ASSOC PROF LESTER: Yes.

THE COMMISSIONER: But it’s only at a certainly at a certain level that you avoid damage.

30 ASSOC PROF LESTER: Yes. And so this part of the report explicitly explores failing to meet the targets, and whether if there’s a linear relationship in the water and the degradation.

35 THE COMMISSIONER: And on page 27, the first full page, commencing the pattern through time of flow delivery.

ASSOC PROF LESTER: Yes.

40 THE COMMISSIONER: That’s how I should understand – the whole of that paragraph is still grappling with that question of significance of the consequences of failing them by not quite so much.

ASSOC PROF LESTER: Yes, that’s right.

45 THE COMMISSIONER: And I didn’t understand the English of the fourth line of that paragraph.

ASSOC PROF LESTER: Yes.

THE COMMISSIONER: What does – how do I understand the word the relative?

5 ASSOC PROF LESTER: I think you should assume that there is a glitch.

THE COMMISSIONER: Thank you. What should it read, do you think?

ASSOC PROF LESTER: I think there is a word missing.

10

THE COMMISSIONER: Is it - - -

ASSOC PROF LESTER: The relative increase in the number of environmental water requirements were met. I think that should be in that sentence.

15

THE COMMISSIONER: Thank you very much. I don't know whether I had come across a scientific usage that I didn't understand.

ASSOC PROF LESTER: No, no. Just a typo.

20

THE COMMISSIONER: That's all from me.

MR BEASLEY: I have one more very quick - - -

25 THE COMMISSIONER: It's back on your time.

MR BEASLEY: It is back on my time. You have told me about – because you've told me about a concern you have about the Basin Plan in relation to the ecological equivalence test that's out in schedule 6 of the Basin Plan.

30

ASSOC PROF LESTER: Yes.

MR BEASLEY: And I'm going to be completely frank with you. When you explained it to me, I didn't have a complete understanding of it which, no doubt, is a reflection of my – the difficulties I have in understanding certain things. But I'm going to have another go with you now and perhaps other people will understand, and perhaps I will this time too. Can I – the general concern you have is that if the model doesn't detect a difference in ecological equivalence, none is assumed?

35

40 ASSOC PROF LESTER: That's right.

MR BEASLEY: And, therefore, there's tremendous reliance on the accuracy and the sensitivity of the model. Is that correct?

45 ASSOC PROF LESTER: The sensitivity.

MR BEASLEY: The sensitivity of the model. All right.

ASSOC PROF LESTER: Yes.

MR BEASLEY: Can I hand you, to make sure we're – that I have got the right part of the Basin Plan. So I'm directing the witness to schedule 6, which is the default
5 method for calculation of supply contribution. And, in particular, I'm taking the witness to section – well, schedule 6.07, Limits of Change in Score or Outcomes:

The following limits of change in score or outcome will apply in the method under the historic climate conditions.

10

Can we just pause there? Do you have a view as to whether climate change projections should have been included in the Basin Plan in relation to setting SDLs?

ASSOC PROF LESTER: I think they need to be included.

15

MS GILLESPIE. Sorry, I didn't catch that.

ASSOC PROF LESTER: I think they need to be included.

20

MS GILLESPIE Thank you.

MR BEASLEY: And is that, in part, because climate change projections, amongst other things, are part of the best available science?

25

ASSOC PROF LESTER: That's right. The – the ecology – the ecosystem is not going to respond to – is only going to respond to the water that's available and the manner in which that's delivered, and so the projections for this part of the world are that climate change will result in less water availability, and so that means that in order to meet the environmental water requirements, climate change should be
30 considered.

30

MR BEASLEY: I'm sorry, I probably have to ask a follow-up on that. But are the – what's your understanding of how, for example, climate change projections for the Basin may impact in the area you've started to study, such as the Coorong and Lower
35 Lakes?

35

ASSOC PROF LESTER: Certainly the – the amount of water will decline through time. How much by is very uncertain. The relationship between declines in rainfall and declines in run-off are hard to model, and so, therefore, there's a lot of variability
40 in that and the different models that are around give quite different answers. Nonetheless, a rule of thumb of about one to three is – is a typical kind of relationship that's given in the literature, whereby you would expect that, for every, I guess, decline of one unit in rainfall, you would expect a threefold decline in run-off. So run-off will decline by three times as much as rainfall, give or take.
45

45

MR BEASLEY: And rainfall is projected generally to decline, certainly in the southern Basin.

ASSOC PROF LESTER: Decline. Absolutely.

MR BEASLEY: Sorry. That was a distraction from 6.07, 'Limits of Change in Score or Outcomes'.

5

ASSOC PROF LESTER: Yes.

MR BEASLEY:

10 *The following limits of complaining in score or outcome will apply in the method under historic climate conditions, column A. For each region of the basin – no reduction in the benchmark environmental outcome scores, although some reduction in individual may be permitted if they are offset by increases in other elements.*

15

Can you explain your concern in relation to that part of the Plan?

ASSOC PROF LESTER: Yes. This – this part of the Plan effectively puts the onus of demonstrating that there's no difference on the sensitivity of the models. A – I think a fairer test would be to say that the – no - - -

20

MR BEASLEY: No difference in environmental outcomes, you're talking about?

ASSOC PROF LESTER: No difference in environmental outcomes. So I think a fairer test would be to demonstrate actively that there isn't a loss of environmental outcome. By – by saying that no difference is detected, that means that a very poor model is likely to allow a bigger decrease in environmental water because it can't detect a difference until that difference is large. So the less sensitive the model is, by the wording of this part of the Act, the bigger the decline – or the – or the – the bigger the difference in environmental water that you could allow before you actually indicate were actively able to say there is no – there is a difference in the in-flow.

25

30

THE COMMISSIONER: So how does this wording reward insensitivity?

35

ASSOC PROF LESTER: No reduction in environmental scores.

THE COMMISSIONER: Scores. So that means you're looking at a model which produces the score.

40

ASSOC PROF LESTER: Yes.

THE COMMISSIONER: And if the model is, as you say, not so sensitive - - -

45

ASSOC PROF LESTER: Yes.

THE COMMISSIONER: - - - the irony is that the less precise the science, the greater the change - - -

ASSOC PROF LESTER: That's correct.

5

THE COMMISSIONER: - - - in the watering – environmental watering - - -

ASSOC PROF LESTER: Yes.

10 THE COMMISSIONER: - - - would be permitted.

ASSOC PROF LESTER: Would be permitted, and I think that is around the wrong way. I think that it should be an active demonstration that you do not lose ecological character. I think the emphasis should be on demonstrating no loss as opposed to not being able to demonstrate a difference.

15

MR BEASLEY: Well, now - - -

ASSOC PROF LESTER: Which – it sounds semantic, but it actually reverses the onus of proof.

20

THE COMMISSIONER: No, not at all.

MR BEASLEY: Yes.

25

THE COMMISSIONER: No, not at all. It sounds statutory to me, because of the principles of - - -

MR BEASLEY: Ecologically sustainable development.

30

THE COMMISSIONER: - - - ecologically sustainable development.

ASSOC PROF LESTER: Yes.

35 MR BEASLEY: The precautionary principle.

THE COMMISSIONER: Which are required to include the precautionary principle, which assigns an onus on those who would do something - - -

40 MR BEASLEY: 21(4)(a).

THE COMMISSIONER: - - - when there is uncertainty with respect to the science.

ASSOC PROF LESTER: Yes.

45

THE COMMISSIONER: Insensitivity of models is one of the well-known ways in which one detects and tries to accommodate uncertainty in science, isn't it?

ASSOC PROF LESTER: That's right.

THE COMMISSIONER: Thank you. Thanks.

5 MR BEASLEY: I don't have any further questions for – sorry, I'm being given ...
yes, I will do that at some stage. I - - -

THE COMMISSIONER: Can I - - -

10 MR BEASLEY: Yes.

THE COMMISSIONER: It's always a risk to read a junior's note. It's always
valuable, too. Could I just inquire, where's the best place in your publications or
15 publications you've taken a part in for me to understand the relation – you've talked
about it a bit – between the MDBA EWRs and the South Australian EWRs, or at
least that class of them - - -

ASSOC PROF LESTER: Yes.

20 THE COMMISSIONER: - - - that I see referred to in appendix A on page 29 - - -

MR BEASLEY: Is that the 500-page report?

THE COMMISSIONER: - - - of your - - -
25

ASSOC PROF LESTER: No.

MR BEASLEY: No.

30 ASSOC PROF LESTER: No, that's a shorter one, I think.

THE COMMISSIONER: Of your 13/2 Goyder paper, that is, the technical report
series number 13/2? If – that's the one Mr Beasley had taken you to most recently,
and it's page 29. There is the appendix A which provides the brief summary of the
35 EWRs which were the subject of consideration here, and you've got the MDBA ones
and the South Australian Government ones.

MR BEASLEY: ...

40 THE COMMISSIONER: I've tried to but I didn't do all that well in understanding
the relation. I don't want you to talk me through it now.

ASSOC PROF LESTER: No.

45 THE COMMISSIONER: Where do I find that in your documents? Where do I find
that best explained?

ASSOC PROF LESTER: I think the – the best place to look would be in the other Goyder report that we've been discussing.

THE COMMISSIONER: Yes.

5

ASSOC PROF LESTER: That has an explicit comparison, which is - - -

THE COMMISSIONER: no, I know it. Yes. Thank you very much. Well, look, I'm much obliged for your time and trouble. Thank you very much for your help.

10

MR BEASLEY: Yes. Thank you

15 <THE WITNESS WITHDREW

[1.22 pm]

THE COMMISSIONER: And we will adjourn now till - - -

20 MR BEASLEY: Next Tuesday, I think. Next Tuesday at 10.

THE COMMISSIONER: Tuesday, 10 July - - -

MR BEASLEY: Yes.

25

THE COMMISSIONER: - - - at 10 am.

MR BEASLEY: At the Town Hall.

30 THE COMMISSIONER: At the Town Hall.

MR BEASLEY: Yes.

THE COMMISSIONER: Thanks very much.

35

MR BEASLEY: Thank you.

MATTER ADJOURNED at 1.22 pm UNTIL TUESDAY, 10 JULY 2018

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